

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking, cants, furring, supports, and nailers.
2. Plywood backing panels.
3. Plywood ceiling sheathing at canopy.
4. Plywood wall sheathing.
5. Plywood subfloor
6. Rough carriages and framing for wood stairs.

1.2 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. SPIB - Southern Pine Inspection Bureau.
4. WCLIB - West Coast Lumber Inspection Bureau.
5. WWPA - Western Wood Products Association.

1.3 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

- A. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. 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 lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Provide dressed lumber, S4S, unless otherwise indicated.
 - 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, and Use Category UC3b for exterior construction not in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. The use of CCA preservative treated wood is prohibited.

- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- C. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee 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. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

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 E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency

2.4 DIMENSION LUMBER FRAMING

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Stair Framing: No. 2 grade Douglas fir-larch; WCLIB or WWPA, minimum.

2.5 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
 - 4. Sleepers
 - 5. Cants

- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and the following species: Mixed southern pine; SPIB.

- C. For concealed boards, provide lumber with 19 percent maximum moisture content of the following species and grades:
 - 1. Spruce-pine-fir (south) or Spruce-pine-fir, Construction or 2 Common grade; NELMA, NLGA, WCLIB, or WWPA.

2.6 PLYWOOD PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.
 - 1. Paint before mounting of equipment.

- B. Plywood Ceiling Sheathing: DOC PS 1; Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.

- C. Plywood Wall Sheathing: DOC PS 1; Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.

- D. Plywood Subfloor: DOC PS 1, Exposure 1, Structural I sheathing; span rating to suit framing in each location and in thickness indicated.

- E. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch (13 mm).
 - 1. Provide fire-retardant-treated panels for interior locations unless indicated.
 - 2. Provide preservative-treated panels for exterior locations unless indicated.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners:

1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.8 ACCESSORY MATERIALS

- A. Weather Resistant Barrier: Asphalt-saturated organic felt, ASTM D 226, Type 1 (No. 15 asphalt felt), unperforated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 PANEL PRODUCT INSTALLATION

- A. Fastening Methods: Fasten panels as indicated below:
 1. Plywood Backing Panels: Screw to supports.
 2. Miscellaneous Concealed Plywood Panels: Screw to supports.
 3. Wall Sheathing: Screw to supports.
 4. Ceiling Sheathing: Screw to supports.
 5. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 WOOD BLOCKING, AND NAILER INSTALLATION

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

3.4 INSTALLATION OF STAIR FRAMING

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Size: 2-by-12-inch nominal (38-by-286-mm actual) size, minimum.
 - 2. Material: Solid lumber.
 - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches (89 mm) of effective depth.
 - 4. Spacing: At least three framing members for each 36-inch (914-mm) clear width of stair.
- B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

END OF SECTION 061053

SECTION 061643 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Division 07 Section "Fluid-Applied Membrane Air and Moisture Barriers" for moisture-resistive barrier applied over wall sheathing.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each gypsum sheathing product through one source from a single manufacturer.

1.4 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.

1.5 SEQUENCING AND SCHEDULING

- A. Sequence installing sheathing with installing exterior cladding to comply with requirements indicated below:
1. Do not leave glass-mat gypsum sheathing board exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory," or GA-600, "Fire Resistance Design Manual."

- B. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly of the School Building is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test. Gypsum sheathing shall be part of an assembly that has passed NFPA 285 testing.

2.2 GYPSUM SHEATHING, 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 WALL SHEATHING

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

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. National Gypsum Company; Gold Bond e(2)XP.
 - b. United States Gypsum Co.; Securock.
 - c. Georgia Pacific; DensGlass
2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) or 48 by 120 inches (1219 by 3048 mm) for vertical installation.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
- B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by

tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
2. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.
3. Sealants and tapes shall be compatible with air and moisture barrier specified in Section 072726

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 manufacturer's published instructions.
- D. Coordinate wall sheathing installation with air and moisture barrier installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

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 boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

- C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
- D. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061643

SECTION 064020 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plastic-laminate cabinets and casework.
2. Wood cabinets and casework, including built-in bookcases and storage units.
3. Interior wood trim and rails
4. Plastic laminate countertops.
5. Plastic laminate cubbies.
6. Coat hooks, wall mounted, for classrooms.
7. Wood seating (banquette)
8. Seating upholstery for seating units.
9. Sliding whiteboard doors for built-in bookcases.
10. Wood stairs.
11. Wood surround at Proscenium opening.
12. Slat wall.

B. Refer to the Schedule of Millwork for scope required.

C. Related Work Specified Elsewhere:

1. Solid surface countertops are specified in Division 06 Section "Solid Surface Material Fabrications."
2. FRP panel cladding for Learning Commons casework and columns and Cafeteria booths are specified in Division 09 Section "Fiberglass Reinforced Plastic Panels."
3. Composite quartz countertops are specified in Division 12 Section "Simulated Stone Countertops."

1.2 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Rough framing members associated with stairwork are specified in Division 06 "Miscellaneous Rough Carpentry" and Division 09 Section "Non-Structural Metal Framing."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories, and finishing materials and processes.

- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips and clips, cabling and connectors, and attachment devices, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, wire management, and other items installed in architectural woodwork.
 - 4. Show locations of seams in countertops.

- C. Samples for Verification: For the following:
 - 1. Lumber with or for transparent finish, 50 sq. in. (300 sq. cm), for each species and cut, finished on 1 side and 1 edge.
 - 2. Wood-veneer-faced panel products with or for transparent finish, 8 by 10 inches (200 by 250 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.
 - 3. Plastic-laminate-clad products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
 - 4. Upholstery fabric, 8 by 10 inches (200 by 250 mm), for each type.
 - 5. Markerboard Panels: 6 inches (150 mm) square, showing exposed-edge finish.

- D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

- E. 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.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed architectural woodwork 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.

- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.

- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 1. Provide AWI Quality Certification Program certificate indicating that woodwork complies with requirements of grades specified.

- D. Fire-Test-Response Characteristics of Upholstered Chairs:

1. Upholstery Assembly: Assembly shall comply with component-testing requirements of California Technical Bulletin 117-2013.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

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

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Low-Emitting Materials: All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI)
- C. Wood Species and Cut for Transparent Finish: Grade A Maple, plain sawn/sliced.

1. Matching: Solid stock shall be matched for color and grain; veneer faces shall be compatible in color with solid stock.
 2. Veneer Matching: Slip matched and balanced within panel.
 3. Maple edge on casework shall match the approved submittal on maple door finish.
- D. Wood Species for Stair Treads and Risers: Match wood flooring species, format and color at stage; refer to Division 09 Section "Wood Athletic Flooring."
- E. Cabinet Interiors (Cabinets with Doors): Plastic laminate with 3 mm PVC edgebanding (kerf and adhesion installation) on shelves.
- F. Wood Products: Comply with the following:
1. Hardboard: Tempered, S1S, Class 1 minimum 1/4 inch and conforming to PS 58-73.
 2. Particleboard: Minimum 45 lb. density particleboard complying with requirements in ANSI A208.1, Grade M - 3i.
 3. Medium-Density Fiberboard: ANSI A208.2, Grade 130
 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
1. Colors, Patterns and Finishes: As scheduled, or if not scheduled as selected by Architect.
 2. Basis of Design Products: As scheduled, or if not scheduled as selected by Architect.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Laminart.
 - c. Panolam Industries International, Inc.
 - d. Wilsonart
- I. Adhesive for Bonding Plastic Laminate: Contact cement.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

- J. Sliding Whiteboard Doors for Bookcases and Other Locations as Indicated: Interior sliding aluminum-framed door system with magnetic whiteboard finish one side, bottom-rolling doors, door tracks and hardware.
1. Basis-of-Design Product: Provide System S42 by Raumplus North America, Inc. or equal, with the following attributes.
 - a. Stile/Profile: S3000 Symmetrical, extruded aluminum with clear anodized finish.
 - b. Depth: 42 mm (1-5/8")
 - c. Panel Faces:
 - 1) Front: Magnetic markerboard 6 mm thick (1/4")
 - 2) Rear: MDF 6 mm thick (1/4"); paint in field.
 - d. Tracks: Clean anodized aluminum extrusions.
 - 1) Top Track: Double top track 40 mm with end covers as required.
 - 2) Bottom Tracks: Double surface-mounted bottom track with inset cover.
 - e. Hardware: Top Knobs, Raumplus 10.20 rod handle 1'-0" HT. One pair for each set of doors. Finish: Brushed Satin Nickel
 - f. Markerboard Accessories: Provide magnetic markerboard tray 12" wide for each markerboard.
 - g. Accessories: Provide guide rails, rollers, door stops, floor guides, door steady, connectors, fasteners and all required accessories for complete assembly.
- K. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
 2. Contact Adhesive: 80 g/L.
- L. Glass for Swinging Cabinet Doors and for Glass Shelves: Clear Tempered Glass, 1/2" thick, as specified in Division 08 Section "Glazing."
- M. Upholstery Fabric: 100% polyurethane (polycarbonate) fabric 54" wide with Write-Off ink and stain resistant finish and polyester backing, with a weight of 1.53 lbs./yd., and the following:
1. Flammability: Meets NFPA 260 and UFAC Class 1 for cigarette ignition resistance, and California Technical Bulletin 117-2013.
 2. Repeat: 2.1"V 3.4"H
 3. Basis of Design Product: Tessellation by Architex, or equal.
 4. Color: Bayleaf
- N. Upholstery Foam: Combustion Modified High Resilient (CMHR) foam meeting the following:
1. Density: 3.0 lb/cu ft
 2. 25% ILD: 35 lb
 3. Support Factor: 2.6
 4. Resiliency: 45%
 5. Meets California Technical Bulletins 117-2013 and 133 and NFPA 260.

6. Basis of Design Product: Code Red II foam by Hickory Springs Manufacturing, or equal.

O. Springs for Upholstered Seating: Sinuous springs with cross-connecting links. Springs shall be fabricated from high-carbon, high-tensile oil-tempered spring wire in 9 gauge for seats and 11 gauge for seat backs.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2. Other specific finishes are scheduled on Drawings

C. Bumpers: Clear pressure sensitive non-skid vinyl bumpers 1/2 inch diameter by 5/32 inches thick; Grass #GF-BP-C, or equivalent.

D. Frameless Concealed Hinges (European Type): 180 degrees of opening, self-closing, three-way adjustable; Grass #GF-1200VX-8, or equivalent.

E. Catches: Magnetic catches, 5 lb. holding power; Ives 324-P69, or equivalent. Provide 1 top mounted at each door.

F. Pulls: Mockett Rounded Square Pull #1088-SS Platinum finish.

G. Wire Management Grommets: Plastic grommets with cut-out covers cap, 1-1/2 inch I.D. unless otherwise indicated; Hughes Plastic Parts, or equivalent. Color as selected by Architect from manufacturer's standard colors.

H. Drawer Slides: 3/4 extension type, constructed from zinc plated cold-rolled steel, with ball-bearing rollers, 75 lbf (330 N) load rated; Accuride 214 Series, or equivalent.

I. Slides for File Drawers: Full extension type, constructed from zinc plated cold-rolled steel, with ball-bearing rollers, 200 lbf (890 N) load rated; Accuride 4437 Series, or equivalent.

J. Pencil Drawer Slides: 45 lbf (200 N), Accuride 214 Series, or equivalent

K. Adjustable Shelf Supports: Peg type, steel, 5/16" stem length, 1/4" bore, spoon width 25/64"; Progressive IF-739NP, or equivalent.

L. Locks: Door locks - NL-C8173-26D; drawer locks - NL-C8178-26D; strike - NL-C2004-14A; National Cabinet Lock, or equivalent. Keyed as requested by Owner.

- M. Levelers: Plastic leveling system, including socket, leveler, toe kick clip, and toe kick handle; Camar model CM-835-E1-00, CM-345-10-P2, CM-202-V1-T2, and CM-230-01-DE, or equivalent.
- N. Hooks for Cubbies: Double-pronged stainless steel hooks, ceiling mounted.

2.3 ACCESSORIES

- A. Shelving: 3/4" thick with 3 mm PVC kerfed edges, unless otherwise indicated.
 - 1. Provide MDO plywood for painted shelving.
 - 2. Provide wood veneered panel product with solid wood edge where scheduled or indicated on drawings.
 - 3. Provide plastic laminate faced panel product where scheduled or indicated on drawings.
 - 4. Shelving as part of a bookcase assembly shall be 1" thick.
- B. Adjustable Shelf Supports: Decorative, heavy-duty double-slotted standards adjustable on 1-1/4" centers with decorative brackets in length indicated on drawings. Include all accessories including cover strips, end caps, joiners, spacers and fasteners, as required for complete installation. Provide with epoxy finish in color as selected by Architect from manufacturer's standards.
 - 1. Product: Knap & Vogt #82 standards and #182 brackets, or equivalent.
- C. Countertop Support: Rakks EH Surface Mount Bracket RAKKS #EH1824 or equal.
 - 1. Finish: White or grey powder paint finish as selected by Architect.
- D. Coat Hooks, Wall-Mounted, for Classrooms: Single piece of 1/8" thick hot-rolled steel plate shaped into hook with 45 degree upper and lower prong angles; 3/4" wide x 4-3/16" h x 1-1/4" d; with two 3/16" OD screw holes, and load capacity of 150 lbs., as follows:
 - 1. Basis of Design Product: Mini Doohooky by Shelfology, or equal.
 - 2. Colors: Four colors as selected by Architect.
- E. Slatwall: Provide maple Slatwall in size 6' x 4' with finished edge trim and aluminum insert channels. Provide the following accessories:
 - 1. One carton wire baskets (quantity 6 baskets) S-22887 - 12" x 5" x 6"
 - 2. One carton Slatwall shelves (quantity 4 shelves) H-3882 in white 14"w x 8"d

2.4 INSTALLATION MATERIALS

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

- B. Rough Carriages for Stairs: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry." Kiln-dry to less than 15 percent moisture content.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm)
- D. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- F. Stairs: Cut rough carriages to accurately fit treads and risers.
 - 1. Glue treads to risers, and glue and nail treads and risers to carriages.
 - 2. House wall and face stringers, and glue and wedge treads and risers.
 - 3. Fabricate stairs with treads and risers no more than 1/8 inch (3 mm) from indicated position and no more than 1/16 inch (1.5 mm) out of relative position for adjacent treads and risers.

2.6 INTERIOR WOOD TRIM AND RAILS

- A. Quality Standard: Comply with AWI Section 6.

- B. Grade: Premium, for transparent finish items.
- C. For trim items wider than available lumber, use veneered construction. Do not glue for width.
- D. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work
- E. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- F. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.7 WOOD CABINETS AND CASEWORK FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 10 requirements for custom wood cabinets.
- B. Grade:
 - 1. Premium, for transparent finish items.
- C. AWI Type of Cabinet Construction: Flush overlay.
- D. Wood Species and Cut for Exposed Surfaces: As specified above.
- E. Grain and Veneer Matching: As specified above
- F. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. All cabinet interiors (at cabinets with doors) shall be plastic laminate faced with edgebanding as specified above
 - 2. Drawer Sides and Backs: Thermoset decorative overlay.
 - 3. Drawer Bottoms: Thermoset decorative overlay.
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops

2.8 PLASTIC-LAMINATE CABINETS AND CASEWORK

- A. Quality Standard: Comply with AWI Section 10 requirements for custom laminate cabinets.
- B. Grade: Premium
- C. AWI Type of Cabinet Construction: Full overlay.

- D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: HGS.
 - 2. Postformed Surfaces: HGP.
 - 3. Vertical Surfaces: HGS.
 - 4. Edges: HGS
 - 5. For the main office reception desk laminate, provide Wilsonart High Wear laminate in type General Purpose (HGS) Type 107HW, or equal.
- E. Materials for Semiexposed Surfaces Other Than Drawer Bodies:
 - 1. Drawer Sides and Backs: Thermoset decorative overlay.
 - 2. Drawer Bottoms: Thermoset decorative overlay.
- F. Colors, Patterns, and Finishes: As scheduled, or if not scheduled, as selected by Architect.
- G. Substrate: Plywood.
- H. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.9 PLASTIC LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 11 requirements for high-pressure decorative laminate countertops.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate Grade: HGS.
- D. Colors, Patterns, and Finishes: As scheduled, or if not scheduled, as selected by Architect.
- E. Edge Treatment: As indicated on Drawings.
- F. Core Material: Particleboard or medium-density fiberboard.
- G. Core Material at Sinks: Particleboard made with exterior glue, or medium-density fiberboard made with exterior glue
- H. Backing: Provide all laminate counter tops with backer/balance sheets.
- I. Provide backsplashes and end splashed as indicated.

2.10 STAIRWORK AND HANDRAILS

- A. Quality Standard: Comply with AWI Section 7.
- B. Grade: Premium.
- C. Wood Species: As specified above.
- D. Finishes for Stair Parts: Transparent finish; comply with Division 09 Section "Wood Flooring."

2.11 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 5, unless otherwise indicated.
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General:
 - 1. Finish all transparent finished architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
- D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
 - 1. AWI Finish System 9: UV Curable, Acrylated Epoxy, Polyester or Urethane.
 - 2. Staining: As selected by Architect.
 - 3. Wash Coat for Stained Finish: Apply a vinyl wash coat to woodwork made from closed-grain wood before staining and finishing.
 - 4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 5. Sheen: Satin.

2.12 FIELD FINISHING

- A. Field paint MDF side of sliding whiteboard doors in the field before installing into frames. Refer to Division 09 Section "Painting" for specifications.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Sections cited for fabrication and in the same grade, as specified in Part 2 of this Section for type of woodwork involved
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Wood Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
 - 2. Install trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- 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, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish

- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. 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.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.
 - 3. Caulk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

- H. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

- B. Clean, lubricate, and adjust hardware.

- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064020

SECTION 066116 - SOLID SURFACE MATERIAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes solid surface material fabricated into the following:
 - 1. Solid surface material countertops.
 - 2. Solid surface material sills.
 - 3. Solid surface benches.
- B. Related Sections include the following:
 - 1. Blocking and grounds, including supports for solid surface material countertops, is specified in Division 06 Section "Miscellaneous Carpentry".
 - 2. Sealants are specified in Division 07 Section "Sealants."

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions, cutouts for insertion of accessories, and coordination requirements with adjacent work.
- B. Samples: Submit minimum 6" x 6" samples of selected colors and patterns. Where color is not specified, provide full range of manufacturer's available color samples for selection by Architect.
- C. Product Data: Indicate product description, fabrication information, and compliance with specified performance requirements.

1.3 INFORMATIONAL SUBMITTALS

- A. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.
- B. Fabricator's Certificate: Submit certificate from manufacturer stating that fabricator is certified by manufacturer for this work.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced and licensed by manufacturer for production of solid surface fabrications similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

- B. Fire-Test-Response Characteristics: Provide materials with surface-burning characteristics as indicated below, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less

1.5 JOB CONDITIONS

- A. Do not deliver components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.
- C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. Allow for adjustments where taking of field measurements before fabrication might delay work.
- D. Coordination: Furnish inserts and anchorages which must be built into other work. Coordinate delivery with other work to avoid delay.

1.6 WARRANTY

- A. General: The special warranty specified in this Article shall not deprive Owner of other rights Owner 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. Manufacturer's Warranty. The manufacturer warrants to the original purchaser for commercial use that the manufacturer will at its option repair or replace, without charge, such product if it fails due to a manufacturing defect during the first 10 years after initial installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers: Provide Basis of Design Products or equal product of one of the following:
 - 1. AristechAcrylics, LLC.
 - 2. DuPont Polymers
 - 3. Formica

2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ICPA SS-1.
 - 1. Thickness: 12 mm (1/2").
 - 2. Color(s) and Pattern(s):
 - a. Countertops:
 - 1) Health Suite: Wilsonart "Yukon Riverstone" 9196
 - 2) Faculty Room: Wilsonart "Chilled Earth" 9228
 - 3) Learning Commons Circulation Desk: Corian "Antarctica"
 - 4) Makerspace, Art: Corian "Dove"
 - 5) Security and Health Care Transaction Window: Wilsonart "Silver Smoke" 9226SS
 - b. Corridor Nook Benches: Corian "Natural Grey".
 - c. Sills: Corian "Deep Titanium"
 - 3. Finish: Semigloss.
 - 4. Basis of Design Products: Corian Solid Surface by DuPont Polymers, and Wilsonart Solid Surface by Wilsonart Engineered Surfaces, LLC, or equal.

2.3 MISCELLANEOUS MATERIALS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints with chemical bonding.
- B. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.4 FABRICATION

- A. General: All fabrications shall be made using solid surface material. Fabrications shall be adhesively jointed with no exposed seams and having edge details as indicated on drawings. No exposed fasteners shall be allowed.
- B. Factory fabricate components into single unit to sizes and shapes indicated, in accordance with approved shop drawings.
- C. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
- D. Provide factory cutouts for bowls, plumbing fittings and accessories as indicated on the drawings.

- E. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.
- F. Countertops and Sills: Fabricate tops and sills in one piece. Comply with solid surfacing material manufacturer's recommendations for adhesives, sealers, fabrication, and finishing. Provide countertops with backsplash, endsplashes, aprons and nosings as shown.
 - 1. Total countertop and sill thickness shall be as indicated on the Drawings or if not indicated, 1-1/2" thick. Provide built-up fabrication as required to obtain required total thickness.
 - 2. Countertop Edges: Built-up, 1-1/2" thick, with eased edge.
 - 3. Provide waterfall edge at all sills.
- G. Allowable Tolerances
 - 1. Variation in component size: $\pm 1/8"$.
 - 2. Location of openings: $\pm 1/8"$ from indicated location.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surface to receive work and conditions under which work will be installed. Do not proceed with work until all unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and product installation data.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

3.3 ADJUST AND CLEAN

- A. Clean exposed surfaces using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period. Repair work or replace damaged work that cannot be repaired as required.
- B. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains. Replace stained components.

END OF SECTION 066116

SECTION 071326 – SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Types of sheet waterproofing specified in this Section include the following:
1. Adhesive-coated HDPE sheet waterproofing for below grade applications at elevator pit floors and under Classroom Building basement slabs on grade and turned up at edges.
 2. Rubberized asphalt sheet waterproofing for below grade applications at elevator pit walls, basement walls and all below-grade walls at occupied spaces.
 3. Drainage protection board for vertical applications.
- B. Related Sections Include the Following:
1. Division 07 Section "Thermal Insulation" for below-grade rigid insulation installed with waterproofing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site in compliance with the following:
1. Before installing waterproofing, meet with Owner, Architect, consultants, independent testing agency, waterproofing manufacturer, and other concerned entities.
 2. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.
 3. Notify participants at least 7 days before conference.

1.3 ACTION SUBMITTALS

- A. Product Data for each type of waterproofing specified, including manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
1. Certification by waterproofing materials manufacturer that products supplied comply with local VOC regulations.
- B. Shop Drawings showing locations and extent of waterproofing, including details for substrate joints and cracks, sheet flashings, penetrations, tie-ins with adjoining construction, and other termination conditions.

- C. Samples, 3-by-6-inch (75-by-150-mm) minimum size, of each waterproofing and associated materials required for Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Submit certificates signed by manufacturer stating that installers comply with requirements under the "Quality Assurance" Article
- B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Obtain primary waterproofing materials of each type required from a single manufacturer that has been producing such materials for a minimum of ten years. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: A firm with not less than five waterproofing projects similar to requirements (including size and scope) for this Project with satisfactory in-service performance and which is acceptable to primary waterproofing materials manufacturer.
- C. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed and areas are free of standing or running water, ice, and frost. Verify that concrete is dry, smooth, and free from sharp or ragged out-angles, honeycombing, rock pockets, depressions, and projections.
- B. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
 - 2. Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

- C. Do not install waterproofing where it will be exposed to rain, sleet or snow for any duration prior to the installation of toppings or other adjacent materials.

1.8 WARRANTY

- A. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer, agreeing to repair or replace sheet membrane waterproofing that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Provide waterproofing system with all auxiliary components as required and recommended by manufacturer for applications indicated; manufactured by one of the following, or equal:
 - 1. Carlisle Coatings and Waterproofing
 - 2. GCP Applied Technologies, Inc.
 - 3. Tamko Roofing Products, Inc.

2.2 RUBBERIZED ASPHALT SHEET WATERPROOFING

- A. Self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film, formed into uniform flexible sheets of not less than 1.5 mm (0.060 inch) thick, complying with the following:
 - 1. Tensile Strength: 325 psi minimum; ASTM D 412.
 - 2. Ultimate Elongation: 300 percent minimum; ASTM D 412.
 - 3. Puncture Resistance: 50 lbs minimum; ASTM E 154.
 - 4. Hydrostatic Head Resistance: 230 feet minimum; ASTM D 5385.
 - 5. Water Absorption: Not more than 0.1 percent weight gain after 48 hours' immersion at 70 deg F (21 deg C); ASTM D 570.
 - 6. Permeance: 0.1 perm maximum; ASTM E 96, Section 12 – Water Method.
- B. Basis of Design Product: Provide Bituthene System 3000 by GCP Applied Technologies, Inc. or one of the following:
 - 1. CCW MiraDRI 860/861, Carlisle Coatings and Waterproofing.
 - 2. TW-60; Tamko Roofing Products, Inc.

2.3 ADHESIVE-COATED HDPE SHEET WATERPROOFING

- A. Adhesive-Coated HDPE Sheet for Horizontal Applications: 46-mil- (1.2-mm-) thick, uniform, flexible sheets consisting of 30-mil- (0.76-mm-) thick, HDPE sheet coated with a pressure-sensitive rubber adhesive, a protective adhesive coating, a detackifying surface treatment, an uncoated self-adhering side lap strip, and a release liner with the following physical properties:
1. Tensile Strength, Film: 4000 psi (27.6 MPa) minimum; ASTM D 412.
 2. Low-Temperature Flexibility: Pass at minus 10 deg F (minus 23 deg C); ASTM D 1970.
 3. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m); ASTM D 903, modified.
 4. Lap Adhesion: 2.5 lbf/in. (440 N/m); ASTM D 1876, modified.
 5. Hydrostatic-Head Resistance: 231 feet (70 m); ASTM D 5385, modified.
 6. Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m); ASTM E 96, Water Method.
 7. Water Absorption: 0.5 percent; ASTM D 570.
- B. Basis of Design Product: Provide Preprufe 300R manufactured by GCP Applied Technologies, Inc. or one of the following:
1. Underseal Underslab Membrane; Polyguard Products, Inc.
 2. Or equivalent.

2.4 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
- B. Adhesives and Joint Tape: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer for bonding to substrate (if required), for waterproofing seams in membrane, and for waterproofing joints between membrane and flashings, adjoining surfaces, and projections through membrane.
1. Detail Tape for HDPE Membrane: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches (114 mm) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
- C. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.
- D. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by waterproofing sheet manufacturer.
- E. Trowelable Liquid Membrane: Two component, cold-applied trowel grade waterproofing material used to flash corners, form fillets and detail hard-to-reach areas. Type recommended by membrane manufacturer, compatible with membrane.

- F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.
- G. Rigid Insulation: Specified in Division 07 Section "Thermal Insulation".
- H. Waterstops: Hydrophilic waterstop for non-moving concrete construction joints.
 - 1. Basis of Design Product: Adcor by GCP Applied Technologies or equal.

2.5 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite drainage panels, 3-dimensional, nonbiodegradable, manufactured with a permeable geotextile bonded to molded-plastic-sheet drainage core and designed to effectively convey water.
 - 1. Vertical Application: Provide product with properties suitable for use vertically:
 - a. Thickness: 0.40 inches (10.16 mm) min.
 - b. Compressive Strength per ASTM D 1621: 15,000 pounds per sq. ft..
 - c. Filter Fabric Tensile Strength per ASTM D 4632: 100 pounds min.
 - d. Filter Fabric Puncture Resistance per ASTM D 4833: 65 pounds.
 - e. Filter Fabric Apparent Opening Size per ASTM D 4751: Sieve size 70 max.
 - 1) Basis of Design Product: Provide Hydroduct 220 by GCP Applied Technologies, Inc. or one of the following:
 - 2) CCW MiraDRAIN 6000/6200, Carlisle Coatings and Waterproofing.
 - 3) Hydrodrain 400, American Hydrotech, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
 - 2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 3. Verify that compacted subgrade is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.
 - 4. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.2 SURFACE PREPARATION

- A. General: Comply with manufacturer's instructions for preparing surface.

- B. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- C. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.
- D. Remove grease, oil, bitumen, form release agents, paints, and other penetrating contaminants from concrete.
- E. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- F. Prepare, fill, prime, and treat joints and cracks in substrate in accordance with manufacturer's directions. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135 and manufacturer's directions.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.
- I. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Reprime areas not covered by waterproofing membrane within 24 hours.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for handling and installing sheet waterproofing materials.
 - 1. Apply rubberized asphalt membrane waterproofing to vertical surfaces of elevator pit, foundation walls, and elsewhere as indicated on drawings.
 - 2. Apply adhesive coated HDPE membrane waterproofing under slab at elevator pit, for all blind pours, at basement floor slabs and elsewhere as indicated on drawings.
- B. Coordinate installing waterproofing materials with associated work to provide complete system complying with combined recommendations by manufacturers and installers involved in Work. Schedule installation to minimize exposure of sheet waterproofing materials.

3.4 RUBBERIZED ASPHALT SHEET WATERPROOFING APPLICATION

- A. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.

- B. Apply bonding adhesive to substrate at required rate and allow to partially dry.
- C. Apply waterproofing sheet to vertical surfaces in shingled fashion, starting at the low point and working toward high point of wall. Overlap all side seams a minimum of 2-1/2 inches and end laps a minimum of 5 inches. Roll all membrane with hand roller. Firmly press edges of membrane to surfaces to provide watertight seal. Apply bead of mastic to all terminations.
 - 1. Provide a fillet of liquid membrane at all inside corners covered with sheet waterproofing prior to flashing with sheet waterproofing.
- D. Seal projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.
- E. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal waterproofing sheet in place with clamping ring.
- F. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints
- G. For vertical and sloped-wall membrane, finish in termination bar; otherwise finish under flashing or under masonry in joint. Seal exposed edges with mastic or sealant.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches (150 mm) beyond repaired areas in all directions.
- I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.
- J. Immediately install drainage panels with butted joints over waterproofing membrane

3.5 ADHESIVE-COATED HDPE SHEET WATERPROOFING APPLICATION

- A. Install adhesive-coated HDPE sheets according to manufacturer's written instructions.
- B. Horizontal Applications: Install adhesive-coated HDPE sheet with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch- (75-mm-) minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps with detail tape to ensure watertight installation.
- C. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- D. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- E. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

- F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.
- G. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels with geotextile facing away from wall surface, according to manufacturer's written instructions over installed waterproofing membrane. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels by installing protection course of rigid insulation over drainage panel, as indicated on Drawings.

3.7 INSULATION INSTALLATION

- A. Install single layer of board insulation over installed drainage panel as indicated on Drawings. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. Protect during subsequent construction operations.

3.8 PROTECTING AND CLEANING

- A. Protect waterproofing from damage and wear during application and remainder of construction period according to manufacturer's written instructions. Do not allow traffic of any type on unprotected membrane.
- B. Protect installed insulation from damage due to ultraviolet light exposure, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Mineral-wool board insulation.
3. Mineral-wool blanket insulation.
4. Insulation jacketing system for ducts on roof.

B. Related Sections:

1. Section 042000 "Unit Masonry" for insulation installed in cavity walls and masonry cells.
2. Section 075323 "EPDM Roofing" for insulation specified as part of roofing construction.
3. Section 078446 "Joint Firestopping" for insulation installed as part of a perimeter joint firestopping system.
4. Section 092900 "Gypsum Board" for installation of acoustical blankets in metal-framed assemblies.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

- ##### A. Product Test Reports:
- Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- ##### B. Research/Evaluation Reports:
- For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

- ##### A. Surface-Burning Characteristics:
- As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- ##### B. Vertical and Lateral Fire Propagation Test Characteristics:
- The exterior wall assembly of the School Building is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific

assembly test. Insulation shall be part of an assembly that has passed NFPA 285 testing.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Basis of Design Product: Styrofoam Brand SM Insulation by DuPont (formerly Dow) or equal products by one of the following:
 - a. DiversiFoam Products.
 - b. Owens Corning.
 - 2. Type IV, 25 psi (173 kPa).
 - 3. Thickness: As indicated on Drawings for each application.
 - 4. Edges: Square edge or shiplap edge boards, manufacturer's standard for thicknesses required.
 - 5. Applications: Below grade applications.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Basis of Design Product: Provide Thermax (ci) Exterior Insulation by DuPont (formerly Dow) or equal products by one of the following.
 - a. Atlas Roofing Corporation.
 - b. Rmax, Inc.
 - 2. Thickness: As indicated on Drawings for each application.
 - 3. Facing: Foil faced both sides.

4. Edges: Square edge or shiplap edge boards, manufacturer's standard for thicknesses required.
5. Application: Exterior wall sheathing.
6. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

2.2 MINERAL-WOOL BOARD INSULATION (SEMI-RIGID)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:

1. Industrial Insulation Group LLC; Div. of Johns Manville
2. Isolatek International.
3. Owens Corning.
4. Roxul Inc.
5. Thermafiber.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
2. Fiber Color: Regular color, unless otherwise indicated.
3. Thickness: As indicated on Drawings for each application
4. Application: Provide for perimeter wall insulation at spandrels in curtainwall framing, at steel beams, roof areas, and other areas indicated.
 - a. Refer to Section 078446 "Joint Firestopping" for mineral wool insulation provided as part of a joint firestopping assembly/system.

C. Foil-Faced, Mineral-Wool Board Insulation: ASTM C 612; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5, respectively, per ASTM E 84.

1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
 - a. Application: Provide for perimeter wall insulation at fin tube cabinet enclosures' interior surfaces.
2. Fiber Color: Regular color, unless otherwise indicated.
3. Thickness: As indicated on Drawings for each application

2.3 MINERAL-WOOL BLANKET INSULATION

- A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type 1 (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ROXUL; Comfortbatt
 - b. Thermafiber; UltraBatt
 2. Thickness: As indicated on Drawings for each application
 3. Application: Provide for concealed building insulation in ceiling/roof assemblies, parapets, exterior stud walls, and elsewhere indicated on drawings.

2.4 INSULATION JACKETING SYSTEM FOR DUCTS ON ROOF

- A. System consisting of factory faced insulation board and multi-ply laminate insulation wrap which acts as a vapor barrier, suitable for installations in temperature range at building locale; provide 3M VentureClad Insulation Jacketing System or equal.

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 indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
 - b. Eckel Industries of Canada; Stic-Klip Type N Fasteners
 - c. Gemco; Spindle Type.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. Gemco; 90-Degree Insulation Hangers.
 2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.

3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. AGM Industries, Inc.; RC150 or SC150.
 - b. Gemco; Dome-Cap, R-150 or S-150.
 2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
 - d. Where indicated.
- D. Gas-Actuated Insulation Fasteners: Non-metallic insulation fastener assembly consisting of a plate or washer component formed from HDPE and a nail or pin component fabricated from zinc coated carbon steel pre-mounted in the plastic assembly, designed to be installed using a proprietary gas-actuated tool.
1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. X-IE-G Insulation Fastening System by Hilti
 - b. Ramset-I-F System by ITW Commercial Construction

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing 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 indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions. Extend insulation to dimension below exterior grade line as indicated.
 - 1. Where below grade insulation is installed over drainage protection board and installed waterproofing membrane, install boards vertically, loose laid.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.4 INSTALLATION OF INSULATION FOR FRAMED AND FURRED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Mineral-Wool 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. Install with required number of fasteners in accordance with manufacturer's recommendations.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

a. Exterior Walls: Set units with facing placed toward interior of construction.

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

1. Unfaced mineral wool insulation.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where mineral-wool blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

B. Install board insulation on concrete substrates by gas-actuated fastening system in accordance with manufacturer's directions.

3.7 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass, but in no case less than 1 inch cavity width.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system; refer to Section 078446 for installation of joint firestopping system components.

3.8 PROTECTION

- A. Protect installed insulation and vapor retarders 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 072100

SECTION 072419 - WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM
(EIFS)

PART 1 - GENERAL

1.1 This Section includes the following:

1. Water-drainage exterior insulation and finish system (EIFS) applied over gypsum sheathing.

B. Related Work Specified Elsewhere:

1. Gypsum sheathing is specified in Division 06 Section "Gypsum Sheathing."

1.2 DEFINITIONS

A. Class PB EIFS: A non-load-bearing, exterior wall cladding system that consists of an insulation board attached adhesively, mechanically, or both to the substrate; an integrally reinforced base coat; and a textured protective finish coat.

B. Water-Drainage EIFS: EIFS with a means that allows water entering into an EIFS assembly to drain to the exterior.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of EIFS specified.

B. Shop Drawings: Show fabrication and installation of system including plans, elevations, sections, details of components, reveals, joint locations and configurations within system and between system and construction penetrating it, termination details, and attachments to construction behind system.

C. Samples for Initial Selection: Manufacturer's color charts and small-scale samples consisting of units or sections of units showing the full range of colors, textures, and patterns available for each finish choice indicated.

1. Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing the full range of colors available.

D. Samples for Verification: 24-inch- (600-mm-) square panels for each finish, color, texture, and pattern specified. Prepare samples using same tools and techniques intended for actual work.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:

1. EIFS complies with requirements.
2. Substrates to which EIFS is indicated to be attached are acceptable to EIFS manufacturer.
3. Accessory products installed with EIFS, including joint sealants, flashing, water-resistive barrier coatings, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer..

B. Qualification Data: For installer.

C. Product Test Reports: Indicate compliance of proposed EIFS with physical property requirements specified in "Performance Requirements" Article based on comprehensive testing of current products by a qualified testing and inspecting agency.

D. Research/Evaluation Reports: Evidence of EIFS compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by the EIFS manufacturer as qualified to install their system using trained workers

B. Source Limitations: Obtain materials for system from one source and by a single manufacturer or by manufacturers approved by EIFS manufacturer as compatible with other system components.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install system when ambient outdoor air and substrate temperatures are 40 deg F (4.4 deg C) and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F (4.4 deg C) during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 24 hours after installation.

1.8 COORDINATION AND SCHEDULING

A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors, are

protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind EIFS.

1.9 WARRANTY

A. **Manufacturer's Special Warranty:** Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Bond integrity and weathertightness.
 - b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.
2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
 - a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
 - b. Insulation installed as part of EIFS.
 - c. Insulation adhesive and mechanical fasteners.
 - d. EIFS accessories, including trim components and flashing.
 - e. Water-resistive barrier coatings.
 - f. EIFS drainage components.
3. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design Manufacturers:** Subject to compliance with requirements, provide "Outsulation X" system by Dryvit Systems, Inc., or equal products by one of the following:
1. Synergy, a BASF Company.
 2. STO.

2.2 PERFORMANCE REQUIREMENTS

- A. **EIFS Performance:** Comply with ASTM E2568 and with the following:
1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior
 2. Structural Performance of Assembly and Components:
 - a. Wind Loads: Uniform pressure as indicated on Structural Drawings.
 3. Impact Performance: ASTM E2568; Standard impact resistance except provide Ultra High impact resistance at all lower panels within 8 ft. of ground.
 4. Abrasion Resistance: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for a minimum of 28 days; and

showing no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested per ASTM D 968, Method A.

5. Mildew Resistance: Sample consisting of finish coat applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days; and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D3274.
6. Drainage Efficiency: 90 percent average minimum when tested according to ASTM E2273.

- B. Fire-Test-Response Characteristics: Provide system assemblies and components with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread of Insulation Board and Finish Coats: 25 or less when tested individually per ASTM E 84.
2. Smoke Developed of Insulation Board and Finish Coats: 450 or less when tested individually per ASTM E 84.

2.3 MATERIALS

- A. Compatibility: Provide substrates, adhesive, board insulation, reinforcing meshes, base-and finish-coat materials, air and moisture barrier, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.
- B. Colors, Textures, and Patterns of Finish Coat: Comply with the following requirements:
1. Provide Architect's selections from system manufacturer's full range of colors, textures, and patterns for type of finish coat indicated.
- C. Weather Barrier: System manufacturer's secondary air and weather barrier 100 percent acrylic barrier job mixed with portland cement complying with ASTM C 150, Type I designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation; "Backstop NT," or equivalent.
- D. Weather Barrier Accessories:
1. Fiberglass Mesh Tape: Open weave fiberglass mesh tape with pressure sensitive adhesive; "Grid Tape," or equivalent.
 2. Liquid-Applied Flashing: Flexible water-based polymer material; "Aquaflash Liquid" and "Aquaflash Mesh" or equivalent.
 3. Flashing and Filler: Flexible waterproof, low temperature gun applied material: "Backstop Flash and Fill" or equivalent.
- E. Waterproof Adhesive for Application of Insulation: System manufacturer's waterproof formulation designed for indicated use, compatible with substrate, and complying with the following requirements:

1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, and polymer-based adhesive; "Genesis," or equivalent.
- F. Extruded-Polystyrene Board Insulation: Rigid, closed cell high-performance polystyrene material formed by the extrusion process, and meeting ASTM C578 Type X properties.
1. R-Value = 5.0/inch
 2. Provide insulation in boards not more than 24 by 48 inches (610 by 1219 mm) and in thickness indicated but not more than 4 inches (102 mm).
 3. Provide pre-coated insulation starter boards, corners and shapes as required for complete installation.
 4. Basis of Design Product: Provide DOW XENERGY XPS by Dryvit.
- G. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:
1. Heavy-Duty/Panzer Mesh: 20.0 oz./sq. yd. at bottom panels (within 8 ft of walking surface).
 2. Standard/I.S. Reinforcing Mesh: Not less than 5.0 oz./sq. yd.
 3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd. (127 g/sq. m).
 4. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).
- H. Base-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use indicated; "Genesis," or equivalent.
- I. Primer: System manufacturer's standard factory-mixed elastomeric-polymer primer for preparing base-coat surface for application of finish coat; "ColorPrime," or equivalent.
- J. Finish-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers; selected by Architect from "DPR Finish" textures and all available colors, or equivalent.
- K. Water: Potable.
- L. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with system manufacturer's written requirements, manufactured from vinyl plastic and complying with ASTM C 1063.

1. Drip Screed: Prefabricated one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and extended to form a drip; "Drainage Strip," or equivalent.
 - M. Elastomeric Sealant Products: Provide sealant in accordance with requirements of Division 07 "Joint Sealants" Section and as recommended by EIFS system manufacturer..
 - N. Fasteners: Type recommended by EIFS system manufacturer based on substrate.
 - O. Parapet Cap Flashing: Type for both flashing and covering parapet top, with design complying with ASTM C1397 and ANSI/SPRI/FM 4435/ES-1.
- 2.4 MIXING
- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

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 system. Proceed with installation of system only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.
- C. Prepare and clean substrates to comply with system manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.

3.3 SUBSTRATE PROTECTION APPLICATION

- A. Air and Moisture-resistive Weather Barrier: Apply over sheathing to provide a air and water-resistive barrier.
 1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.

- B. Flexible Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where required by EIFS manufacturer. Prime substrates if required and install flashing to comply with EIFS manufacturer's written instructions and details.

3.4 TRIM INSTALLATION

- A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.
 - 1. Weep Screed/Track (Drainage Strips): Use at bottom termination edges, at window and door heads, and at floor line expansion joints of water-drainage EIFS unless otherwise indicated.
 - 2. Windowsill Flashing: Use at windows unless otherwise indicated.
 - 3. Expansion Joint: Use where indicated on Drawings.
 - 4. Casing Bead: Use at other locations.
 - 5. Parapet Cap Flashing: Use where indicated on Drawings.

3.5 INSTALLATION

- A. Comply with ASTM C1397 and the EIFS manufacturer's system application instructions. Apply base coat sufficient to fully embed the reinforcing mesh. The recommended method is to apply the base coat in two (2) passes
- B. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397 and the following:
 - 1. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.
 - 2. Press and slide insulation board into place. Apply pressure over the entire surface of the insulation board to accomplish uniform contact, high initial grab, and an overall level surface.
 - 3. Allow adhered insulation to remain undisturbed for period recommended by system manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
 - 4. Apply insulation boards over dry substrates in courses with long edges oriented horizontally. Begin first course from drip screed/drainage strip and work upward. Work from perimeter casing beads toward interior of panels if possible.
 - 5. Stagger vertical joints in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings.
 - a. Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
 - 6. Interlock ends at internal and external corners.

7. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
 8. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
 9. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/32 inch (0.8 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm).
 10. Score substrates to receive finish system to profiles indicated on drawings.
 11. Interrupt insulation for expansion joints where indicated.
 12. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
 13. Treat exposed edges of insulation board as follows:
 - a. Wrap edges after installing insulation board and before applying field-applied reinforcing mesh.
 - b. Wrap mesh of width required to extend not less than 2-1/2 inches (63 mm) onto substrate behind insulation board, cover insulation board edge, and extend not less than 2-1/2 inches (63 mm) onto insulation board face.
 - c. Wrap edges of insulation board, except those forming substrates of sealant joints, by encapsulating with base coat, reinforcing mesh, and finish coat.
 - d. Wrap edges of insulation board forming substrates of sealant joints within system or between system and other work by encapsulating with base coat and reinforcing mesh.
 14. Treat edges of insulation board at trim accessories by extending base coat, reinforcing mesh, and finish coat over face leg of accessories.
 15. Coordinate flashing installation with installation of insulation to produce a wall system that does not allow water to penetrate behind protective coating.
- C. Install trim accessories at locations indicated according to system manufacturer's written instructions.
- D. Install expansion joints at locations indicated, where required by system manufacturer, and as follows:
1. Where expansion joints are indicated in substrates behind EIFS.
 2. Where EIFS adjoins dissimilar substrates, materials, and construction.
 3. Where wall height changes.
- E. Apply base coat to exposed surfaces of insulation in minimum thickness recommended in writing by system manufacturer, but not less than 1/16-inch (1.6-mm) dry-coat thickness.
- F. Embed reinforcing mesh of type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches (64

mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.

1. Heavy-Duty/Panzer Mesh: 20.0 oz./sq. yd. at bottom panels (within 8 ft of walking surface).
2. Standard/I.S. Reinforcing Mesh: Not less than 5.0 oz./sq. yd.

G. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-305-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch (200-mm-) wide strip reinforcing mesh at both inside and outside corners, unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.

1. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

H. Double Base-Coat Application: At lower panels, apply second base coat in the same manner and thickness as first application, with standard reinforcing mesh. Do not apply until first base coat has cured.

I. Apply tinted primer over dry base coat according to system manufacturer's written instruction.

J. Apply finish coat over dry primer, maintaining a wet edge at all times for uniform appearance, in thickness required by system manufacturer to produce a uniform finish of color and texture matching approved sample.

3.6 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Joint Sealants" and EIFS manufacturer's instructions.

1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
5. Apply joint sealants after base coat has cured but before applying finish coat.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform required special inspections.

B. EIFS will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports

3.8 CLEANING AND PROTECTING

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 072419

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fluid-applied, vapor-permeable membrane air barriers.
- B. Related Requirements:
 - 1. Section 061643 "Gypsum Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- 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 the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
 - 1. Install fluid-applied membrane air barriers system on mockups of exterior wall systems specified in other specification sections to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - b. 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.

1.7 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.

1.8 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.

1.9 WARRANTY

- A. Manufacturer's Warranty: Submit manufacturer's standard warranty form for membrane systems, include affirmation of waterproofing mock-up observation and approval as required by warranty provisions. Approval by manufacturer for warranty is required prior to system application. Submit manufacturer's "Request Form" and supporting documentation at completion of waterproofing application through the local Authorized Distributor of the materials.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Special Installer's Warranty: Installer's standard form in which installer agrees to repair or replace membranes that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- A. 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 783, or ASTM E 2357.
- B. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly of the School Building is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific

assembly test. Membrane air and moisture barriers shall be part of an assembly that has passed NFPA 285 testing.

2.3 HIGH-BUILD VAPOR-PERMEABLE MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils (0.9 mm) or thicker over smooth, void-free substrates.
1. Basis of Design Product: Provide Henry Company; Air-Bloc 31MR or one of the following:
 - a. GCP Applied Technologies: Perm-A-Barrier VPL.
 - b. ExoAir 230 by Tremco.
 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 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M.
 - c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

- A. General: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
1. Basis of Design Product: Aquatac by Henry Co., or equal.
- C. Liquid Flashing: Moisture cure single-component elastomeric liquid-applied flashing containing Silyl-Terminated Polyether (STPE) polymer, designed to cure through reaction with airborne moisture.
1. Basis of Design Product: Air-Bloc LF Liquid-Applied Flashing by Henry Co., or equal.
- D. 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.
1. Basis of Design Product: Blueskin SA or Blueskin SA LT by Henry Co., or equal

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, treat, and seal 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. 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.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with 26 gauge stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
- H. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.
 - 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

- B. Connect and seal exterior wall air-barrier material 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.

- C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

- D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

- E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip/flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
 - 1. Transition Strip/Flashing: Roll firmly to enhance adhesion.

- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with sealant.

- G. Terminations:
 - 1. Seal strips and transition strips around masonry reinforcing or ties and penetrations.
 - 2. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, transition strip.
 - 3. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with sealant or liquid flashing.

- H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.4 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats
- B. High-Build Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 35-mil (0.9-mm) dry film thickness, applied in one or more equal coats.
- C. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a Project Inspector to perform 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, if applicable.

7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. 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.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 074114 - METAL-FACED INSULATING GLAZING PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Insulated metal-faced wall panels for glazing into storefront framing.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, and special details. Distinguish between factory- and field-assembled work.
- C. Samples for Initial Selection: For each type of metal-faced panel indicated with factory-applied color finishes.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, 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 on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal panels from exposure to sunlight and high humidity, except to extent necessary for period of metal panel installation.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify locations of framing dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alclad alloy 3003, 3004, or 3105 for painted finishes, with temper as required to suit forming operations and structural performance required.

2.2 METAL-FACED INSULATED WALL PANELS

- A. Insulated Metal Panels: Manufacturer's standard laminated aluminum-faced panels of overall thickness indicated, flat with no deviations in plane exceeding 1/16 inch in 24 inches (1.5 mm in 600 mm) or 1/8 inch (3 mm) over entire panel, forming outer skin of insulated panels with core of rigid insulation between panels.
 - 1. Face Panels Fabrication: Face panels shall be coil coated aluminum sheet bonded to solid substrate.
 - a. Aluminum Sheet Thickness: 0.032"
 - b. Substrate: 1/8" tempered hardboard.
 - c. Exposed Panel Texture: Smooth.
 - d. Exposed Panel Finish: Painted enamel or powder paint, in color as selected by Architect from full range of colors.
 - 2. Core: Rigid, polyisocyanurate 1.7 lb. density
 - 3. Edge Configuration: Unsealed.
 - 4. Overall Panel Thickness: 1".
 - 5. Basis of Design Product: Mapes-R Panel by Mapes Architectural Products or equal.

2.3 FABRICATION

- A. General: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2.4 FINISHES, GENERAL

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

PART 3 - EXECUTION

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

3.2 PANEL INSTALLATION, GENERAL

- A. General: Install metal-faced panels in orientation, sizes, and locations indicated on Drawings and in compliance with approved shop-drawings. Anchor metal-faced panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting of metal-faced glazing panels is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal-faced panel manufacturer.

3.3 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 074114

SECTION 074213.53 - COMPOSITE METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Metal-faced composite core wall panels used for soffits, fascia cladding, wall panels, cornice cladding, copings, and other applications.
2. Metal wall panel accessories including closures, fasteners and clips, corners, flashings, and other components of wall panel system.
3. Wall panel stub framing system.
 - a. Subframing required to support the composite core wall panel profiles indicated on the Drawings shall be part of the system designed under this Section.

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for secondary support framing supporting metal panels.
2. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment systems, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Include structural data indicating compliance with performance requirements including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Indicate coordination dimensions related to structural support system elements provided by others.

C. Samples for Initial Selection:

1. Include Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, clips, closures, and other metal panel accessories.
 2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 3. Sealants: 12 inches (300 mm) long strips of cured sealants showing the colors to be provided for each sealant exposed to view

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Maintenance Data: For metal panels to include in maintenance manuals.
- C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of metal panels through one source from a single manufacturer.
- C. Mockups: Prior to installing composite metal wall panels, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.
1. Provide mock-up of roof coping/cornice assembly for each different configuration.
 2. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 3. Include exposed sealant joint in mock-up.
 4. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's approval of mockups before start of Work.
 7. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal wall panel systems including secondary

framing that are similar to those indicated for this Project in material, design, and extent.

- E. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated in subparagraphs below:
1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, 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 on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal panels from exposure to sunlight and high humidity, except to extent necessary for period of metal panel installation.

1.6 PROJECT 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.
- B. Field Measurements: Verify locations of framing dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: 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: Provide metal panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Thermal Movements: Provide metal panel assemblies 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa) for metal-faced composite core wall panels.

- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa) for metal-faced composite core wall panels.
- E. Structural Performance: Metal wall panel assemblies shall withstand the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Structural Drawings.
 2. Deflection Limits: Metal wall panel assemblies shall withstand wind loads with horizontal deflections no greater than the following
 - a. 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel for metal-faced composite core wall panels.
 3. Secondary Framing: Design secondary framing system according to AISI "Standard for Cold-Formed Steel Framing - General Provisions."
- F. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly of the School Building is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test. Metal wall and soffit panels shall be part of an assembly that has passed NFPA 285 testing.

2.2 PANEL MATERIALS

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

2.3 MISCELLANEOUS METAL FRAMING

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
- B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.
- C. Base or Sill Angles and Channels: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 2. Depth: 7/8 inch (22 mm) unless otherwise indicated.
- E. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (13-mm-) wide flange.
1. Depth: As indicated.
- F. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
- G. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating.
1. Fasteners for Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.

2.5 METAL-FACED COMPOSITE CORE WALL AND SOFFIT PANELS

- A. General: Provide factory-formed and -assembled, metal-faced composite panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system. Metal composite panel system shall be a full system that includes the sub-framing designed by system supplier's professional engineer.
1. Surface-Burning Performance: Product shall have the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Basis of Design Product: Provide Alucobond PLUS manufactured by 3A composites USA or equal products of one of the following:
 - a. Arconic Architectural Products (USA).
 - b. Mitsubishi Chemical Composites.

- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.
 - 1. Panel Thickness: 4 mm.
 - 2. Core: Fire retardant core.
 - 3. Exterior Finish for Aluminum: Three-coat fluoropolymer. AAMA 620/621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coats. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Color: As selected by Architect from manufacturer's full range.
- C. Attachment System Components: Formed from extruded aluminum.
 - 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips and anchor channels as indicated or as required for a complete assembly.
- D. System Installation Method: Rout and return wet seal.
- E. Applications: Soffits, fascia, copings, cornice, wall cladding, trim, and other articulated exterior metal wall panels, and other applications indicated on Drawings.
- F. Flashing and Trim Color: Same material, finish, and color as facings of adjacent panels

2.6 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

2.7 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals
- C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
 - 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 - 2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.

3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
 4. Dimensional Tolerances:
 - a. Panel Bow: 0.8 percent maximum of panel length or width.
 - b. Squareness: 0.25 inch (5 mm) maximum.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 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 by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application but not less than thickness of metal being secured.

2.8 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 and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 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 work.

- B. Examine primary and secondary framing to verify that structural panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous panel support members and anchorage according to metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Factory cut metal panels as required for penetrations and openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by saw or torch is not permitted.
 - 2. Install metal panels perpendicular to structural supports, unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal panel manufacturer.
- C. Joint Sealers: Install sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.

3.4 METAL WALL AND SOFFIT PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Anchor metal wall 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 wall panels.
 - 2. Install flashing and trim as metal wall panel work proceeds.

- B. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-turned flanges of wall panels to panel clips with manufacturer's standard fasteners.
 - 1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."
 - 2. Install semi-rigid mineral wool between subframing for the clip installation system where indicated.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

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

END OF SECTION 074213.53

SECTION 075323 - EPDM ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Applicable provisions of the Conditions of the Contract and Division 1, General Requirements, govern work in this Section.

1.2 DESCRIPTION OF WORK

- A. The work of this section consists of all plant, labor, materials, equipment, testing and services necessary to complete the work shown on the drawings, schedules, and keynotes, as specified, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:
1. Inspect the underside of the roof deck before starting work, and periodically each day as work occurs, to determine if there are conduits, pipes, ceiling hangers or fixtures next to the deck or fastened to the deck that could be affected as roof work occurs.
 - a. Perform roof work so any conduits, pipes, ceiling hangers or fixtures are not disturbed.
 - b. Replace and reset any conduits, pipes, ceiling hangers or fixtures that are affected by the work.
 2. Clean all residual material and debris from the surface of the decks, and from within the flutes of the steel decks.
 3. Install a new fully adhered unreinforced 60 mil thick EPDM roofing system, including a vapor barrier on concrete deck areas, thermal barrier, insulation, cover board, flashing, stripping and related accessories.
 4. Install new flashings at the roof drains, and all roof-mounted and roof-penetrating equipment.
 5. Cover rooftop ductwork with isocyanurate insulation and fully adhered unreinforced EPDM. Configure the insulation so the top surfaces slope for drainage. Install acrylic color coating on the EPDM duct wrap.
 6. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. The entire project specification with particular reference to these sections:
1. Masonry - Division 4
 2. Carpentry - Division 6

- 3. Sheet Metal Flashing & Specialties - Section 07 6200
- 4. Roof Accessories - Section 07 7200

1.4 CODE APPROVAL REQUIREMENTS

- A. Install roofing and insulation system components to meet the following minimum requirements:
 - 1. New York State Uniform Fire Prevention and Building Code, which includes by reference the New York State Energy Conservation Code.
 - 2. Underwriters Laboratories Inc. Class A External Fire Rating for roof assemblies tested in accordance with ASTM E 108 or UL 790.
 - 3. Underwriters Laboratories Inc. Standard 1256 for roof assemblies with foam insulation.
 - 4. Minimum wind uplift pressure calculated using ASCE 7 and a safety factor of 2:
 - a. Field Zone - 90 psf
 - b. Perimeter Zones - 135 psf
 - c. Corner Zone - 165 psf
- B. Provide written certification from the roof material Manufacturer, before beginning work, to confirm the roofing system meets these requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. A firm (Installer) with at least 5 continuous years experience performing work similar to that required for this project, employing personnel skilled in the work specified.
 - a. The Installer shall directly employ the personnel performing the work of this section.
 - b. The Installer shall have a full time supervisor on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience with work similar in nature and scope to this project, and speak fluent English.
 - 1. Submit the supervisor's resume upon request.
 - 2. The Installer shall provide a reference list of at least three previously completed projects of comparable size and similar design within a fifty mile radius of this project, which may be observed by representatives of the Owner:
 - a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
 - b. Submit the reference list upon request.

3. The Installer shall be acceptable to or licensed by the Manufacturer of the primary roofing materials, and provide written certification from the Manufacturer to confirm this prior to award if requested.
- B. Material Quality: Obtain each product, including the insulation, cover board, roof and flashing sheets, and the cements, primers and adhesives from a single Manufacturer which has manufactured the same products in the United States of America for not less than 5 continuous years.
- C. Material Quality: Obtain each type of material from a single source to ensure consistent quality, color, pattern, and texture.

1.6 PRE-CONSTRUCTION CONFERENCE

- A. Meet at the project site approximately two weeks prior to starting work, with the Architect, Owner and other representatives to discuss the following:
 1. How new roofing will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, flashings and other items to provide a watertight installation.
 2. Generally accepted industry practice and the Manufacturer's instructions for handling and installing his products.
 3. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
 4. Incomplete submittals; note that progress payments will be not processed until all submittals are received and approved.
 5. The construction schedule, weather forecast, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
 6. A schedule for Manufacturer and Architect inspections.

1.7 SUBMITTALS

- A. Submit the following items far enough in advance to obtain approval prior to performing any work on site:
 1. A pre-work inspection report with photos to document the condition of the roof deck, equipment curbs and overall building before work starts.
 2. Written certification from the Manufacturer which states that the Installer is acceptable or licensed to install the specified roofing; if not previously provided.
 3. Manufacturer's technical data sheets for all materials.
 4. Samples of the Contractor's Guarantee and Manufacturer's warranty forms.
 5. Test reports and certifications substantiating compliance with specification requirements, but only if requested by the Architect.

- B. Simultaneously provide all technical submittals needed for this project, for all technical sections, collated by section. Incomplete submittals will not be reviewed.
 - 1. Submittals shall be prepared and made by the firm that will perform the actual work.
 - 2. Provide electronic submittals via an on-line submittal exchange program if one is established for this project; if an on-line program isn't established, provide the submittals on portable USB drives in pdf format, organized in folders by Section.
- C. Safety Data Sheets: Simultaneously provide all Safety Data Sheets needed for this project, for all specification sections - collated by section, in three ring binders. Provide two binders for each building.
- D. Payment requisitions will not be processed until all submittals are received and approved.

1.8 JOB CONDITIONS (CAUTIONS & WARNINGS)

- A. Do not use oil or solvent based roof cement with EPDM roofing. Do not allow waste products, (petroleum grease or oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with any roofing, insulation or flashing product. Do not expose EPDM roofing and accessories to a temperature in excess of 175 degrees Fahrenheit.
- B. Splice cleaner, primer, cements and bonding adhesives are flammable. Do not breathe vapors or use near fire or flame or in a confined or unventilated area. Dispense only from a UL listed safety can or the Manufacturer's original container.
- C. Remove empty adhesive, cleaner and solvent containers and contaminated rags from the roof and legally dispose of them daily.
- D. Do not apply primer, cleaners or adhesives next to ventilation system louvers or windows. Temporarily cover the louvers and windows with 6 mil fire retardant polyethylene and prevent odors from entering the building. Remove temporary covers at the end of each work day.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver material to the site in the Manufacturer's original and unopened packaging, with intact and legible labels which identify the products and Manufacturers,
- B. Cover all stored materials, except rolls of EPDM and sealed cans of adhesives, with watertight tarpaulins installed immediately upon delivery.
- C. Immediately remove insulation which gets wet from the job site.
- D. Store and install all material within the Manufacturer's recommended temperature range.
- E. Do not overload the structure when storing materials on the roof.

- F. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

1.10 GUARANTEE AND WARRANTY

- A. Provide a written Manufacturer's Full System Warranty which warrants that the roofing system, including the thermal barrier, vapor barrier, insulation, cover board, EPDM roofing and flashings, will remain in a watertight condition for a twenty year period beginning upon Final Completion.
 - 1. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - 2. Guarantee coverage shall have no dollar value limit.
- B. Provide a written Contractor's Guarantee which guaranties that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:
 - 1. Defects include but are not limited to the following: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, joint separation, movement and undue expansion or shrinkage.
 - 2. The Contractor shall make the repairs and modifications necessary to enable the work to perform as guaranteed at his own expense:
 - 3. Guarantee coverage shall include removing and replacing materials installed as part of the original work, if removal is needed to affect guaranteed repairs.
 - 4. Guarantee coverage shall remain in effect for gust wind speeds up to 72 miles per hour, measured at ground level at the site.
 - 5. Guarantee coverage shall have no dollar value limit.
- C. Provide one Contractor's Guarantee that covers "all work performed" when a single contractor is awarded work specified in multiple Sections.
- D. The Manufacturer's Warranty and Contractors Guarantee shall take effect no more than 30 days before the completion of all punch list work.
- E. The Contractor's Surety Company may add a rider to the Performance Bond which clarifies that Performance Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor's Guarantee.
- F. Guarantee and Warranty coverage may be cancelled, for the affected portion of the roof, if the work is damaged by winds in excess of 72 mph, by hail, lightning, insects or animals, by failure of the structural substrate, by exposure to harmful chemicals, by other trades on the roof, or by vandalism, or if the Owner fails to maintain the roof in

accordance with, or makes roof alterations contrary to, the Manufacturer's printed recommendations.

1. Guarantee and Warranty coverage shall be reinstated, for the remainder of the original period; if the Owner restores the roof to the condition it was in prior to the damage occurring.

1.11 SUBSTITUTIONS

- A. The following factors will be considered when evaluating a possible alternative to the roofing system specified:
 1. The wording and intent of the warranty to be issued.
 2. The financial status, numbers of years in business, and stability of the entity that will issue the warranty.
 3. A reference list of at least five completed similar projects of comparable size, with a successful functional history of at least five years, within an approximate fifty mile radius of the Project.
 4. Technical aspects of the system, especially relating to durability, serviceability and performance.
 5. The Manufacturer's ability and history providing technical support, on-site inspections and in progress assistance.
 6. The availability and experience of local authorized applicators to install and maintain the proposed alternate system.
 7. The Manufacturer's willingness and history responding to warranty claims previously made by the Owner, Architect or Consultant's involved in this project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. EPDM roof system components are specified as products of Firestone Building Products Company to establish a standard of quality. Equal products and systems from Carlisle SynTec and Johns Manville will be accepted.
- B. Primary products required for this project include:
 1. Vapor barrier
 2. Thermal barrier
 3. Roof insulation
 4. Cover board
 5. EPDM roofing
 6. Primers and adhesives
 7. Sealants
 8. EPDM flashing
 9. Fasteners

10. Acrylic coating

2.2 EPDM

1. Unreinforced 60 mils thick, fire retardant, EPDM (Ethylene Propylene Diene Monomer) sheet membrane conforming to the following minimum physical properties.

PROPERTY	TEST METHOD	SPECIFICATION
Color	—	Gray/Black
Tensile Strength	ASTM D-412	1305 psi min.
Elongation	ASTM D-412	300% min
Tear Strength	ASTM D-624	150 lb/in min
Ozone Resistance	ASTM D-1149	No cracks, 7 days/100 pphm/100°F/50% strain
Heat Aging	ASTM D-573	1200 psi min@ 200% elongation/4 wks/240°F
Brittleness Temperature	ASTM D-746	-49°F
Water Vapor Permanence	ASTM E-96	2.0 perm max
Thickness	ASTM D-412	60 mils plus/minus 6 mils
Fire Retardant		UL Class A

2.3 RELATED MATERIALS

- A. Cleaners, adhesives, sealants, caulking and fasteners furnished by the EPDM system Manufacturer, that comply with low VOC regulations in effect at the time of application.
 1. Stripping: 90 mil thick 5 inch and 9 inch wide self adhering flashing, consisting of 45 mils of semi-cured EPDM factory laminated to 45 mils of cured seaming tape.
 2. Bonding Adhesive: High strength contact adhesive.
 3. Splice Adhesive: High strength synthetic polymer based contact cement formulated specifically to splice EPDM sheets.
 4. Lap Sealant: EPDM rubber based gun grade sealant.
 5. Water Block Seal: One component low viscosity butyl rubber sealant.
 6. Pre-Molded Pipe Flashing: Pressure sensitive prefabricated flashings with pre-applied adhesive.
 7. Pourable Sealer: Two component, solvent free polyurethane based sealant.
 8. Reinforced Perimeter Fastening Strips: .030 inch thick reinforced cured EPDM.
 9. Seam Tape Primer: Synthetic rubber polymer based primer designed to clean and prime seam tape splice areas prior to installing the tape.
 10. Seam Splice Tape: Nominal 30 mil thick cured polymer self adhesive tape with release paper carrier, 6 inches wide.

11. Plates and Bars: Galvanized and corrosion resistant specialty products.
 12. Fasteners: #14 Fluorocarbon polymer coated heavy duty screws.
- B. Primer & Vapor Barrier:
1. Primer: Thin, cut back asphalt meeting ASTM D41.
 2. Vapor Barrier: Fire resistant torch grade SBS modified granular surfaced polyester and glass scrim reinforced cap sheet meeting ASTM D 6163 Type I, Grade G, furnished by the same manufacturer as the EPDM.
- C. Gypsum Thermal Barrier and Cover Board: 1/2 inch thick fire resistant gypsum board decking with inorganic glass mat facers and a water resistant core, formulated in 48 x 48 inch square edge boards, UL Class A, meeting ASTM C-1177, manufactured under the trade name Dens-Deck Prime.
- D. Insulation: Flat and tapered rigid cellular polyisocyanurate boards with fibrous felt/fiberglass mat facers, minimum compressive strength 20 psi, meeting ASTM C1289-01, Type II, Class1, Grade 2, as manufactured by Firestone under the trade name of "ISO 95+ Isocyanurate Insulation".
1. Install 2 layers of 3 inch thick insulation (6 inches total) on deck surfaces that have structural slope.
 2. Install tapered insulation that slopes 1/4 inch per foot (minimum starting thickness 6 inches) on deck surface that are flat - without structural slope.
 3. Install crickets that sloped 1/2 inch per foot.
- E. Tapered edge strips – high density isocyanurate or wood fiberboard strips installed at the drain sumps, and insulation transition points.
- F. Insulation adhesive: Two component low rise polyurethane foam adhesive, installed with a mixing extruding Pace Cart dispenser, or with a pleural heated foam rig, Firestone I.S.O. Adhesive.
1. Use insulation adhesive suitable for application at the intended application temperatures.
 2. Do not use twin cartridge "caulking gun" adhesive except on very small isolated sections of roof.
- G. Acrylic Color Coating: Latex based acrylic coating containing 67% solids by weight, resistant to heat, cold water, ozone, ultraviolet rays, and intended for installation on weathered EPDM. Custom color tint as selected by the Architect.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install the new roofing system in a watertight, workmanlike manner, meeting the guarantee requirements specified herein; in accordance with the drawings and in conformance with the Manufacturer's requirements, except as enhanced by the drawings and specifications.

- B. Perform work next to roof mounted mechanical equipment, so the work coincides with equipment shutdown periods and so fumes do not enter the building or affect building occupants. Temporarily cover and protect equipment openings, and windows next to the work area, with 6 mil fire retardant polyethylene, so dirt, dust and odors do not enter the equipment or building. Remove covers as soon as the work is complete and at the end of each workday.
- C. Clean substrate surfaces of all laitance, dirt, oil, grease or other foreign matter before any roofing is installed.
- D. Remove debris daily and as it is generated. Do not stock-pile debris on the roof. Do not leave any debris on the roof at the end of the day. Do not overload the roof structure when moving debris.
- E. Install roof system components on dry surfaces only. Do not install any components when the weather and outside temperatures are not suitable in accordance with the Manufacturer's recommendations.
- F. Complete all work including the equipment flashings, in sequence as quickly as possible so the smallest area possible is under construction at any one time. Complete the entire area of work begun each day, the same day, and make all exposed edges watertight at the end of each day's work.
- G. Protect roof surfaces where material and equipment is placed on them, and where construction traffic occurs, with 6 mil fire retardant polyethylene, covered with 1-1/2 inch thick foam insulation, overlaid with 2 by 10 wooden planks.

3.2 VAPOR BARRIER CONCRETE DECKS

- A. Install primer and a vapor barrier on the concrete decks: install the primer and allow it to dry.
- B. Starting at the low point, torch apply and fully adhere modified bitumen vapor barrier sheets to the primed substrate. Lap sheets at least 4 inches at the ply overlaps and at least 6 inches at the end laps.
- C. Carefully install the vapor barrier sheets to achieve only the minimum required bleed out.
- D. Extend vapor barrier up vertical surfaces at the roof perimeter, and up and around all penetrations and curbs, and seal the vapor barrier to provide continuity of the building air/vapor envelope.

3.3 GYPSUM BOARD THERMAL BARRIER

- A. Install gypsum board over all other deck areas. Lay boards with tight joints. Fill spaces over 1/4 inch.

3.4 INSULATION

- A. Install tapered insulation neatly cut at all miters and transitions. Do not lace corner boards.
 - B. Install insulation with joints offset between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
 - C. Fasten the gypsum board thermal barrier and all layers of insulation only to the top flute of steel decks, with screws and discs which penetrate through the deck a minimum of 3/4 inch and a maximum of 1-1/2 inches.
 - 1. Install 16 fasteners per 4 by 8 foot insulation board in the field of the roof.
 - 2. Install 28 fasteners per 4 by 8 foot insulation board in 8 foot wide perimeter zones.
 - 3. Install 32 fasteners per 4 by 8 foot insulation board in 8 foot square corner zones.
 - 4. Carefully choose the length and position of each screw to ensure the screws do not protrude through the underside of the deck where visible inside the school, and to ensure the screws do not damage conduits mounted on the underside of the deck.
 - 5. Perform pull tests using the intended fasteners, on each roof area before beginning work, and obtain the Manufacturer's written approval of the fastener that will be used.
 - D. On concrete deck areas install all layers of insulation using low rise polyurethane foam adhesive applied in accordance with the Manufacturer's recommendations and to achieve the specified minimum uplift resistance. Offset joints in the insulation between rows and layers a minimum of 12 inches. Cut insulation to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
 - 1. Install 1/2 inch diameter adhesive beads 12 inches on center in the field of the roof.
 - 2. Install 1/2 inch diameter adhesive beads 6 inches on center in 8 foot wide perimeter zones.
 - 3. Install 1/2 inch diameter adhesive beads 4 inches on center in 8 foot square corner zones.
 - 4. Place 5 gallon pails half full of gravel or concrete on the insulation and gypsum cover boards to hold them firmly in position for at least 15 minutes while the low rise foam adhesive sets. Position the pails no more than 24 inches apart in all directions.
 - a. **Insulation installed without using pails of concrete or gravel shall be removed and replaced.**
- 3.5 COVER BOARD
- A. Install the cover board neatly cut at all miters and transitions. Do not lace corner boards.
 - B. Install the cover board with joints offset between rows and layers a minimum of 12 inches. Cut the cover board to fit neatly at penetrations and joints. Fill any gap which is greater than 1/4 inch.
 - C. Install the cover board using low rise foam adhesive.
 - 1. Install 1/2 inch diameter adhesive beads 12 inches on center in the field of the roof.

2. Install 1/2 inch diameter adhesive beads 6 inches on center in 8 foot wide perimeter zones.
 3. Install 1/2 inch diameter adhesive beads 4 inches on center in 8 foot square corner zones.
- D. Place 5 gallon pails half full of gravel or concrete on the insulation and gypsum cover boards to hold them firmly in position for at least 15 minutes while the low rise foam adhesive sets. Position the pails no more than 24 inches apart in all directions.
1. **Cover boards installed without using pails of concrete or gravel shall be removed and replaced.**

3.6 EPDM

- A. Place EPDM roofing on the substrate without stretching it, and allow it to relax approximately one hour – before starting to adhere it to the substrate and form the seams.
- B. Place adjoining sheets in the same manner lapping the edges to shed water.
- C. Fully adhere EPDM to the substrate with bonding adhesive.
 1. Open each can of adhesive and stir it with an electric paddle mixer for at least 5 minutes before applying the adhesive. Re-stir adhesive that isn't used within two hours of initial mixing.
 2. Do not punch holes in cans of adhesive and use them in a "Better Spreader" without first opening the cans to mix them.
 3. Replace used roller covers each day; discard covers after each days use.
 4. Allow bonding adhesive to dry to the touch before joining the EPDM to the substrate.
 5. Roll the EPDM onto the dried bonding adhesive and immediately rub it vigorously with a soft bristle broom to ensure complete adhesion.
- D. EPDM installed over improperly applied adhesive or with adhesive that wasn't stirred, and roofing installed with blisters, ridges, mole runs and similar deficiencies shall be removed and replaced. Removal shall include the insulation and cover board assembly.

3.7 SPLICING

- A. Form EPDM roof splices with 6 inch wide field applied seam tape, or with 3 inch wide factory applied seam tape.
 1. Fold the top sheet back and clean mating surfaces using clean rags with splice wash.

2. Scrub a smooth coat of QuickPrime onto mating surfaces, with long strokes, and to obtain complete coverage, using approximately 1 gallon per 225 square feet. Do not allow the QuickPrime to glop, streak or puddle; allow it to dry to the touch before installing the seam tape.
 3. Seam tape shall be positioned so 1/8 inch minimum and 1/2 inch maximum will be exposed at the seam edge when the seam is complete.
 - a. Install 5 inch uncured EPDM stripping over any seam where the tape is exposed less than 1/8 inch or more than 1/2 inch.
 4. Roll and allow the top sheet to fall freely into place without stretching or wrinkling it.
 5. Pull splice tape release paper from within the seam and neatly mate the seam using hand pressure to rub the membrane together.
 6. Immediately roll the splice with a 2 inch wide roller, using positive pressure, toward the outer edge of splice.
- B. Install uncured EPDM target patches with rounded corners, over all T-Seam intersections.

3.8 PERIMETER FASTENING

- A. Secure the EPDM at the perimeter of each roof level, and at eaves, penetrations, expansion joints and slope changes greater than 1 inch in 12 inches. Utilize surface applied discs or adhere the EPDM to continuous reinforced EPDM fastening strips. Secure the discs and EPDM fastening strips 12 inches on center.

3.9 FLASHINGS

- A. Utilized cured EPDM for all flashings; utilize self-curing EPDM at corners and angle changes only where required by the Manufacturer.
1. Form flashing splices, and the splice between the flashing and main roof sheet with 6 inch seam tape.
 2. Adhere the flashing to vertical surfaces with bonding adhesive.
 3. Fasten the top edge of all flashings, positioning the fasteners 12 inches on center, to be covered by a cap flashing.
- B. Install premolded pipe flashings wherever possible. Where premolded pipe flashings cannot be installed, use field wrapped flashings. Install sealant pockets as a last resort.
- C. Remove existing pipe flashings and Kennedy type couplings and extend the vent pipes to finish a minimum of 18 inches above the roof surface.
1. Extend the pipes using the same type of pipe material as the original vent pipe.

2. Use threaded or no-hub couplings, positioned within the insulation layer to extend the pipes.

3.10 DUCT WRAP WATERPROOFING & COATING:

- A. Cover all roof top ductwork with isocyanurate insulation and fully adhered 60 mil thick EPDM roofing.
 1. Install EPDM cover strips and target patches to seal all duct air leaks before recovering them.
 2. Install flat 3 inch thick insulation on the sides and bottom of the ducts.
 3. Install tapered insulation sloping 1/4 inch per foot, minimum-starting thickness 3 inches on top of the ducts.
 4. Secure the isocyanurate insulation with screws and plates, installed at the rate of one fastener per 2 square feet.
 5. Cover the insulation with fully adhered 60 mil fire retardant EPDM.
 6. Install two roller applied coats of acrylic color coating on the EPDM duct cover.

3.11 MISCELLANEOUS

- A. Provide any miscellaneous roofing, flashing, caulking, and metal work needed to leave the work complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.
- B. Use mechanics skilled and licensed in the trades to perform mechanical and electrical work. Provide new material, couplings, transition pieces, blocking, fasteners and the like needed to complete the work.

3.12 CLEANING, PROTECTION AND WATERTIGHTNESS

- A. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.
- B. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather - which may occur unexpectedly. Make all work areas watertight at the end of each day's work.
- C. Clean up all litter, refuse, rubbish, scrap materials and debris at least twice a day; at noon and at the end of the work day, so the roof and site presents a neat, orderly and workmanlike appearance. Place the debris in a dumpster, and remove the dumpster from the site as soon as it is full or no longer being used.

- D. Carefully and thoroughly clean the entire roof to remove all residual debris when all work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.13 ROOF INSPECTIONS BY MANUFACTURER

- A. Arrange for the roofing Manufacturer, or his authorized representative, to make a minimum of five inspections in accordance with the following schedule and submit a written report of each inspection to the Architect.
 - 1. First inspection during the first two days of new roof installation.
 - 2. Second inspection when roofing is approximately one third complete.
 - 3. Third inspection when roofing is approximately two thirds complete.
 - 4. Fourth inspection when all roofing and flashings are installed.
 - 5. Final inspection at the completion of all work.
- B. Provide 48 hours advance written notice to the Architect, so he may have a representative attend the inspections.
- C. Submit the inspection reports within one week following each inspection.
 - 1. Payment requisitions will not be reviewed nor approved until the inspection reports are received.

3.14 WASTE MANAGEMENT – Coordinate with Section 017419

- A. Separate and recycle materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
- B. Set aside and protect materials suitable for reuse and/or remanufacturing.
- C. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING, FABRICATIONS AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Metal flashing.
2. Reglets.
3. Scuppers.
4. Downspouts and conductor heads.
5. Downspout boots
6. Metal trim.

B. Related Work Specified elsewhere:

1. Zinc sheet metal siding, flashing, trim and fabrications are specified in Division 07 Section "Sheet Metal Siding."
2. Aluminum composite copings/cornice fabrications are specified in Division 07 Section "Composite Metal Wall and Soffit Panels."

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated 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. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Building Code of NY, Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1.

1. Fabricate and install roof edge flashing, metal edge securement, facae and copings capable of resisting the following forces:
 - a. Wind Zone 2 (roof edge perimeter, vertical load direction): As indicated on Structural Drawings.
 - b. Wind Zone 3 (roof edge corners, vertical load direction): As indicated on Structural Drawings.
 - c. Wind Zone 4 (wall edge perimeter, horizontal load direction): As indicated on Structural Drawings.
 - d. Wind Zone 5 (wall edge corners, horizontal load direction): As indicated on Structural Drawings.
2. Dimension of perimeter and corner zones shall be as indicated on Structural Drawings.

- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces

1.3 ACTION SUBMITTALS

- A. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- B. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
- C. Samples for Verification: Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
 - 1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.
 - 2. 12-inch- (300-mm-) long samples of factory-fabricated products exposed as finished Work and accessories, as specified below.
 - a. Dowspouts.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.
- C. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.6 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 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.
- B. Performance Warranty: Include copings, fasciae and roof edge flashings in Total System Warranty provided by roofing membrane manufacturer; refer to Section 075323.

PART 2 - PRODUCTS

2.1 METALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:
 - 1. Aluminum Sheet: ASTM B 209, Alclad 3003-H14, with a minimum thickness as indicated.
 - 2. Extruded Aluminum: ASTM B 221, alloy 6063-T52, with a minimum thickness of 0.080 inch for primary legs of extrusions, unless otherwise indicated.
- B. Stainless Steel: ASTM 240/A 240M, Type 304 sheet.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
- B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.
- C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

- D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 07 Section "Joint Sealants."
- E. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- F. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
- G. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- H. Slip Sheet: 3-lb. rosin-sized building paper or Tyvek by DuPont.
- I. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40 mils (1.0 mm) thick; slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Product: Ice and Water Shield by GCP Applied Technologies.or equal.
- J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
- K. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.
- L. Cast Iron Downspout Boots: Size as indicted on Drawings, by JR Hoe,or equal.

2.3 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. General: Provide items designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.
- B. Expansion Provisions: Fabricate running lengths to allow controlled expansion not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation or damage.
- C. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.
 - 1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

2. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
6. Material: Fabricate reglets from the following metal, in thickness indicated:
 - a. Stainless steel, 0.020 inch thick.
7. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. Metal-Era Inc
 - c. OMG, Inc.

2.4 FABRICATION, GENERAL

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams in Aluminum: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- C. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25.4 mm) deep, filled with mastic sealant (concealed within joints.)
- D. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- E. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- F. Conceal fasteners and expansion provisions unless noted otherwise. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

- G. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.
- H. Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.
- I. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Metal Material: Aluminum.
 - 2. Metal Thickness: 0.024" min.
 - 3. Size: As indicated on Drawings.
 - 4. Finish: Fluoropolymer 2-Coat System, color as selected by Architect.

2.5 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Miscellaneous Exposed Trim, Scuppers, Base Flashing, Conductor Head: Fabricate from the following material (where indicated on Drawings):
 - 1. Aluminum: 0.040 inch (1 mm) thick
 - 2. Stainless Steel: 24 gauge
- C. Counterflashing, Flashing Receivers: Fabricate from the following material (where indicated on Drawings):
 - 1. Aluminum: 0.032 inch (0.813 mm) thick
 - 2. Stainless Steel: 26 gauge

2.6 ALUMINUM FINISHES

- A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.
- B. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color

- topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
- 2. Colors: As selected by Architect for each location.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Roof-Edge Flashings and Edge Securement: Secure metal flashings, copings and edge securement at roof edges according to Building Code of NY, Chapter 16 for specified wind zone.
- D. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by sheet metal producer.
- E. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- F. Sealed Joints: Form nonexpansion, but movable, joints in aluminum to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.

- G. Seams in Aluminum: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- H. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
 - 1. Underlayment: Where installing copper or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper over one layer of felt underlayment before installing sheet metal.
 - 2. Bed flanges in a thick coat of roofing cement where required for waterproof performance.
- I. Install reglets to receive counterflashing according to the following requirements:
 - 1. Where reglets are shown in concrete, furnish reglets for installation under Division 03 Section "Cast-in-Place Concrete."
 - 2. Where reglets are shown in masonry, furnish reglets for installation under Division 04 Sections.
- J. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.
- K. Fascia and Copings: Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners. Anchor fasciae and copings to meet performance requirements.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 076200

SECTION 076223 - SHEET METAL SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Zinc flat lock tile wall cladding system.
2. Zinc reveal flat panels wall cladding system.
3. Zinc coping, soffits and wall trim
4. Zinc wall cladding accessories including closures, fasteners and clips, corners, flashings, and other components of wall panel system; include all required accessories for a weatherproof installation.
5. Weather membrane and metal deck directly behind zinc cladding.
6. Wall panel stub framing system and panel stiffeners with foam tape.
 - a. Subframing required to support the composite core wall panel profiles indicated on the Drawings shall be part of the system designed under this Section.

B. Related Sections include the following:

1. Division 07 Section "Sheet Metal Flashing and Trim" for flashing, rain drainage units, copings and fascia.

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated 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. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Building Code of NY, Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1.

1. Fabricate and install roof edge flashing, metal edge securement, facae and copings capable of resisting the following forces:
 - a. Wind Zone 2 (roof edge perimeter, vertical load direction): As indicated on Structural Drawings.
 - b. Wind Zone 3 (roof edge corners, vertical load direction): As indicated on Structural Drawings.
 - c. Wind Zone 4 (wall edge perimeter, horizontal load direction): As indicated on Structural Drawings.

- d. Wind Zone 5 (wall edge corners, horizontal load direction): As indicated on Structural Drawings.
2. Dimension of perimeter and corner zones shall be as indicated on Structural Drawings.
- C. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly of the School Building is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test. Metal wall and soffit panels shall be part of an assembly that has passed NFPA 285 testing.
- D. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces
- E. Structural Performance: Metal wall panel assemblies shall withstand the effects the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:
 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure as indicated on Structural Drawings.
 2. Secondary Framing: Design secondary framing system according to AISI "Standard for Cold-Formed Steel Framing - General Provisions."

1.3 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation layouts of metal panels and tiles; details of edge conditions, joints, panel and tile profiles, corners, anchorages, attachment systems, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
 1. Include structural data indicating compliance with performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Indicate coordination dimensions related to structural support system elements provided by others.
 3. Show details for forming, joining, and securing sheet metal siding, and for pattern of seams.

4. Show expansion-joint details and waterproof connections to adjoining work and at obstructions and penetrations.

C. Samples for Verification: 12-inch- (300-mm-) square specimens of each type of sheet metal siding material with specified finishes applied. Where finishes involve normal color and texture variations, include Sample sets of 2 or more units showing the full range of variations expected.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: Signed by sheet metal siding manufacturers certifying that the products furnished comply with requirements.

B. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Warranty: Sample of special warranty

1.5 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Engage an experienced sheet metal fabricator/installer with 10 years experience, who has completed sheet metal siding similar in material, design, forming method, and extent to that indicated for this Project and with a record of successful in-service performance.

1. The fabricator and installer of the wall panel system shall be trained by the zinc material manufacturer. Installer shall submit list of three (3) successful "natural metal" project installations of similar complexity and scope.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal wall panel systems including secondary framing that are similar to those indicated for this Project in material, design, and extent.

C. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. Single Source Responsibility: Provide panels and tiles which are the product of one manufacturer. Provide secondary materials, which are acceptable to the metal siding manufacturer.

E. Field Measurements: Verify locations of framing dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

- F. Mockups: Before installing sheet metal siding, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using exposed and concealed materials and forming methods indicated for completed Work.
1. Locate mockups on-site in the locations and of the sizes as directed by Architect.
 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Reprepare mock-ups as required to obtain Architect's approval.
 5. Obtain Architect's approval of mockups before starting sheet metal siding Work.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. When directed, remove mockups from Project site.
- G. Pre-Installation Conference: Prior to commencement of work, convene an installation conference to include the Architect, General Contractor and Zinc Panel Installer in order to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
1. Review methods and procedures for installation including, but not limited to: substrates, sub framing, penetrations and other preparatory work.
 2. Review drawings, specifications, submittals and other contract documents
 3. Review construction schedule verifying availability of all materials, personnel and equipment needed to proceed and avoid delays
 4. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including cold temperatures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal coils, panels, and other siding materials so they will not be damaged or deformed. Package siding materials for protection against transportation damage.
- B. Handling: Exercise care in unloading, storing, and erecting siding materials to prevent bending, warping, twisting, and surface damage.
1. Require all personnel to wear clean white cotton gloves when handling and installing zinc panels and accessories when no strippable film is present.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store sheet metal coils and panels to ensure dryness. Do not store coils or panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.
- B. Corrosion Control: Avoid direct contact of incompatible materials including but not limited to copper, red rosin paper and masonry cleaning solutions.
 - 1. Do not start installation of zinc siding until masonry has received its final washdown.
- C. 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.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Material Only Warranty: provide 20-year limited warranty for Titanium-Zinc alloy from original rolling mill manufacturer. Warranty to cover the material quality of the sheet/ coil material used to fabricate sheet metal flashing & trim profiles appropriate for zinc installation.
- C. Fabrication Warranty: provide 5-year fabrication warranty against sharp bends that fracture the metal, tears, and equipment induced damage to the Architectural Zinc sheet or coil.
- D. Installation Warranty: provide 2-year guarantee covering the proper material or product application preventing failure due to hot-water corrosion, damage due to inappropriate slip sheet, absorptive separation material, or other installer induced failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Sheet Metal Manufacturers: Provide Basis of Design Products by RHEINZINK America Inc., or equal products by VM Zinc.

2.2 METALS

- A. Zinc Alloy Sheet/Coils: Titanium Zinc Alloy whose base is electrolytic high grade with a 99.995 % Zn degree of purity and alloying additives of 0.08% - 1.0% copper and 0.07% - .12% titanium, .001% - .015% aluminum in accordance with ASTM B69-20 (or latest edition) - Architectural Rolled Zinc - Type 1

1. Basis of Design Product: RHEINZINK-GRANUM phosphating process, "Sky-Grey" color and finish; or equal.
2. Minimum Panel Thickness: 0.8 mm (22 ga.) for flat lock tiles and trim, and 1.0 mm (20 ga.) for reveal panels and trim.

2.3 MISCELLANEOUS METAL FRAMING

- A. Steel Sheet Components, General: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
- B. Subgirts: C- or Z-shaped sections fabricated from 0.0598-inch (1.5-mm) bare steel thickness, shop-painted, cold-formed, metallic-coated steel sheet.
- C. Base or Sill Angles and Channels: 0.079-inch (2.0-mm) bare steel thickness, cold-formed, galvanized steel sheet.
- D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm)
 2. Depth: 7/8 inch (22 mm) unless otherwise indicated.
- E. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (13-mm-) wide flange.
 1. Depth: As indicated.
- F. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
- G. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 ACCESSORIES

- A. General: Provide components matching sheet metal siding in finish and material that are required for a complete siding system. Comply with Division 07 Section "Sheet Metal Flashing and Trim" for requirements.
- B. Provide all components necessary for a complete, functional, weatherproof assembly including, but not limited to, trims, copings, fascias, sills, flashings, counter flashings, door frame trim, corner units, soldering, clips, wall caps, copings, sealants, closures, fillers, foam tapes, and gaskets. All accessories shall be zinc compatible.
- C. Clips and Fasteners: Provide stainless steel concealed clips and stainless steel fasteners; of types and sizes as required in accordance with manufacturer's recommendations and per the engineering calculations. Attachment clips shall permit expansion and contraction

of the panel system throughout the specified temperature range. Provide fasteners with watertight washer gaskets (such as self-adhered membrane) for permeable air barrier sheets.

- D. Solder: Lead solder containing 50% tin and 50% lead in accordance with ASTM B32 - 08 (or latest edition) or lead-free solder.
- E. Flux: Felder ZD-Pro or equal.
- F. Air Barrier Underlayment: Provide vapor permeable sheet underlayment; Tyvek Commercial Wrap or equal (note taped joints and fastener gasket requirement).
- G. Sealants:
 - 1. Seam Sealing Tape: pressure-sensitive 100 per cent solid polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, non-toxic non-staining tape.
 - 2. Joint Sealant: DOW 795 or other documented pH neutral sealant.
 - 3. Backer rod shall be extruded polyethylene foam as DOW ETHAFOAM SB or equal.
 - 4. Foam tapes at stiffeners shall be compressible open cell breathable type.

2.5 FABRICATION

- A. General: Custom fabricate sheet metal panels to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" and RHEINZINK Division 7 Binder; Latest Edition that apply to the design, dimensions (pan width and depth), geometry, metal thickness, and other characteristics of installation indicated. Shop fabricates sheet metal wall panels and accessories at the shop to the greatest extent possible.
- B. Flat-Lock Tile Wall Panels: Form flat-lock tile panels from continuous metal sheets, with two hooks (hems) turned under and two hooks (hems) turned over. A minimum of a ¾" hook (hem) is required; relief cuts are recommended for ease of installation (contact RHEINZINK for proper notching pattern).
- C. Fabricate sheet metal wall panels to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.
- D. Form and fabricate sheets, seams, strips, cleats, edge treatments, integral flashing, and other components of metal wall to profiles, patterns, and drainage arrangements shown and as required to resist Water infiltration without excessive use of sealants (dry joints) while also allowing any water infiltration behind the wall panels to weep out.
- E. Sealant Joints: Where movable, non-expansion type joints are indicated or required to produce weather tight seams such as at window and door penetrations, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of sheet metal siding. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine primary and secondary framing to verify that structural panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.

3.2 PREPARATION

- A. Coordinate sheet metal siding with flashing, trim, and construction of walls and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of sheet metal siding. Strip with care to avoid damage to finish.
- C. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous panel support members and anchorage according to metal panel manufacturer's written recommendations and approved shop drawings.
- D. Install air barrier underlayment on substrate in accordance with air barrier manufacturer's installation instructions. Comply with manufacturer's requirements for underlayment end and side laps, attachment, seaming, and terminations.

3.3 INSTALLATION, GENERAL

- A. General: Unless otherwise indicated, install sheet metal siding, flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual". Anchor Work securely in place by methods indicated, providing for thermal expansion of sheet metal units; conceal fasteners and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- C. Expansion Provisions in Accessories: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where

lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

- D. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature is moderate, between 40 and 70 deg F (4 and 21 deg C), at time of installation, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C). Comply with requirements of Division 07 Section "Joint Sealants" for handling and installing sealants.
- E. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, oil-canning, excessive waves, and avoidable tool marks, considering temper and reflectivity of sheet metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges, unless otherwise indicated.
 - 1. All shop and field fabricated bends shall have an acceptable "rounded" or radius bend. NO SHARP BREAKS.
- F. 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.
- G. Roof-Edge Flashings and Edge Securement: Secure metal flashings, copings and edge securement at roof edges according to Building Code of NY, Chapter 16 for specified wind zone.

3.4 SHEET METAL SIDING INSTALLATION

- A. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- B. Install work to meet specified performance requirements. Flat-Lock Tile panels shall be installed from the bottom up. CAUTION: Horizontal and Vertical Flat-Lock Tile panel applications become directional when notched according to RHEINZINK'S recommendations .
- C. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except where pretinned surface would show in finished Work.
 - 1. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

- D. Sealed Joints: Form nonexpansion, but movable, joints in sheet metal to accommodate elastomeric sealant to comply with siding manufacturer's standards. Fill joint with sealant and form sheet metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- E. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder, or seal seams with specified elastomeric joint sealant, as approved by the Architect.
- F. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.
- G. Fascia and Copings: Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners. Anchor fasciae and copings to meet performance requirements.
- H. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

- A. Clean exposed sheet metal surfaces of substances that interfere with uniform oxidation and weathering.

3.6 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure sheet metal siding is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 076223

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof hatches
2. Hatch safety railing system
3. Ladder safety post.

B. Related Work Specified Elsewhere:

1. Roof ladders are specified in Division 05 Section "Metal Fabrications."
2. Vegetated roof trays are specified in Division 07 Section "Vegetated Roof Systems."

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

C. 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.

1.3 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. 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. Hatches and Safety Railings:
 - a. Babcock-Davis Hatchways, Inc.
 - b. Bilco Company.
 - c. Greenheck
 - d. Milcor, Inc.

2.2 MATERIALS, GENERAL

- A. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 (Z275) coating designation; commercial quality, unless otherwise indicated.
1. Structural Quality: Grade 40 (Grade 275), where indicated or as required for strength.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M) for alclad alloy 3005H25 or alloy and temper required to suit forming operations, with mill finish, unless otherwise indicated.
- C. Extruded Aluminum: ASTM B 221 (ASTM B 221M) alloy 6063-T52 or alloy and temper required to suit structural and finish requirements, with mill finish, unless otherwise indicated.
- D. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.
- E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coating.
- H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- I. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

- J. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF HATCHES

- A. General: Fabricate units to withstand 40-lbf/sq. ft. external loading pressure and a 20 psf wind uplift pressure. Cover and curb shall be thermally broken. Frame with minimum 12-inch-high, integral-curb with 3-inch insulation, mounting flange and cap flashing (roofing counterflashing), with welded or sealed mechanical corner joints. Provide double-wall cover (lid) construction with 3- inch-thick insulation core. Provide EPDM compression gasketing and equip with corrosion-resistant or hot-dip galvanized hardware including pintle hinges, hold-open devices, interior and exterior padlock hasps, and both interior and exterior latch handles.
- B. Type: Single-leaf equipment access.
- C. Size: 30" x 54".
- D. Material: Aluminum covers (lids) and curbs, fabricated from 11 gauge aluminum with a 18 gauge aluminum cover liner.
- E. Finish: Mill finish.
- F. Basis of Design Product: Type NB-50TB manufactured by Bilco or equal.

2.4 HATCH RAIL SYSTEM

- A. Performance Characteristics: Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and shall meet OSHA strength requirements with a factor of safety of two.
- B. Posts and Rails: 1-1/4" round 6061-T6 schedule 40 aluminum pipe with factory applied safety yellow powder coat paint finish. Provide self-closing gate and positive latching system.
- C. Hardware: Mounting brackets shall be 3/8" thick extruded aluminum. Post guides shall be cast aluminum. Hinges and fasteners shall be Type 316 stainless steel.
- D. Manufacturer: Bilco Bil-Guard 2.0 Roof Hatch Railing System, Model RL2-NBTB or equal

2.5 ROOF HATCH ACCESSORIES

- A. Ladder Safety Post: Preassembled unit with tubular post locking automatically when fully extended, and controlled upward and downward movement, release lever to disengage the post to allow it to be returned to its lowered position, and adjustable mounting brackets to fit ladder rungs.
 - 1. Material: Steel

2. Balancing Spring and Hardware Material: Stainless steel
3. Steel Finish: Safety yellow powder coat.
4. Basis of Design Product: Bilco Ladder-Up Safety Post, Model LU-1 or equal.

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.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Powder Paint Finish: Manufacturer's standard.

2.8 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the air-dried primer specified below immediately after cleaning and pretreating.
 1. Shop Primer: Manufacturer's standard, compatible with finish paint specified in Division 09 Section "Painting."
- C. Factory Finished Powder Paint System: Manufacturer's standard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that

each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

- B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated.
- C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
- D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.
- F. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.2 CLEANING AND PROTECTION

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 077200

SECTION 077273 - VEGETATED ROOF SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Modular system of preplanted plastic modules containing a drainage layer with growth media and plant species preplaced into the module.
 - 2. Slip sheet for separation from roof membrane surface.
- B. Roofing membrane is specified in Section 075323.

1.2 SUBMITTALS

- A. Product Data: Before materials are delivered to site, submit manufacturer's printed product data and specifications for all materials and components of green roof system. Include installation instructions and data substantiating that materials comply with requirements.
- B. Shop Drawings: Show roof configuration and module layout, location and type of all penetrations, termination details, and all other application details, each at an appropriate scale.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Maintenance Data: For green roof system to include in the maintenance manuals specified in Division 01 Section "Closeout Procedures."
- E. Warranty: Sample copy of green roof system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty as stated in "Warranty" Article.
- F. Inspection Report: Copy of green roof system manufacturer's inspection report of completed installation, specified in the "Quality Assurance" Article.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary green roof system materials from a single manufacturer. Provide secondary materials as produced by or accepted by manufacturer of primary materials.

- B. Installer: Green roof system and all associated work shall be installed by a firm that has five (5) years experience in the installation of green roofing systems similar to the system specified.
- C. Single-Source Responsibility: The vegetated roof assembly shall be installed in conjunction with the membrane roof system installer as a single source installer or a partnership for single source responsibility of membrane roof system warranty and vegetated roof assembly warranty covering replacement of overburden in the event roofing repair service is required.
- D. Pre-Roofing Inspection and Certification: Prior to start of installation of the work of this Section, secure a visit to the job site by a representative of the manufacturer of the roofing membrane used who shall inspect the job conditions and shall certify in writing to the Architect that each of the surfaces to which the green roof system materials will be applied is in a condition suitable for this application.
- E. Preinstallation Conference: Before installing green roof system, conduct conference at Project site to comply with requirements of Division 01 Section "Project Management and Coordination."
- F. Post-Roofing Inspection: At the completion of the installation of the green roof system, a representative of the green roof system manufacturer shall inspect the work as required to provide the manufacturer's guarantee as specified below. The representative shall either approve the work or shall order changes in the work required for approval in which case he shall reinspect the work after the changes have been made.
 - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, and directions for storing.
- B. Install planted modules on rooftop within 4 hours of delivery.

1.5 PROJECT CONDITIONS

- A. Weather: Proceed with green roof system work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.
- B. Installation Season: Install during the time period of April 1 to October 15, unless otherwise recommended by manufacturer.
- C. Coordination with Roofing Membrane Warranty: Roofing membrane manufacturer shall provide "single source" warranty that includes the vegetated cover and the membrane roofing system. covering removal and replacement of vegetated roofing system in the event repair work is required on the roof membrane.

1.6 SPECIAL PROJECT WARRANTY

- A. The warranty specified in the Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner the following written guarantees:
 - 1. The installer will guarantee a uniform stand of plants by watering and maintaining green roof areas until final acceptance, and will replant areas that fail to provide a uniform stand of plants until all areas are accepted by Owner.

1.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide full maintenance by skilled employees of installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable green roof system is established, but for not less than 30 days from date of Substantial Completion.

PART 2 - PRODUCT

2.1 GENERAL

- A. Basis of Design Product: Provide "GreenGrid G4 Module" Extensive Module manufactured by Weston Solutions or equal.

2.2 MATERIALS

- A. Modules: Formed from black or grey 100mil thick HDPE (100% recycled post industrial material) 24" x 24" in size, with 4-1/4" depth of modules. Modules shall have water retention reservoirs, bottom drainage holes and integrated handles.
- B. Underlayment Material: Heavy duty HDPE, Polypropylene, TPO, EPDM or recyclable PVC slip sheet/root barrier of 40-60 mil. thickness with effectively bonded seams. Material shall be compatible with roofing membrane system.
- C. Growth media shall be engineered light weight blend inorganic content, provided by module manufacturer, and appropriate for materials being planted. Saturated weight with mature vegetation shall be 26-30 lbs. per square foot.
- D. Ground Covers and Plants: Design mix of grasses, perennials and groundcovers that can thrive in non-irrigated extensive rooftop environment in project location; exact mix as approved by Architect. Plants shall be grown to maturity (approximately 95+% soil coverage) before delivery to site.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Prior to work of this Section, carefully inspect all surfaces and verify that surfaces are satisfactory so that the work of this Section may properly commence. Verify that green roof system may be installed in strict accordance with the manufacturer's current recommendations, and all pertinent codes and regulations.
- B. Examine substrates, areas, and conditions under which system will be applied, with roofing Installer present, for compliance with requirements.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 SURFACE PREPARATION

- A. Clean substrate of dust, debris, and other substances detrimental to green roof system installation according to manufacturer's written instructions .
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION

- A. Place underlayment sheet over completed and tested membrane roof. Place modules on roof surface in arrangement according to approved landscape design and shop drawings. Water modules to insure growth.

3.4 MAINTENANCE

- A. Maintain and establish green roof system by watering, fertilizing, weeding, trimming, replanting, and other operations. Replant bare or eroded areas and those damaged by insects or disease. Provide materials and installation the same as those used in the original installation.
- B. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep green roof system uniformly moist to a depth of 4 inches (100 mm).
 - 1. Water with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

- C. Acceptance: Upon completion of maintenance period, Owner will inspect green roof system to determine if a uniform stand of plants exists, and will accept if all requirements have been met. Upon acceptance, Owner will assume maintenance of green roof system.

END OF SECTION 077273

SECTION 078100 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes sprayed fire-resistive materials (SFRM).
- B. Locations of sprayed fire-resistive materials includes the following:
 - 1. Steel columns, wide-flange and hollow structural section types, where indicated
 - 2. Roof construction including deck, beams and joists where indicated.
 - 3. Floor construction including deck, beams and joists where indicated
 - 4. Any other area indicated on the Drawings.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. UL Designs: For each UL Design proposed for use.
- D. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for materials and execution and for preconstruction testing.
 - 1. Build mockup of each type of fireproofing and different substrate as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Coordination: Coordinate installation of spray fireproofing with installation of ceiling-mounted supports and hangars for mechanical and electrical equipment installed by others.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups of fireproofing.
 - 1. Provide test specimens and assemblies representative of proposed materials and construction.
- B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F (7 deg C) or lower unless temporary protection and heat are

provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Primers, Sealers, and Undercoaters: 200 g/L.
 - 2. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
 - 1. Basis of Design Product: Provide Isolatek International; Cafco Blaze-Shield II or equal.
 - 2. Bond Strength: Minimum 150-lbf/sq. ft. (7.18-kPa) cohesive and adhesive strength based on field testing according to ASTM E 736.
 - 3. Density: Not less than 15 lb/cu. ft. (240 kg/cu. m) and as specified in the approved fire-resistance design, according to ASTM E 605.
 - 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
 - 5. Combustion Characteristics: ASTM E 136.

6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 10 or less.
7. Compressive Strength: Minimum 1,440 lbf/sq. in. (68.9 kPa) according to ASTM E 761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq. m) in 24 hours according to ASTM E 859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G21.
13. Sound Absorption: NRC of 0.75 according to ASTM C423 for Type A mounting according to ASTM E795.
14. Finish: Spray-textured finish.
15. UL Designs:
 - a. As required to achieve 1-hour fire-rating at columns.
 - b. As required to achieve 1-hour fire-rating at roof and floor beams, decking and joists.
16. Adjust thickness of sprayed on material for columns and beams (lintels) with W/D ratio less than the W/D ratio of the specified assembly, as described in UL Fire Resistance Directory, Design Information Section at the front of the directory.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Patching Material: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction; Cafco Fiber Patch or equal.

2.4 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.
- C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

2.5 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.
- E. For areas with spray material on beams only, and exposed steel deck, cover deck to limit overspray of materials. Remove protective covering upon completion

2.6 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

- F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
- O. The substrate shall have a minimum ambient temperature before and after application as specified in the approved manufacturer's written instructions. The area for application shall be ventilated during and after application as required by the approved manufacturer's written instructions.

2.7 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections as required by the BCNYS, Subsection 1705.13, "Sprayed Fire-Resistant Materials."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design. See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

2.8 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

SECTION 078123 – INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes mastic and intumescent fire-resistive coatings (MIFRC).

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Material List: Provide an inclusive list of required intumescent coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
- B. UL Designs: For each UL Design proposed for use.
- C. Shop Drawings: Structural framing plans indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements..
- B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of each type of fireproofing and different substrate as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PROJECT CONDITIONS

- A. Apply waterborne coatings only when temperatures of surfaces to be coated and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 INTUMESCENT COATING MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise
- D. Low-Emitting Materials: Products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits 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. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

- E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, water-based, factory-mixed formulation, and complying with indicated fire-resistance design:
 - 1. Basis of Design Product: CAFCO SprayFilm WB 5 manufactured by Isolatek International, or the following equal (listed in the UL Designs indicated):
 - a. ISOLATEK Type WB 5 manufactured by Isolatek International
 - 2. Application: Designated for "interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 - 4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 5. Hardness: Not less than 80, Type D durometer, according to ASTM D 2240.
 - 6. VOC Content: Zero.
 - 7. UL Design No.:
 - a. Architecturally Exposed Steel Including Beams and Columns: UL X650, UL N614 for a one hour rating.
 - 8. Alternative Manufacturers: Subject to compliance with requirements, equal MIFRC products of the following manufacturers may be provided. Submit alternative UL Designs for approval prior to providing the alternative products.
 - a. Albi Manufacturing, Division of StanChem Inc.
 - b. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.
 - c. International Paint Limited, subsidiary of Akzo Nobel N. V.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Refer to Division 09 Section "Painting" for additional information on prime paint.
- C. Decorative Topcoat: Finish paint specified in Division 09 Section "Painting". Topcoat shall be suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 - 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
 - C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
 - D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
 - E. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
 - F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
 - G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
 - H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
 - I. Cure fireproofing according to fireproofing manufacturer's written recommendations.
 - J. Do not install enclosing or concealing construction or apply finish paint coat until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
 - K. Finishes: Apply fireproofing to produce surface finish matching approved mock-up.
 - L. Field Painting: Refer to Division 09 Section "Painting".
- 3.4 FIELD QUALITY CONTROL
- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.11.
 - B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested

values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078123

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in fire-resistance-rate horizontal assemblies.
3. Penetrations in non-fire-resistance-rate horizontal assemblies.
4. Penetrations in smoke barriers, smoke partitions and smoke tight partitions.

B. Related Sections:

1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 ACTION SUBMITTALS

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

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include

having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

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

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Penetration Firestop Systems specified in the Schedule in Part - 3 include:
 - a. Fire Barrier Products, 3M Fire Protection Products
 - b. RectorSeal Corporation.
 2. Subject to compliance with specified requirements, provide Penetration Firestop Systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory (BXRH), by one of the following:
 - a. Hilti, Inc.
 - b. Nelson Firestop Products.
 - c. RectorSeal Corporation.
 - d. Specified Technologies Inc.
 - e. 3M Fire Protection Products.
 - f. Wiremold/Legrand

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. Horizontal assemblies include floors and floor/ceiling assemblies.
 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

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

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. For penetrations in non-fire rated horizontal assemblies, smoke barriers, smoke partitions and smoke tight partitions, provide systems tested for 1 hour unless otherwise noted.
- C. Basis of Design Assemblies: Subject to compliance with requirements, provide the design indicated below or a comparable UL design by one of manufacturer's listed in Part 2 above.
 1. Schedule of construction components, type of penetrant, and U.L. Penetration Firestop Systems include, but are not limited to the following:
 2. Schedule of construction components, type of penetrant, and U.L. Penetration Firestop Systems include, but are not limited to the following:

	P E N E T R A N T
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	Metal Conduit	Cable Tray⁴	Cables	Non-Insul. Metal Pipe	Insul. Pipe	FR Polypropylene Pipe	Insul. Metal Duct
GWB Stud Wall, or Shaft Wall up to 2 Hr Rating	W-L-1001	W-L-4004	W-L-3001	W-L-1001	W-L-5011	W-L-2002	W-L-7006 ³
CMU Wall up to 2 Hr Rating	C-AJ-1044	C-AJ-4003	C-AJ-3030	C-AJ-1044	C-AJ-5001	C-AJ-2001	C-AJ-7003 ³ , 7016 ³
Concrete Floor / Metal Deck 1 Hr Rated F and T-Rating²	C-AJ-1008	N/A	C-AJ-3029	C-AJ-1008	C-AJ-5002	F-A-2002	C-AJ-7009 ⁵
Concrete Floor / Metal Deck 2 Hr Rated F and T-Rating²	C-AJ-1008	N/A	C-AJ-3029	C-AJ-1008	C-AJ-5060	F-A-2002	N/A
Concrete Floor / Metal Deck up to 2 Hr F Rated¹	F-A-1002	N/A	C-AJ-3030	C-AJ-1044	C-AJ-5001	F-A-2002	N/A

KEY TO NOTES

1. Penetration within wall cavity.
2. Penetration that does not fall within wall cavity, T-Rating required.
3. Up to 1 hour rating, submit engineered judgement firestopping system for this combination of penetrant, wall/floor assembly, and fire rating. Install fire dampers in 2-hour walls in accordance with manufacturer's instructions and testing agency requirements.
4. Where cable tray extends through wall.
5. For floor penetrations not enclosed above and below the floor with shaft wall.

D. Membrane Penetrations:

1. Firestop membrane penetrations by cables, pipes and conduit similar to through wall penetrations.
 2. Provide putty pad box wrap firestopping for membrane penetrations in rated walls for electrical back boxes over 16 sq. inches, where any back boxes are located within 24 inches horizontal of another back box, or when total area of back boxes exceeds 100 sq in. in 100 sq. ft. of wall area.
- E. Where another type of construction or penetrant is encountered, or if field conditions vary from those described in the U.L. System listed (i.e. annular space is greater/smaller, insulation type varies, etc.), provide firestopping systems which are appropriate, and U.L. tested, for that condition.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Sections:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.2 ACTION SUBMITTALS

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

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint

system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
 - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
 - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
 - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

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

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall

accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Grace Construction Products.
 - b. Hilti, Inc.
 - c. RectorSeal Corporation.
 - d. Specified Technologies Inc.
 - e. 3M Fire Protection Products.
 - f. Tremco, Inc.; Tremco Fire Protection Systems Group.
- C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.
1. L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.
 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Grace Construction Products.
 - b. Hilti, Inc.
 - c. Johns Manville.
 - d. RectorSeal Corporation.
 - e. Specified Technologies Inc.
 - f. 3M Fire Protection Products.
 - g. Tremco, Inc.; Tremco Fire Protection Systems Group.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings

required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

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

- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

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

3.6 CLEANING AND PROTECTING

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

3.7 FIRE-RESISTIVE JOINT SYSTEM / FIRESTOP JOINT SYSTEM SCHEDULE

A. Where UL-classified firestop joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

Firestop Joint System Location	Basis-of-Design	Assembly Rating	Nominal Joint Width	Movement Capabilities ²
Floor-to-Wall				
Rated concrete masonry wall construction intersection with adjacent floor construction	FW-D-1012, FW-D-1013	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Head-of-Wall				
Rated gypsum wall construction intersection with steel floor deck above	HW-D-0087, or HW-D-0089	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II or III,
Rated gypsum wall construction intersection with concrete floor deck above	HW-D-0083, HW-D-209	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Rated concrete masonry wall construction intersection with steel floor deck above	HW-D-0081, or HW-D-0098	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Rated concrete masonry wall construction intersection with concrete floor deck above	HW-D-0268, HW-D-0097	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Class II
Bottom-of-Wall				
Rated gypsum wall construction intersection with concrete floor	BW-S-0002	1 hour or 2 hours ¹	As indicated, or required by tested assembly	Static

1. Rating to match wall construction.
2. Class UL2079

B. Where another type of construction is encountered, or if field conditions vary from those described in the U.L. System listed (i.e. annular space is greater/smaller,

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insulation type varies, etc.), provide firestopping systems which are appropriate, and U.L. tested, for that condition.

END OF SECTION 078446

ATTACHMENT: FIRESTOP JOINT SYSTEMS SUBMITTAL SHEET

3.8 FIRESTOP JOINT SYSTEMS SUBMITTAL SHEET

A. **HEAD-OF-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.

1. Gypsum wall construction intersection with floor deck above: _____.
Gypsum wall construction intersection with roof deck above: _____.
2. Concrete masonry wall construction intersection with floor deck above: _____.
3. Concrete masonry wall construction intersection with roof deck above: _____.

B. **FLOOR-TO-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.

1. Concrete masonry wall construction intersection with adjacent floor construction: _____.

C. **BOTTOM-OF-WALL FIRESTOPPING:** Fill in the U.L. Design number and attach copy of U.L. Test. Insert n/a if condition is not applicable.

1. Gypsum wall construction intersection with floor deck: _____. Gypsum wall construction intersection with roof deck above: _____.
2. Concrete masonry wall construction intersection with floor _____.
3. Concrete masonry wall construction intersection with roof deck above: _____.

D. **CURTAIN WALL FIRESTOPPING:** Fill in the design number and copy test. Insert n/a if condition is not applicable.

1. Aluminum mullion and glass spandrel panel curtainwall intersection with adjacent floor construction:
2. Gypsum sheathed curtainwall intersection with adjacent floor construction: _____.

E. **OTHER:** Where another type of construction or penetrant is encountered, attach a separate sheet listing each condition and attach copy of the U.L. Test.

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes joint sealants for the following locations:
1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
 - a. Control and expansion joints in cast-in-place concrete
 - b. Joints in brick veneer wall surfaces.
 - c. Joints in stone veneer wall surfaces.
 - d. Joints at cast stone units.
 - e. Joints in EIFS wall panels.
 - f. Joints in composite metal wall panels.
 - g. Joints in sheet metal wall panels.
 - h. Joints between different materials listed above
 - i. Perimeter joints between materials listed above and frames of aluminum entrance and storefront framing, aluminum curtainwall framing and frames of doors, louvers and windows.
 - j. Control and expansion joints in ceiling and overhead surfaces.
 - k. Other joints as indicated.
 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefront and entrance framing, curtainwall framing, and elevator and wheelchair lift entrances.
 - e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - f. Tile control and expansion joints
 - g. Openings and joints in sound-rated partitions.
 - h. Other joints as indicated.
 4. Interior joints in the following horizontal traffic surfaces:
 - a. Control and expansion joints in tile flooring.
 - b. Control and expansion joints in cast-in-place concrete slabs.

c. Other joints as indicated.

B. Related Sections include the following:

1. Sealants used in glazing are specified in Division 08 "Glazing."
2. Coordinate work of this section with all sections referencing it.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- B. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.
- C. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- D. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
- E. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

- F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an installer who has successfully completed at least three (3) joint sealer applications similar in type and size to that of this project within the last five (5) years. All workers used for work of this Section shall be experienced in the techniques of sealant application and shall be completely familiar with the published recommendations of the manufacturer of the joint sealant materials being used.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
1. Locate test joints where indicated or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
 5. Test Method: Test joint sealants by hand pull method described below:
 - a. Install joint sealants in 60 inches (1500 mm)) joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
 - b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches (50 mm) long at side of joint and meeting horizontal cut at top of 2-inch (50-mm) cuts. Place a mark 1 inch (25 mm) from top of 2-inch (50-mm) piece.
 - c. Use fingers to grasp 2-inch (50-mm) piece of sealant just above 1-inch (25-mm) mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 6. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 7. Evaluation of Field 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.

- D. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:
 - 1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.
- E. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division 01 Section covering this activity.
- F. Random Field Tests: Periodically test sealants, in place, for adhesion, using methods recommended by sealant manufacturer. Promptly replace any sealant that does not adhere, fails to cure, or fails to perform as specified by the sealant manufacturer.
- G. Field Water Test: Perform two field water tests on completed areas including as many conditions as possible. If leakage occurs during testing, repair as required, and re-test area and also test two additional locations.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Warranty: Provide written warranty agreeing to repair or replace, at no cost to Owner, defective materials for twenty (20) years, and workmanship for two (2) years from the Date of Substantial Completion. Defective materials and workmanship shall include, but are not limited to:
 - 1. Deterioration, aging or weathering of the work;
 - 2. Water leakage and/or air leakage;
 - 3. Sealant loss of adhesion, loss of cohesion, cracking or discoloration;
 - 4. Staining or discoloration of adjacent surfaces;
 - 5. Joint failure due to building or joint movement up to the limits prescribed by the manufacturer;
 - 6. Cracks or bubbles on sealant surface.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's standards or custom colors to match Architect's samples, as directed by Architect.
- C. Additional Movement Capability: Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.
- D. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.

- E. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project

2.2 LATEX JOINT SEALANT

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, paintable latex acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.

- 1. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. AC-20; Pecora Corporation.
 - b. Tremflex 834; Tremco.
 - c. ALEX PLUS; DAP .

- B. Uses: General interior use, paintable.

2.3 MILDEW-RESISTANT SILICONE JOINT SEALANT

- A. Single-Component Mildew-Resistant Silicone Sealant: Manufacturer's standard, non-modified, one-part, silicone sealant; complying with ASTM C 920, Type S, Grade NS, Class 25, Uses NT, G, A, and, as applicable to non-porous joint substrates indicated, O. Formulate sealant with fungicide and specifically intended for sealing interior joints with nonporous substrates and subject to in-service exposure to conditions of high humidity and temperature extremes.

- 1. Available Products: Subject to compliance with requirements, silicone joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. 786 Mildew Resistant; Dow Corning.
 - b. Sanitary 1700; GE Silicones.
 - c. 898 Silicone Sanitary Sealant; Pecora Corporation.
 - d. Trensil 600 White; Tremco.

- B. Uses: Interior use in wet locations, and all toilet and shower rooms.

2.4 NONSAG URETHANE JOINT SEALANT

- A. Multicomponent Nonsag Urethane Sealant: Manufacturer's standard, non-modified, multi-part, nonsag urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses NT, M, G, A, and as applicable to joint substrates indicated, O.

- 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. Dynatrol II, Pecora Corporation
 - b. Sikaflex-2c NS, Sika Corporation
 - c. Dymeric 240FC; Tremco.

- d. Masterseal NP 2; Master Builders Solutions Div., BASF

- B. Uses: Interior use for exposed concrete or masonry wall control joints

2.5 SILICONE JOINT SEALANT

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100, for Use G, A, M, O; non-staining and field-tintable.

- 1. Basis of Design Product: Provide Pecora Corporation "890FTS" sealant or equal manufactured by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Advanced Materials - Silicones
 - c. Sika Corporation, Construction Products Division
 - d. Tremco Incorporated

- B. Additional Movement Capability: 100 percent movement in extension and 50 percent in compression for a total of 150 percent movement.

- C. Uses: General exterior use.

2.6 POURABLE URETHANE JOINT SEALANT

- A. Multicomponent Pourable Urethane Sealant: Manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade P, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.

- 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. NR-200 Urexpan, Pecora Corporation
 - b. Sikaflex 2c SL, Sika Corporation
 - c. Masterseal SL 2; Master Builders Solutions Div., BASF

- B. Uses: Interior or exterior use for level pavement or slab joints.

2.7 NONSAG URETHANE JOINT SEALANT

- A. Multi-Part Non-Sag Urethane Sealant: Except as otherwise indicated, provide manufacturer's standard, non-modified, two-part, urethane sealant; complying with ASTM C 920, Type M, Grade NS, Class 25, Uses T, M, A and, as applicable to joint substrates indicated, O.

- 1. Available Products: Subject to compliance with requirements, urethane joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. Sikaflex 2c NS; Sika Corp
 - b. Dynatred, Pecora Corporation
 - c. Masterseal NP 2; Master Builders Solutions Div., BASF

- B. Uses: Interior or exterior use for pavement or slab joints where slope exceeds one percent.

2.8 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Non-sag (gun grade), non-flammable, latex-based sealant designed to limit sound transmission through interior STC-rated partitions. Sealant remains flexible and adhered to metal, wood, plaster, gypsum, and concrete after drying.
 - 1. Maintains the STC rating of partitions with intersections and penetrations sealed with product: Tested by independent, accredited, NVLAP facility according to ASTM E 90.
 - 2. Products: Provide one of the following:
 - a. QuietZone Acoustic Sealant by Owens Corning.
 - b. OSI GreenSeries SC-175 Draft & Acoustical Sound Sealant by Henkel Corporation
 - c. Pecora AIS-919: Acoustical and Insulation Latex Sealant by Pecora Corporation
 - d. Smoke 'N' Sound Acoustical Sealant by Specified Technologies Inc.
- B. Uses: At penetrations through and intersections of sound-rated wall, floor and ceiling assemblies in order to preserve their ability to reduce airborne sound impact noise transmission.

2.9 PREFORMED FOAM SEALANTS

- A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
 - 1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
 - 2. Impregnating Agent: Chemically stabilized acrylic.
 - 3. Density: Manufacturer's standard.
 - 4. Backing: None.
 - 5. Available Products: Subject to compliance with requirements, preformed foam sealants that may be incorporated in the Work include, but are not limited to, the following:
 - a. "Emseal," Emseal Corp.
 - b. "Emseal Greyflex," Emseal Corp.
 - c. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.
 - d. "Wil-Seal 250," Wil-Seal Construction Foams Div., Illbruck.

2.10 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - 2. Manufacturer: Provide Cera-Rod manufactured by W.R. Meadows, Inc., or equivalent.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.11 JOINT FILLERS FOR EXTERIOR CONCRETE SLABS

- A. General: Provide joint fillers of thickness and depth indicated, or if not indicated 1/2" thick by depth of joint.
- B. Bituminous Fiber Joint Filler: Provide preformed strips of with asphalt binder encased between two layers of saturated felt or glass-fiber felt, complying with ASTM D 1751.
 - 1. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint and seal with sealant.

2.12 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
- F. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that

they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Types of joints for which architectural joint systems are specified include the following:
 - 1. Interior pedestrian traffic joints.
 - 2. Interior wall and ceiling joints.
 - 3. Exterior wall expansion joint.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for elastomeric sealants and preformed compressed-foam sealants without metal frames.
 - 2. Division 07 Sections "Sheet Metal Flashing and Trim" and "Roofing Accessories" for expansion joint covers at roof.

1.2 DEFINITIONS

- A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.
- B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.
- D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- F. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage of nominal value of joint width.
- G. Nominal Joint Width: Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
 - 1. Pedestrian Traffic Joints: Support pedestrian traffic across joint.
 - 2. Exterior Joints: Maintain continuity of weather enclosure.
 - 3. Joints in Fire-Resistance-Rated Assemblies: Maintain fire-resistance ratings of assemblies.
 - 4. Joints in Smoke Barriers: Maintain integrity of smoke barrier.
 - 5. Other Joints: Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
 - 6. Joints in Surfaces with Architectural Finishes: Serve as finished architectural joint closures.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.
- B. Shop Drawings: For each joint system specified, provide the following:
 - 1. Placement Drawings: Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each exposed metal and elastomeric material of joint system indicated.
 - 1. Include similar Samples of material for joints and accessories involving color selection.
- D. Samples for Verification: Full-size units 6 inches (150 mm) long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
- E. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.
- F. Research/Evaluation Reports: Evidence of architectural joint system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Other manufacturers' systems complying with requirements may be considered. Refer to Division 01 Section "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: The design for each architectural joint system specified in Part 2 "Architectural Joint Systems" Article below is based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the following:
 - 1. M M Systems
 - 2. Balco, Inc.
 - 3. Construction Specialties, Inc.
 - 4. Inpro
 - 5. Watson Bowman Acme.

2.2 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), alloy 6061-T6 for sheet and plate.
 - 1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Preformed Seals: Single or multicellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles. Formed to be installed in frames or with anchored flanges, in color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.
- C. Strip Seals: Elastomeric membrane or tubular extrusions with a continuous longitudinal internal baffle system throughout complying with ASTM E 1783; used with compatible frames, flanges, and molded-rubber anchor blocks.
- D. Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E 1612 in sizes and profiles indicated or as recommended by manufacturer.

- E. Fire Barrier: Manufacturer's standard for fire ratings indicated on Drawings.
- F. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS

- A. General: Provide joint systems of design, basic profile, materials, and operation indicated. Provide units with the capability to accommodate joint widths indicated and variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials.
 - 2. Include closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.
 - 3. Frames for Strip Seals: Designed with semiclosed cavity that provides a mechanical lock for seals of type indicated.
 - 4. Fire Barrier: Provide manufacturer's standard fire barriers material where indicated on the Drawings, for fire ratings indicated.
- B. Interior Floor-to-Floor Architectural Joint System: Metal frame and free-floating center plate for interior, pedestrian traffic joints. Units shall have recessed side frames for minimal visual impact.
 - 1. Basis-of-Design Product: Model ALR-200 by Construction Specialties or equal.
 - 2. Nominal Joint Width: 2 inches.
 - 3. Frame and Plate Material: Aluminum extrusions, mill finish.
- C. Interior Wall-to-Wall and Ceiling-to-Ceiling Architectural Joint System: Metal frame and elastomeric seal for interior wall and ceiling joints. Units shall be designed for minimal visual impact.
 - 1. Basis-of-Design Product: Products by Construction Specialties as follows:
 - a. For Acoustical Ceiling Locations: C/S Model FCF-200, or equal.
 - b. For Gypsum Board Walls and Ceilings: C/S Model FWF-200, or equal.
 - 2. Nominal Joint Width: 2 inches.
 - 3. Color of Elastomeric Seal: As selected by Architect.
 - 4. Frame Material: Aluminum extrusions, mill finish.
- D. Exterior Expansion Joint / Waterproofing Joint System: Exposed elastomeric bellows type seal with concealed secondary elastomeric seal and aluminum retainer frame for exterior vertical joints in exterior walls.

1. Basis-of-Design Product: C/S Model SF-200 by Construction Specialties, or equal.
2. Nominal Joint Width: 2 inches.
3. Color of Exposed Elastomeric Material: As selected by Architect to match adjacent wall color.

2.4 FINISHES, GENERAL

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

2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.
- B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.

- D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies to provide continuous, uninterrupted, watertight construction.
- E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.
 - 1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
 - 3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
 - 4. Locate wall, ceiling, and soffit covers in continuous contact with adjacent surfaces.
 - 5. Securely attach in place with required accessories.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- G. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.

3.3 CLEANING AND PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following hollow-metal work:

1. Steel doors
2. Steel door frames
3. Fire-rated door and frame assemblies
4. Transom frames, borrowed lite frames and sidelite frames.
5. Fire-rated frames

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
2. Section 088000 "Glazing" for glazing inserted in hollow metal doors and frames.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ceco Door Products; an Assa Abloy Group company.
 2. Curries Company; an Assa Abloy Group company.
 3. Republic Doors and Frames.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. Provide for interior door and frame locations.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 16 gage 0.053 inch (1.3 mm), except as noted below.
 - 1) Metallic-coated, with minimum A40 (ZF120) coating at the following locations: Basement doors.
 - d. Edge Construction: Model 1, Full Flush
 - a. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Provide mineral core for fire rated doors
- 3. Frames:
 - a. Materials: Minimum thickness of 16 gage, 0.053 inch (1.3 mm), uncoated, steel sheet for the following locations:
 - 1) Wood doors, unless otherwise indicated.
 - b. Materials: Minimum thickness of 14 gage, 0.067 inch (1.7 mm), uncoated, steel sheet (except provide metallic coated where door is metallic coated) for the following locations:
 - 1) Level 3 steel doors
 - 2) Wood doors at all leafs wider than 36-inches (914-mm), and all electrical rooms, storage rooms, machine rooms, mechanical rooms, and maintenance areas
 - c. Construction: Full profile welded.

4. Exposed Finish: Prime door and frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (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.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - 4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 6. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 - 6. Where Pyrostop glazing is scheduled to be inserted into openings in hollow metal doors provide door manufacturer's special window kit to accommodate thickness of glazing unit; Type 8 window kit by Curries, or equal.

2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors, and for electrical wiring as required, to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

- a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
 - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and

replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Solid-core doors with wood-veneer faces for transparent finish.
 2. High STC solid-core doors with wood-veneer faces for transparent finish.
 3. Aluminum-framed, top-hung sliding wood sound control door assemblies.
 4. Factory finishing flush wood doors.
 5. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
1. Division 08 Section "Hollow Metal Doors and Frames" for steel door frames.
 2. Division 08 Section "Glazing" for glass view panels in flush wood doors

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications. For acoustical doors, include test report for acoustical performance.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
1. Dimensions and locations of blocking.
 2. Dimensions and locations of mortises and holes for hardware.
 3. Dimensions and locations of cutouts.
 4. Undercuts.
 5. Requirements for veneer matching.
 6. Doors to be factory finished and finish requirements.
 7. Fire-protection ratings for fire-rated doors.
 8. Provide schedule of doors based on door schedule included in contract documents
 9. For sliding door assemblies, frame anchorages and wall reinforcement requirements.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species

and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.
3. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.4 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
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4
- B. Sample Warranty: For special warranty.
- C. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Field quality control reports.

1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1
- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.
- B. Contractor's Responsibilities: Replace doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Marshfield – Algoma by Masonite Architectural
 - 2. Oshkosh Door Company.
 - 3. VT Industries, Inc. (formerly Eggers)
- B. Source Limitations:
 - 1. Obtain flush wood doors from single manufacturer.
 - 2. Obtain each of the top-hung, sliding door components from one source with the complete integrated assembly from a single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C. After 5 minutes into the NFPA

252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill. Provide "Category A" Positive Pressure Tested doors for all fire-rated wood doors.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile; UL category A. Comply with specified requirements for exposed edges.
 4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- E. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
 2. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
 - b. 5-inch (125-mm) bottom-rail blocking, in doors and doors indicated to have kick, mop, or armor plates.
 - c. 4-1/2-by-10-inch (114-by-250-mm) lock blocks and 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
- F. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf (3100 N).
 - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- G. Mineral-Core Doors:
1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware, and as follows:
 - a. 5-inch (125-mm) top-rail blocking.
 - b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
 - d. 4-1/2-by-10-inch (114-by-250-mm) lock blocks and 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - a. Screw-Holding Capability: 550 lbf (2440 N) per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom, with Grade A faces.
2. Species: White Maple
3. Cut: Plain sawn/sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Exposed Vertical Edges: Same species as faces - edge Type A
7. Core:
 - a. Non-Rated Doors: Particleboard except provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors with full light or 2 lights
 - b. Fire-Rated Doors: Mineral core.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
9. WDMA I.S.1-A Performance Grade: Extra Heavy Duty
10. STC Rating for Acoustical Doors: Minimum 43.
11. Basis of Design Doors: Marshfield – Algoma Aspiro Series by Masonite Architectural, or equal.
12. Basis of Design Door, Acoustical Rated: Marshfield – Algoma Aspiro Series by Masonite Architectural, or equal with the following:
 - a. STC: 44
 - b. Non-rated single door
 - c. Perimeter Gaskets: Double row Pemko S-88
 - d. Bottom Seal/Sweep: Zero 360 or Pemko 211 door shoe
 - e. Threshold: not required
 - f. Door Weight 9.3 lbs/ft
 - g. Electric Raceway: Yes
 - h. Glazing: Max 300 sq. in, dual glazed acoustic glazing with ¼” and 3/8” thick laminated glass; flat metal stop DSR 44 sound molding.

2.4 ALUMINUM-FRAMED, TOP-HUNG SLIDING WOOD SOUND CONTROL DOOR ASSEMBLIES

- A. Acoustic Rating: Minimum STC 34 rated sound control assemblies tested at an independent acoustic laboratory in accordance to ASTM E90 Sealed-In-Place standard.
- B. Basis of Design Product: AD Systems OfficeSlide High Performance Barn (Sliding) Door System, or equal.
- C. Wall Thickness: 4-7/8”

- D. Frame and Door Assembly Components:
 - 1. Single Piece Top Track: Extruded aluminum track system with mounting brackets.
 - 2. Fascia: Extruded aluminum with matching integral end caps in square profile.
 - 3. Integral Soft-Closer: Soft and self-closing damper mechanism integrated with top track. Rated for 150K cycles.
 - 4. Concealed Door Bottom Floor Guide: Integral jamb floor guide.
 - 5. Acoustical Automatic Door Bottom.
 - 6. Sound Seal Sets: Integral to frame.

- E. Doors: Match door construction and finish as specified in this Section for other flush wood doors.
 - 1. Provide one side of door with surface mounted whiteboard as indicated on Drawings.

- F. Frames: Extruded aluminum "wrap" frame with integral vertical jamb (stile pocket) and acoustic seals.
 - 1. Finish: Clear anodized.

- G. Hardware: Self-latching lock with single action egress, with return to door tubular lever, finish US32D, AD6450P Office function (keyed lock with cylinder, ADA compliant thumbturn and back to back lever trim.

- H. Fabrication: Fabricate top-hung, sliding door assemblies in sizes, profiles, and configurations as indicated on Drawings.

2.5 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Manufacturer's standard shape.
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

- C. Where Pyrostop glazing is scheduled to be inserted into openings in wood doors provide door manufacturer's special window kit to accommodate thickness of glazing unit.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

- B. Align and fit doors in frames with uniform clearances and bevels as indicated below. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 5/8 inch (16 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
- D. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: WDMA TR-6 and AWS system 11 catalyzed polyurethane.
 - 3. Staining: As selected by Architect.
 - 4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
 - 5. Sheen: Satin

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Sliding Doors and Frames:

1. Examine wall openings and conditions, with Installer present, for plumb, level and square, and compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Sliding door operation will be adversely affected by out-of-tolerance framing.
2. Examine surfaces to receive door bottom guide. Floor shall have no height variance throughout the complete sliding operation.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Aluminum-Framed, Top-Hung Sliding Wood Sound Control Door Assemblies:

1. Install frame components and sliding doors plumb, level, square, and in proper alignment.
2. Anchor sliding door assemblies securely in place to supports according to manufacturer's written installation instructions.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and commissioning activities 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.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

- C. Commissioning: Commissioning of all doors shall be performed by the installer supervised by an Architectural Hardware Consultant who is thoroughly knowledgeable of the various components and systems. Include the following:
 - 1. Testing of opening force, closing device, complete closure of the door within clearance tolerances, and full engagement of latch(es) where required by door type.
 - 2. Verify cleanliness of labels, fusible links and other components that cannot be painted.
 - 3. Functional testing of automatic-closing or power-operated fire door assemblies and electrically controlled latching hardware or release devices shall be coordinated with all components of the electrically controlled system.
 - 4. After all doors have been commissioned and prior their acceptance, the Architect, in consultation with the Owner, will select doors (at least one for each operational type) whose full range operation shall be demonstrated by the Contractor to the satisfaction of the Architect.
 - D. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
 - E. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
 - F. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.
 - G. Prepare and submit separate inspection report for each egress door assembly indicating compliance with each item listed in NFPA 101.
 - H. Prepare and submit commissioning report of all doors.
- 3.4 ADJUSTING
- A. Operation: Rehang or replace doors that do not swing or operate freely.
 - 1. Adjust sliding doors and hardware for smooth operation in accordance with manufacturer's written instructions without binding and with tight fit at contact points and seals. Sliding doors to close against walls without gaps.
 - B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 082250 - POLYESTER FACED DOORS AND ALUMINUM FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fiberglass reinforced polyester (FRP) faced doors
 - 2. Aluminum frames for FRP doors, including frames for sidelites and transoms.
 - 3. Installation of hardware (except surface mounted hardware).
- B. Related sections include the following:
 - 1. Division 07 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 2. Division 08 Section "Door Hardware."
 - 3. Division 08 Section "Glazing."

1.2 SYSTEM DESCRIPTION

- A. General: Provide polyester faced doors and aluminum framing systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Thermal Movements: Provide polyester faced doors and aluminum framing systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change(range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Structural-Support Movement: Provide polyester faced doors and aluminum framing systems that accommodate structural movements including, but not limited to, sway and deflection.
- D. Dimensional Tolerances: Provide polyester faced doors and aluminum framing systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.3 SUBMITTALS

- A. Product data including specifications, standard details, and installation recommendations for polyester faced doors and panels and aluminum frames including test reports certifying that products have been tested and comply with performance requirements, details of core and edge construction, trim for openings, and finish.
- B. Shop drawings showing fabrication and installation of polyester faced doors, panels and frames. Include elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, and details of openings.
 - 1. Provide schedule of doors indicating sizes, locations, and other pertinent information using same reference numbers for details and openings as those on contract drawings.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for doors and panels.
- D. Samples for Verification Purposes: Submit 6" square samples of each color of face sheet specified and 12" long sections of aluminum extrusions with specified finish system applied. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide doors and frames produced by single manufacturer for entire Project.
- B. Manufacturer Qualifications: Provide product series that has produced by the manufacturer for at least five years, for similar building type and size as this project.
- C. Installer's Qualifications: Firm with not less than 4 years successful experience installing systems similar to those required.
- D. Fire Performance Characteristics: Where indicated, provide class "A" fiber reinforced polyester faces with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- E. Design Criteria: The construction documents are based on a specific polyester door faced and aluminum frame system. Other manufacturer's system of similar and equivalent nature will be acceptable when, in Architect's judgement, differences do not materially detract from design concept or intended performance.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to surface finishes.

- B. Inspect doors upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.
- D. Identify each door and frame with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check openings by field measurement before fabrication to ensure proper fitting of work; show measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.
- B. Coordinate work of this section with that specified in Section 087100 to ensure proper installation of hardware.

1.7 WARRANTY

- A. Product Warranty: Provide manufacturer's standard written warranty agreeing to repair or replace polyester faced doors which fail in materials or workmanship within time period indicated below. Warranty shall include door manufacturer's guarantee that hardware installed by factory will be installed correctly and not come loose within time period indicated below.
 - 1. Warranty period for doors and finish, and hardware installed by factory is ten years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide polyester faced doors, panels and aluminum frames manufactured by one of following:
 - 1. Special-Lite, Inc.
 - 2. Tubelite, Inc.
 - 3. Commercial Door Systems.

2.2 MATERIALS

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet and plate.
- B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M)) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.
- C. Fiberglass Reinforced Polyester Face Material: 0.120" minimum thickness, with color integral through full thickness of face sheet. Provide sandstone textured finish for doors and panels. Face material meeting the following performance criteria:
 - 1. Impact Strength of Face Sheets: ASTM D 256, Izod Impact Strength, 15 foot pounds per inch of notch.
 - 2. Abrasion Resistance of Face Sheets: ASTM D 1242, 25 cycles of Taber Abraser with CH-17 wheel with a 1000 gram load, not to exceed 0.029 percent weight loss.
 - 3. Hardness of Face Sheets: ASTM D 2583, Barcol Meter Hardness Test, not less than 55.
 - 4. Humidity Resistance of Face Sheets: ASTM D 570, water absorption not more than 0.40 percent weight gain after 24-hour immersion.
 - 5. Ultra-Violet Degradation: Only slight color change, and negligible change in surface gloss and other physical properties after exposure to 500,000 Langleys.
 - 6. Fire-Resistance and Flammability: Provide Class A rated faces for door faces of interior doors and for interior face of exterior doors and panels.
 - 7. Product: SpecLite 3 FRP by Special Lite, or equivalent.
 - 8. Per 2015 IBC 2603.4.1.7 for non-rated swing doors with plastic foam cores- provide a thermal barrier of not less than 0.032" thick aluminum or steel with basic thickness of not less than 0.016" between the foam core and FRP skin; or complying with NFPA 275 - per IBC 2603.4.
- D. Core Material: Urethane foam of 5 pounds per cubic foot density for doors and panels.
- E. Fasteners: Aluminum or stainless steel materials warranted by manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
- F. Brackets and Reinforcements: Manufacturer's high-strength aluminum extrusions. Provide manufacturer's standard reinforcement for each type of hardware required.
- G. 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.
- H. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- I. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

- J. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 07 Section "Joint Sealants."
- K. Glazing: 1" insulating glass units as specified in Division 08 Section "Glazing."

2.3 DOORS

- A. General: Provide manufacturer's standard flush and wide stile style doors as indicated on Drawings constructed of aluminum stiles and rails joined with steel tie rods, with polyester face sheets and foamed-in-place urethane inner core. Minimum thermal rating U-factor of 0.09.
 - 1. Basis of Design Product: Provide Sandstone FRP Flush Door Model SL-20 by Special Lite, or equivalent.
 - 2. Color shall be as selected by Architect.
- B. Provide extruded aluminum 2-7/16" tubular stiles designed to accept specified hardware and a minimum extruded aluminum 2-5/16" top and bottom rails with legs for interlocking rigidity weather bar. Minimum thickness of 1/16 inches at face and 1/8 inch at hinge and concealed vertical stiles.
 - 1. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
 - 2. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
- C. Lock polyester face sheets in on all four sides by extruded interlocking edges which are integral part of stiles and rails. Snap in or applied door edge trim is not acceptable.
- D. Miter or mortise and tenon corner joints and mechanically fasten with reinforcing brackets that incorporate concealed minimum 3/8" galvanized steel tie-rods at top and bottom with aviation type nuts.
- E. Internally reinforce doors to receive specified hardware with .125 inch thick aluminum.
- F. Foam-in-place core after the door is completely assembled.
- G. Manufacture doors with cutouts for required vision lites. Provide screw-applied aluminum stops to match perimeter door rails.

2.4 FRAMES

- A. Standard Frame: Provide tubular extruded aluminum frame members, 2 by 4-1/2 inch in size unless otherwise indicated on drawings, with minimum 1/8 inch thick walls and closed back. Fabricate with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts. Supply with 1/2 by 1-1/4 inch door stop, with heavy duty weathering pile included.

1. Provide Tube Frame with Applied Stops, Model SL-245, by Special Lite, or equivalent.
2. Finish: Clear anodized.

2.5 HARDWARE

- A. Hardware is specified in Section 087100.

2.6 FABRICATION

- A. Factory-prefit and premachine doors for all hardware and to fit frame opening sizes indicated with the following uniform clearances and bevels:
 1. Clearances: Not more than 1/8 inch at jambs and heads except between pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.
 2. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
 3. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.
- B. Complete fabrication, assembly, installation of hardware, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation. Field stick framing is not acceptable.
- C. Factory install vision lites and panels.
- D. Install hinges and all other hardware, with the exception of any surface-applied hardware such as door closer and locksets or push/pull hardware, at the manufacturer's plant.
 1. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.
- E. Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator to prevent corrosion.
- F. Maintain accurate relation of planes and angles, hairline fit contacting members.
- G. Conceal fasteners where possible provide countersunk flat or oval heads for exposed screws and bolts.

2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other

components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of polyester faced doors. Correct unsatisfactory conditions before proceeding with the installation.
- B. Examine door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing FRP doors and aluminum framing systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints.
- B. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- D. Install doors and frames plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

2. Install frames with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'- 4" on jamb members, and one additional anchor for each 12 inches over that height.
- E. Construction Tolerances: Install doors and frames to comply with the following tolerances:
1. Variation from Plane: Do not exceed 1/16 inch in 12 feet of length or 1/8 inch in any total length.
 2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
 3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- F. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
 2. Paint dissimilar metals where drainage from them passes over aluminum.
 3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
 4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant.
- G. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible. Refer to Section 087100 for additional installation requirements.
- H. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.
- 3.3 ADJUSTING, CLEANING AND PROTECTION
- A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.
 - B. Clean complete system, inside and out, promptly after installation, exercising care to avoid damage to coatings.
 - C. Institute protective measures required throughout remainder of construction period to ensure polyester faced doors will be without damage and deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 082250

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall access doors and frames for interior locations.
2. Fire-rated wall access doors and frames for interior locations
3. Ceiling access doors and frames for interior locations.
4. Fire-rated ceiling access doors and frames for interior locations.

B. Locations and Quantities of Access Doors: Not all access doors are shown on the Drawings. It is the intent of this section that access doors be provided wherever access is required for operation and maintenance of concealed equipment, dampers, valves, controls or similar devices.

C. Cylinders for access doors are specified in Division 08 Section "Door Hardware."

D. Related Requirements:

1. Division 07 Section "Roof Accessories" for roof hatches.
2. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 PRODUCTS, GENERAL

- A. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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

1. Babcock-Davis.
2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
3. Karp Associates, Inc.
4. Larsen's Manufacturing Company.
5. Milcor Inc.
6. Nystrom, Inc.

- B. Flush Access Doors, with Exposed Trim, for CMU Surfaces: Units consisting of frame with exposed trim, door, hardware, and complying with the following requirements

1. Basis-of-Design Product: Karp Model DSC-214M, Universal Flush Access Door.
2. Assembly Description: Fabricate door to fit flush to frame. Provide flange integral with frame, 3/4 inch (19 mm) wide, overlapping surrounding finished surface.
3. Locations: Provide at non-rated concrete block walls.
4. Uncoated Steel Sheet for Door: Nominal 0.074 inch (1.9 mm), 14 gage.
 - a. Finish: Factory prime.
5. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.074 inch (1.9 mm), 14 gage; No. 4 finish.
6. Frame Material: Nominal 0.060 inch (1.52 mm), 16 gage
7. Hinges: Concealed continuous piano hinge.
8. Latches: Self-latching key-operated bolt type, with interior release; for locking.

- C. Trimless, Flush Access Doors for Gypsum Board Surfaces: Units consisting of frame, concealed edge trim, door, hardware, and complying with the following requirements:

1. Basis-of-Design Product: Karp KDW for drywall
 2. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
 3. Locations: Provide at non-rated gypsum board walls and ceilings.
 4. Uncoated Steel Sheet for Door: Nominal 0.074 inch (1.9 mm), 14 gage.
 - a. Finish: Factory prime.
 5. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.074 inch (1.9 mm), 14 gage; No. 4 finish.
 6. Frame Material: Nominal 0.060 inch (1.52 mm), 16 gage.
 7. Hinges: Concealed continuous piano hinge.
 8. Latches: Self-latching key-operated bolt type, with interior release; for locking.
- D. Recessed Doors for Acoustical Ceiling Tiles: Units consisting of frame with no exposed trim, recessed door to receive tile, hardware, and complying with the following requirements.
1. Basis-of-Design Product: Karp, Model DSC-210, Recessed Acoustical Ceiling Tile Access Doors.
 2. Locations: Provide at non-rated acoustical ceilings tiles.
 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage thick steel sheet; recessed 1-inch (25.4 mm).
 - a. Finish: Factory prime.
 4. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Nominal 0.060 inch (1.52 mm), 16 gage; No. 4 finish.
 5. Frame Material: Nominal 0.074 inch (1.9 mm), 14 gage.
 6. Hinges: Concealed, pivoting-rod type.
 7. Latches: Self-latching key-operated bolt type, with interior release; for locking.
- E. Insulated, Fire-Rated Access Doors for Drywall Walls and Ceilings: Units consisting of frame with gypsum board bead concealed edge trim, self-latching insulated door, and hardware, and complying with the following requirements:
1. Basis-of-Design Product: Karp, Model KRP-350FR, Insulated Fire Rated Access Door, with Drywall Bead, for Walls and Ceilings.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release.
 3. Locations: Provide at rated gypsum board walls and ceilings.
 4. Fire-Resistance Ratings:
 - a. Walls: 1-1/2 hours.
 - b. Ceilings: 3 hours.
 5. Uncoated Steel Sheet for Door: 20 ga., 0.0359-inch- (0.91-mm-) thick steel sheet, welded pan type, filled with 2-inch (50 mm) thick fire-rated mineral-fiber insulation.
 - a. Finish: Factory prime.
 6. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Same gage and style as steel door; with No. 4 finish.

7. Frame Material: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet, 1-inch (25.4 mm) wide, surrounded by galvanized drywall bead.
 8. Hinges: Concealed continuous piano hinge.
 9. Hardware: Self-latching key-operated bolt type, with interior release; for locking.
- F. Insulated, Fire-Rated Access Doors for CMU Walls: Units consisting of frame with exposed edge trim, self-latching insulated door, and hardware, and complying with the following requirements:
1. Basis-of-Design Product: Karp, Model KRP-150FR, Insulated Fire Rated Access Door, with Exposed Flange, for Walls and Ceilings.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide flange integral with frame, 1 inch (25 mm) wide, overlapping surrounding finished surface. Provide self-latching door with automatic closer and interior latch release.
 3. Locations: Provide at rated concrete block walls.
 4. Fire-Resistance Ratings:
 - a. Walls: 1-1/2 hours.
 5. Uncoated Steel Sheet for Door: 20 ga., 0.0359-inch- (0.91-mm-) thick steel sheet, welded pan type, filled with 2-inch (50 mm) thick fire-rated mineral-fiber insulation.
 - a. Finish: Factory prime.
 6. Stainless-Steel Sheet for Door for Toilet Rooms, Shower Rooms, and Other Wet Areas: Same gage and style as steel door; with No. 4 finish.
 7. Frame Material: 16 ga., 0.0598-inch- (1.52-mm-) thick steel sheet, 1-inch (25.4 mm) wide exposed trim.
 8. Hinges: Concealed continuous piano hinge.
 9. Hardware: Self-latching key-operated bolt type, with interior release; for locking.
- G. Hardware:
1. Lock: Cylinder, keyed alike for project
 2. Lock for Fire Rated Access Doors: Rim cylinder.
 - 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. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
- E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- F. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- G. Frame Anchors: Same type as door face.
- H. 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. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 - 3. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 4. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. Non-Rated Doors: For cylinder locks, furnish two keys per lock and key all locks alike.
 - 2. Fire-Rated Doors: Cylinder and keys are specified in Section 087100 "Door Hardware."

2.6 FINISHES

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

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 - 1. Factory Prime: Apply manufacturer's standard, VOC-free, electrostatic-applied powder coat finish immediately after surface preparation and pretreatment.
- E. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.
- F. Aluminum Finishes:
 - 1. Mill finish and factory primed, as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083326 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of overhead coiling doors:
 - 1. Insulated service doors, motor operated.
 - 2. Insulated service door, manual operation.
- B. Related Sections include the following:
 - 1. Division 26 Sections for disconnect switches and circuit breakers for powered operators.

1.2 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and stresses without evidencing permanent deformation of door components.
 - 1. Exterior Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
- B. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 100,000 cycles.
- C. Air Infiltration Performance: Provide overhead coiling doors with maximum air infiltration rate of 1.0 CFM/SQ FT when tested in accordance with NFRC 400 or with ASTM E283 at 1.57psf.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
 - 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 - 2. Summary of forces and loads on walls and jambs.

3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
 - B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
 1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
 - C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes
- 1.5 INFORMATIONAL SUBMITTALS
- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.
 - B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
 1. Obtain operators and controls from the overhead coiling door manufacturer.
 - C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
- 1.7 WARRANTY
- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, for the following period:
 1. Door Assemblies: Two years.
 2. Motors: One year

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Provide specified products of Cornell Iron Works Inc. or equal from one of the following manufacturers:
1. The Cookson Company.
 2. Raynor Garage Doors
 3. Pacific Rolling Door Co.
 4. Overhead Door Corporation.
 5. Wayne-Dalton Corp.
 6. Windsor Door; A United Dominion Company.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Basis of Design Product: Thermiser Insulated Rolling Door Model ESD20 by Cornell in aluminum, or equal.
- B. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Aluminum Door Curtain Slats: Double skin interlocking roll formed interior and exterior metal slats with foamed-in-place insulation between slats.
 - a. Profile: Manufacturer's standard flat-profile slats
 - b. Thickness: Minimum .050".
 - c. Insulation: 7/8" thick closed cell pressure foamed in place urethane insulation, Min R value of 8. Foam shall meet the following criteria:
 - 1) Flame Spread Index of 0
 - 2) Smoke Developed Index of 10 as tested per ASTM E84
 - 3) CFC-free process with an Ozone Depletion Potential rating of 0
 - 4) Meets foam plastic insulation requirements of the 2012 IBC®, section 2603.
 - d. Finish: Three-Coat PVDF.
- C. Service Door Windlocks and Endlocks: Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement
- D. Service Door Bottom Bar: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick, either galvanized or stainless-steel extrusions to suit type of curtain slats.
- E. Service Door Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch-(5-mm-) thick, galvanized steel sections complying with ASTM A 36 (ASTM A 36M), and ASTM A 123. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain and a continuous bar for holding windlocks.

- F. Pass Doors: Provide hollow metal man door and hinged frame integrated into the curtain of the door, in size as indicated on Drawings. Provide in color as selected by Architect.

2.3 HOODS AND ACCESSORIES

- A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
- B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of hood.
 - 1. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.
- C. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
 - 1. Locking Bars: Single-jamb side, operable from inside only.
 - 2. Provide lock cylinder to match cylinders and keying of building as specified in Division 08 Section "Door Hardware."

2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment

accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

- D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

2.5 MANUAL DOOR OPERATORS

- A. Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist shall include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.
 - 1. Basis of Design Product: ControlGard by Cornell or equal.
 - 2. Location: Provide for basement areaway location.

2.6 MOTOR DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
 - 3. Cycle Requirements: Maximum 20 times per day.
 - 4. Location: Provide for East Facade and Gym locations.
- B. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- C. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- D. Motor-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft-type door operator unit consisting of electric motor, enclosed lubricated gear drive, and chain and sprocket secondary drive.
- E. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to

start, accelerate, and operate door in either direction from any position, at not less than 6 in/sec (15 cm/s) and not more than 9 in/sec (23 cm/s), without exceeding nameplate ratings or service factor.

1. Electrical Characteristics: Polyphase, 120V, 60Hz. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
2. Provide motor rating (hp) as recommended by manufacturer for size and type of door.

F. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

G. Remote-Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation by use of disconnect cable for auxiliary push-up operation.

I. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

1. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Provide electrically actuated automatic bottom bar.

2.7 FINISHES, GENERAL

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

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

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

- B. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: As selected by Architect from industry custom or standard full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

3.4 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.

3. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 083326

SECTION 083329 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
2. Division 26 Section "Conductors and Cables" for electrical service and connections for powered operators, and accessories.
3. Division 26 Section "Disconnect Switches and Circuit Breakers" for disconnect switches and circuit breakers for powered operators

1.2 PERFORMANCE REQUIREMENTS

- A. Operation Cycles: Provide overhead coiling grille components and operators capable of operating for not less than number of cycles indicated for each grille. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by grille manufacturer and those provided by others

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling grilles through one source from a single manufacturer.
 - 1. Obtain operators and controls from the overhead coiling grille manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- D. 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.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace grilles that are defective in materials or workmanship, for the following period:
 - 1. Grille Assemblies: Two years.
 - 2. Motors: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Overhead coiling grilles by Cornell Iron Works, Inc. have been used as the Basis of Design. Provide Basis of Design Product or equal product by one of the following:
 - 1. McKeon, Inc.
 - 2. Raynor.
 - 3. Windsor Door.

2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.
 - 1. Grille Curtain: Type 304 stainless steel.
- B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.
- C. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, finished to match grille.
- D. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.3 HOODS AND ACCESSORIES

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Hood Material: Type 304 stainless steel.
- B. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A 36/A 36M structural-steel tubes or shapes, hot-dip galvanized per ASTM A 123/A 123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.
 - 1. Provide pull-down straps or pole hooks for grilles more than 84 inches (2130 mm) high.

2.4 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Locking Bars: Both jambs, operable from both sides of curtain.
 - 2. Provide cylinder with construction core, Owner will provide final core. Comply with requirements specified in Division 08 Section "Door Hardware."

- B. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC GRILLE OPERATORS

- A. Provide electric operators for coiling grilles where scheduled.
- B. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
 - 3. Cycle Requirements: Maximum 20 times per day.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

- E. Grille-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft-type grille operator unit consisting of electric motor, enclosed lubricated gear drive, and chain and sprocket secondary drive.
 - F. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate grille in either direction from any position, at not less than 6 in/sec (15 cm/s) and not more than 9 in/sec (23 cm/s), without exceeding nameplate ratings or service factor.
 - 1. Electrical Characteristics: Polyphase, 120V, 60Hz. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
 - 2. Provide motor rating (hp) as recommended by manufacturer for size and type of grille.
 - G. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
 - H. Remote-Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - I. Emergency Manual Operation: Equip each electrically powered grille with capability for emergency manual operation by use of disconnect cable for auxiliary push-up operation.
 - J. Obstruction Detection Device: Provide each motorized grille with indicated external automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.
 - 1. Sensor Edge: Provide each motorized grille with an automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor immediately stops and reverses downward grille travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Provide electrically actuated automatic bottom bar.
- 2.7 OPEN-CURTAIN GRILLE ASSEMBLY
- A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical chains or spacers.
 - 1. Grille Curtain Material: Stainless steel.
 - 2. Grille Curtain Design: Straight, V3 Pattern (3" spacing)
 - a. Horizontal Rods: Solid 5/16 inch diameter stainless rods spaced 2 inches o.c. vertically

- b. Vertical Chains: Grommetted stainless steel llinks, 3/4 inch wide, positioned by E-rings on 3 inch centers. Provide double E-rings on horizontal bars on both sides of end chains to retain curtain in guides.
 - 3. Finish: #4 brushed finish.
 - 4. Basis-of-Design Product: Provide Visionaire Model ESG10 Straight Pattern Grille manufactured by Cornell Iron Works, Inc., or equal.
 - B. Curtain Jamb Guides, Between the Jambs Mounted: Heavy duty extruded stainless steel sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide hardware as recommended by manufacturer to support grille.
 - 1. Finish: Match curtain
 - C. Hood: Match curtain material and finish
 - 1. Mounting: As shown on Drawings.
 - D. Locking Devices: Equip grille with locking device assembly
 - 1. Locking Device Assembly Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders
 - E. Grille Operator: Motorized
- 2.8 GENERAL FINISH REQUIREMENTS
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - B. 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.
- 2.9 STAINLESS STEEL FINISHES
- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles, hoods, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that grilles operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.4 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
 - 3. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 083329

SECTION 083450 - ELEVATOR DOOR SMOKE CONTAINMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes smoke detector activated elevator door smoke containment curtain and control system designed to provide a tight- fitting, smoke- and draft- control assembly.
- B. Related Sections include the following:
 - 1. Division 14 Section "Hydraulic Elevators" for coordination with the door opening.
 - 2. Division 26 Electrical Sections for 120v and control circuit power including conduit, boxes, conductors, wiring devices, and emergency power.
- C. Products Supplied but Not Installed under this Section:
 - 1. 10K ohm Resistor.

1.2 PERFORMANCE REQUIREMENTS

- A. Air Leakage: Less than 3 cfm (0.001416 cm/s) per sf of door opening at 0.1 in. (25 Pa) water pressure differential at ambient temperature and 400 deg. F (204 deg. C) tested per IBC 714.2.3

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include door width and height, jamb width, jamb and head projection, curtain width, mounting height, housing width, and motor locations. Show and identify related work performed under other Sections of these Specifications.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Product Certificates: For each elevator door smoke containment system, signed by product manufacturer.
- E. Qualification Data: For Manufacturer and Installer.
- F. Product Test Reports: Based on evaluation of manufacturer's tests performed by a qualified testing agency, for each elevator door smoke containment system.
- G. Maintenance Data: For elevator door smoke containment systems to include in operation and maintenance manuals.

- H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Standards: Manufacturer shall maintain a quality control program in accordance with ICBO-ES Acceptance Criteria AC 77.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of systems for this Project.
- C. Manufacturer's Qualifications: Minimum five (5) years experience in producing smoke containment systems of the type specified.
- D. Source Limitations: Obtain all components of elevator door smoke containment system, including operators and controls, through one source from a single manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
- F. Certifications:
 - 1. Manufacturer's ICBO Evaluation Report.
 - 2. Testing Laboratory Label.
 - 3. UL Listing.

1.5 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of elevator door smoke containment systems that fail in materials or workmanship within specified warranty period.
 - 1. Failure include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Faulty operation of operators and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: One (1) year from date of Substantial Completion.

1.6 OWNER'S INSTRUCTIONS

- A. Maintenance and Testing:
 - 1. Perform minimum semi-annual maintenance and testing on each smoke containment system as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
 - 2. Backup Battery: Test semi-annually and replace every three (3) years.
 - 3. Retain permanent record of tests.

- B. Required Replacement: Smoke containment screen requires replacement following exposure to temperatures exceeding 200 degrees F (93 degrees C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for the elevator door smoke containment systems is based on Model 600 manufactured by Smoke Guard Corporation. Subject to compliance with requirements, provide the named product or an approved equivalent product.

2.2 COMPONENTS

- A. Curtain:
 - 1. Film: Minimum 1 mil (0.025 mm) thick transparent polyamide film reinforced with 100 denier nomex yarn at 0.25 in. (6.35 mm) each way.
 - 2. Magnetic Strips: Flexible multi-pole strips attached to longitudinal edges of film with low modulus silicone adhesive.
- B. Housing: 20-gage stainless steel container and door with concealed hinges, and latch.
- C. Auxiliary Rails:
 - 1. Material: 16-gage, ASTM A 240/240M, Type 430, ferritic stainless steel.
 - 2. Size: 2-inch (50 mm) wide by depth required to project beyond face of elevator door frame, unless otherwise indicated.
- D. Rewind Motor: Top mount, NFPA 70, 12v DC.
- E. Release Mechanism: Comply with UL Standard No. 508 or 864.
- F. Control Station: Metal box with battery backup, power disconnect with integral circuit breaker, step down power transformer (120v AC to 12v DC), and controller circuit board.
 - 1. Emergency Power Supply: 12v DC battery with charger.
- G. Wall Switch: Provide switch to rewind curtain into housing, system status indicators, keyed curtain deployment switch, and keyed to silence function.
 - 1. Color: Selected by Architect from manufacturer's full range of colors.

2.3 IDENTIFICATION

- A. Label each smoke containment system with following information:

1. Manufacturer's name.
2. Maximum leakage rating at specified pressure and temperature conditions.
3. Label of quality control agency.

2.4 STAINLESS STEEL FINISHES

- A. General: Remove or blend stretch lines and tool and die marks into finish.
1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Satin Finish: No. 4.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, supports, and other conditions affecting performance of elevator door smoke containment systems.
1. Verify related work performed under other Sections is complete and in accordance with approved Shop Drawings.
 2. Verify wall surfaces and elevator door frames are acceptable for installation of smoke containment system components.
 3. If applicable, verify existing field painted elevator door frames to be used for curtain adherence have been repainted in accordance with smoke containment system manufacturer's instructions or they have the original factory paint.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Do not install damaged components.
- B. Install smoke containment system components plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's installation instructions, Contract Drawings, and approved Shop Drawings..

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent inspecting agency to perform field tests and inspections and prepare test reports. Follow manufacturer's cycle test procedures.
1. Notify Owner's Representative, local Fire Marshal, alarm sub-contractor and

elevator service company minimum one (1) week in advance of scheduled testing.

2. Complete maintenance service record.

- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and adjust operating hardware items just before final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including defective or damaged curtains, housings, rails, bases, and frames that are warped, bowed, or otherwise unacceptable.
- C. Clean all surfaces promptly after installation. Remove excess sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

3.5 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. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Test elevator door smoke containment system closing mechanism activated by detector or alarm-connected fire-release system. Reset elevator door smoke containment system closing mechanism after successful test.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain elevator door smoke containment systems.

END OF SECTION 083450

SECTION 084113 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior and interior storefront systems.
2. Exterior and interior entrance systems including manual-swing aluminum doors and door frames.
3. Operable vents, including rescue windows, installed in storefront framing system.
4. Sunshades installed in storefront framing system.

B. Related sections include the following:

1. Division 07 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
2. Division 08 Section "Door Hardware."
3. Division 08 Section "Glazing."

1.2 DEFINITIONS

A. Rescue (emergency-access/egress) windows are side-hinged, single hung or sliding units that provide emergency exit

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

- E. Qualification Data: For Installer
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems
- G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- B. Source Limitations: Obtain all entrance and storefront systems, curtain wall framing, aluminum doors, sunshades, and operable vent windows for the entire project through one source and from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 for substitutions.
 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."
- E. Mockups: Prior to installing aluminum entrances and storefront system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.

1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Include vent windows and glazing in mock-up.
3. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before start of Work.
6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to glazed aluminum curtain wall system including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
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 required inspecting, testing, and certifying procedures.
4. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
5. Review requirements for coordinating installation of aluminum entrances and storefront framing with installation of electrical wiring and electrified hardware concealed in framing members

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Warranty Period for Framing: 3 years from date of Substantial Completion.
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Failure of system to meet performance requirements.

- c. Failure of operating components to function normally.
 - d. Water leakage through fixed glazing and frame areas.
2. Warranty Period for Finishes: 20 years from date of Substantial Completion.
 - a. Deterioration of metal finishes beyond normal weathering.
3. Warranty Period for Doors: 2 years from date of Substantial Completion.
4. Warranty Period for Operable Vents: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 1. Structural loads.
 2. Thermal movements.
 3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 4. Dimensional tolerances of building frame and other adjacent construction.
 5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.
- B. Structural Loads:
 1. Wind Loads: Resist wind positive and negative pressures calculated according to International Building Code and Building Code of New York State, Section 1609:
 - a. Exterior Wind Loading Code Criteria: As indicated on Structural Drawings.
 - b. Interior Wind Loads: 5 psf
- C. Deflection of Framing Members:
 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 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 directly below to less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below to less than 1/16 inch (1.5 mm).

- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. Air Infiltration:
1. Storefront and Entrance Fixed Framing: When tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa) air leakage rate shall not exceed 0.06 cfm/sq. ft.
 2. Doors: When tested in accordance with ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. air leakage rate shall not exceed 1.0 cfm/lin. ft. of perimeter crack for single (3'-0" x 7'-0") door and pair of doors (6'-0" x 7'-0"),
 3. Operable Vents: When tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa) air leakage rate shall not exceed 0.01 cfm/sq. ft.
- G. Water Penetration Under Static Pressure:
1. Storefront and Entrance Fixed Framing: When tested according to ASTM E 331, there shall be no leakage at a static-air-pressure differential of 10 psf as defined in AAMA 501.
 2. Operable Vents: When tested according to ASTM E 331 and ASTM E547, there shall be no leakage as defined in the test method at a static-air-pressure differential of 12 psf .
- H. Condensation Resistance: When tested according to AAMA 1503 the CRF shall be not less than the following:
1. Storefront and Entrance Framing: 69 (frame) and 70 (glass).
 2. Operable Vents: 73 (frame) and 60 (glass)
 3. Doors: 49 (frame) and 68 (glass)

- I. Average Thermal Conductance: When tested according to AAMA 507 or NFRC 100 the overall U-factor (project specific) shall be no more than the following:
 - 1. Storefront and Entrance Framing: 0.37
 - 2. Operable Vents: 0.38
 - 3. Doors: 0.53
- J. Window Performance Class and Grade: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440 Performance Class and Grade AW-PG90-C. Window units shall successfully pass life-cycle test requirements specified in AAMA 910.

2.2 MANUFACTURERS

- A. Manufacturers: Provide specified products of Kawneer Company, Inc., an Arconic Company or equivalent products by one of the following:
 - 1. EFCO Corporation.
 - 2. YKK AP America Inc.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 - 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.
- C. Glazing as specified in Division 08 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

- G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 07 Section "Joint Sealants."
- H. 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.
- I. Emergency Rescue Labels: 3 inch tall by 5 inch wide decal with bright yellow background, and black letters (Helvetica Medium type), with the following words: RESCUE WINDOW, centered on decal.
 - 1. Provide all designated rescue windows with a permanent decal located on the sash (centered at bottom of lower sash or window) readable from both sides.

2.4 COMPONENTS

- A. Exterior and Interior Storefront and Entrance Framing Members (4-1/2" Deep): Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads. Provide outside captured pressure-plate type framing system, center glazed.
 - 1. Thermal-Break Construction: Kawneer DUAL Isolock™ Thermal Break with two (2) 1/4" (6.4 mm) separations consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505 .
 - 2. Aluminum vertical and horizontal main frame extrusions shall have a minimum wall thickness of .070.
 - 3. Provide entrance framing members compatible with glass framing in appearance and provide single acting entrance frames with positive barrier weathering
 - 4. Provide heavy wall entrance door frames as required to support 2-1/4" heavy wall doors.
 - 5. Dimensions of Framing Members: Provide framing with vertical and horizontal framing members having a nominal face dimension of 2 inches and overall depth of 4-1/2 inches.
 - 6. Finish: Three-Coat PVDF
 - 7. Basis of Design Products: Provide Trifab 451UT by Kawneer Company, Inc., an Arconic Company or equal products of one of the following:
 - a. EFCO Corp.
 - b. Tubelite Inc.
 - 8. Location: Where indicated on the Drawings.
- B. Doors: Manufacturer's standard thermally broken glazed doors, for manual swing operation.
 - 1. Door Construction: 2-1/4 inch overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.

2. Thermal Break: Thermal break shall be IsoPour™ utilizing two continuous rows of polypropylene with a nominal 7/32" (5.5 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum at door rails and stiles.
 3. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets. Provide nonremovable glazing stops on outside of door. Glazing moldings shall be minimum .05" thick.
 4. Door Design: Wide stile; 5 inches wide.
 - a. Top Rail: 5 inches wide.
 - b. Mid Rail (Where indicated): 5 inches wide.
 - c. Bottom Rail: 10 inches wide
 5. Finish: Three-Coat PVDF.
 6. Basis of Design Product: Provide 500T Insulpour Thermal Entrance Doors by Kawneer Company, Inc., an Arconic Company or equal products of one of the following:
 - a. EFCO Corp.
 - b. YKK
- C. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
1. Provide all required accessories (fasteners, clips, brackets, supports, etc.) required for adjustment and installation as required by field conditions.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Reinforce members as required to retain fastener threads.
 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
 3. Provide all required accessories (fasteners, clips, brackets, supports, etc.) required for adjustment and installation as required by field conditions.
- E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
- G. Weather Stripping: Manufacturer's standard replaceable weather compression weather stripping of molded PVC complying with ASTM D 2287 requirements.
- H. Insulating Materials: Provide fiberglass batts for stuffing in openings and cracks.
- 2.5 DOOR HARDWARE

- A. General: Provide hardware units indicated below in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated. All hardware shall be ADA compliant.
- B. Thresholds: At exterior doors, provide manufacturer's standard thermally broken threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than 1/2-inch- (12.7-mm-) high, with beveled edges providing a floor level change with a slope of not more than 1:2, and in the following material:
 - 1. Material: Aluminum, bronze or clear finish to match doors and frames.
- C. Weather Stripping: Provide 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, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- D. Weather Sweeps: Provide manufacturer's standard weather sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.
- E. Remainder of hardware is specified in Section 087100.

2.6 SUNSHADE

- A. General: Projected, louvered sunshade fabricated from aluminum extrusions compatible with aluminum storefront framing system.
 - 1. Components: Square outrigger, rectangular fascia and square blades.
 - 2. Depth: As indicated on Drawings.
 - 3. Finish: Match storefront framing.
 - 4. Basis of Design Product: Versoleil SunShade by Kawneer Company, Inc., an Arconic Company or equal products of one of the following:
 - a. EFCO Corp.
 - b. Tubelite Inc.
- B. Support Design: Outrigger support bracket mechanically fastened to face of storefront framing pressure cap.

2.7 PROJECTED WINDOWS

- A. Basis of Design Product: Provide GLASSvent UT Windows, Outswing Casement by Kawneer or equal.
- B. Rescue Windows: Fabricate all window units designated as "Rescue" windows on drawings to comply with local and state codes for emergency egress windows. Provide a minimum clear opening of 6 square feet, with minimum 24" clearance for opening width and height. Rescue window maximum 54" to operating hardware.

- C. Provide outswing casement windows designed for insertion in storefront framing with minimal sightlines and interior face of the intermediate mullion in alignment and flush with storefront horizontal.
- D. Hardware: Provide the following equipment and operating hardware:
1. Hinges: Concealed stainless steel heavy-duty 4-bar friction hinges with adjustable slide shoe (2 per ventilator); *Truth Series 301*.
 2. Lock: Three Cam-action, sweep lock handles with surface-mounted strike.
 3. Limit Device: Stay bar with adjustable hold-open device.
 4. Screen Hinge: Continuous stainless steel.
 5. Screen Latch: Cast aluminum, operable from interior or exterior.
- E. Fabrication: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide interior aluminum frame adapter of mitered and screw splined that is attached to the storefront framing with concealed fasteners, with tubular vent frame with screw splined corners construction, containing three sided concealed structural silicone glazed system with fourth side exposed structural glazed silicone that does not add to the exterior sightlines of the storefront framing, with bulb and fin type weather stripping that is mounted to extrusions that fits into the storefront framing glass pocket.
- F. Depth: 4-3/8 inches.
- G. Finish: Kawneer Permafluor (70% PVDF) Fluoropolymer coating meeting AAMA 2605, or equal, in Charcoal UC109852.
- H. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier, located between exterior materials and window members exposed on interior, in a manner that eliminates direct metal-to-metal contact.
1. Provide exterior glazed units with minimal or no aluminum exposed to the exterior or poured-in-place two part polyurethane thermal-break construction that has been in use for not less than three (3) years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention and compliance with the CRF indicated in Part 1, Article Performance Requirements.
 2. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior. Pressure equalized each vent utilizing two rows of weather-stripping installed in specifically designed dovetail grooves in the extrusion, omit on bottom of vent to allow pressure equalization and drainage.
 3. Subframes Frames: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.125-inch- thick extruded aluminum. Cope and screw spline corners.
 4. Vent Frames: Provide vents of tubular extrusions of profile and dimensions indicated but not less than 0.156-inch- thick extruded aluminum. Miter corners, angle reinforce, crimp cold, epoxy weld, seal and dress smooth with concealed mechanical joint fasteners.

- I. Preglazed Fabrication: Preglaze projected window units at the factory. Comply with glass and glazing requirements of Division 08 Section "Glazing" of these Specifications and AAMA 101.
 - 1. Glaze all units with four-sided structural glazed silicone. Only factory glazing of the structural silicone shall be acceptable..
 - 2. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 3. Install structural silicone sealant according to sealant manufacturer's written instructions.
 - 4. Mechanically fasten glazing in place until structural sealant is cured.
 - 5. Remove excess sealant from component surfaces before sealant has cured.
 - 6. Absolutely no field application of structural sealant for operable units is permitted.

- J. Insect Screens: Provide insect screens for each operable exterior ventilator. Locate screens on the inside of the window sash or ventilator. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches.
 - 1. Wickets: Provide full height screen hinged-type wickets, framed and trimmed for a tight fit and durability during handling. Provide continuous full side hinge screens. Mount continuous hinge to screen frame and window frame, so that hinge leaves are concealed, when viewed from exterior and interior. Provide appropriate size hinge leaf width to facilitate maintenance re-screening. Hinge length to be flush with top and bottom of screen frame. Provide one latch, which matches hinge finish, at mid span of each screen.
 - 2. Screen Frames: Fabricate frames of tubular-shaped extruded aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.
 - a. Provide removable extruded PVC spline-anchor concealing the edge of the screen frame

2.8 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.

- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

- C. Prepare components to receive concealed fasteners and anchor and connection devices.

- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
- G. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Storefront: Fabricate framing in profiles indicated. Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- I. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 1. Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior door bottom rail, provide an EPDM blade gasket sweep strip applied with concealed fasteners.
 - 3. Install door hinges at factory; field apply other hardware not supplied with the door and frame assemblies.
- J. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site. Refer to Division 08 Section "Door Hardware" for additional hardware installation requirements.
 - 3. Preglaze doors but do not preglaze framing system. Refer to Division 08 Section "Glazing" for specifications.
- K. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.

1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.
 - L. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.
 - M. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.
 - N. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.
 - O. Fasteners: Conceal fasteners wherever possible.
- 2.9 ALUMINUM FINISHES
- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
 - B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
 - C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
 - D. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Color and Gloss: Kawneer Permafluor Charcoal UC109852.

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 entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
 - 1. Install sill flashings with allowance for expansion and contraction at 12 feet on center. Seal expansion joint with manufacturer's recommended pliable sealing tape.
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 08 Section "Glazing," unless otherwise indicated.
- H. Install windows in storefront framing in compliance with manufacturer's directions and approved shop drawings.
- I. Install sunshade in storefront framing in compliance with manufacturer's directions and approved shop drawings.
- J. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.
- K. Install insulation materials in locations indicated, and at head and jamb of storefront system stuffed into openings, held above sill 1 inch (25 mm).
- L. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

3.5 HARDWARE SCHEDULE - Refer to Section 087100

END OF SECTION 084113

SECTION 084133 - FOLDING GLASS STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior folding glass storefront system.

B. Related sections include the following:

1. Division 07 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
2. Division 08 Section "Door Hardware."
3. Division 08 Section "Glazing."

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.

B. Structural Loads:

1. Wind Loads: Resist wind positive and negative pressures calculated according to International Building Code and Building Code of New York:
 - a. Exterior Wind Loading Code Criteria: As indicated on Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 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 directly below to less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below to less than 1/16 inch (1.5 mm).
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.29 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 5.5 psf for insulating glass framing.
1. Maximum Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
- H. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-factor of not more than 0.30 when tested according to AAMA 1503.
- I. Glass Acoustical Performance: System STC 33 and OITC 27 with 15/16 inch double IGU, 4mm and 4mm STC 32 tempered glass.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 - 3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Qualification Data: For Installer
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems
- G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
 - 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other

manufacturers' systems with equal performance characteristics may be considered. Refer to Division 01 for substitutions.

1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glass panel panel partitions that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of glass panel panel partitions.
 - b. Deterioration of glazing, metals, metal finishes, and other materials beyond normal wear.
 2. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Basis of Design Product: Provide NanaWall SL70 by Nana Wall Systems, Inc., or equal.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
 5. Welding Rods and Bare Electrodes: AWS A5.10.
- B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

- C. Glazing: Fully tempered safety glazing meeting ANSI Z97.1 and CPSC 16CFR 1201, total 15/16" thick double IGU, lowE coated, and argon filled; refer to Division 08 Section "Glazing" for specifications.
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 07 Section "Joint Sealants."
- H. 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.

2.3 COMPONENTS

- A. Monumental Thermally Broken Aluminum Framed Folding Glass Storefront Description: Floor-track supported designed for angle changes, segmented curves. Manufacturer's standard or post reinforced frame and panel profiles, with top track, side jambs and panels with dimensions as shown on Drawings.
 - 1. Panels: Single lite.
 - 2. Rail Depth: 2-3/4 inches
 - 3. Top Rail and Stile Width: 2-1/4 inches
 - 4. Bottom Rail Width: 2-1/4 inch except 10" at swinging.
 - 5. Frame: Matching top track and side jambs
 - a. Top Track and Side Jambs Width: 2-9/16 inch
 - b. Top Track and Side Jambs Depth: 3-1/8 inch (80 mm)
 - 6. Sill: Low profile saddle sill (thermally broken) in clear anodized finish.
 - a. Provide gasket to cover the channel in the sill at swing doors for ADA compliance.
 - 7. Thickness of Aluminum Extrusions: 0.078 inch.
 - 8. Thermal-Break Construction: 3/4 to 15/16 inch wide polyamide plastic reinforced with glass fibers. Thinner or poured and de-bridged type thermal breaks not acceptable .
 - 9. System Configuration: Inward folding, 3 panels, with one outswing door.
 - 10. Panel Size: As indicated on Drawings

- B. Sliding/Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware with top and bottom tracks and threshold. All running carriages to be with sealed, self-lubrication, ball bearing multi-rollers. Surface mounted hinges and running carriages not acceptable.
1. Lower Running Carriage Carrying Capacity: 440 lbs. (200 kgs)
 2. Upper guide carriage and lower running carriage provided with four vertical stainless-steel wheels and two horizontal polyamide wheels.
 3. Vertical wheels to ride on top of stainless-steel guide track covers over the full length of the sill track and lie above the water run-off level.
 4. Swing Panel Hinges: Zinc die cast with finish closest match to finish of frame and panels and stainless-steel security hinge pins with set-screws.
 5. Adjustment: Provide folding-sliding hardware capable of compensation and adjustments without needing to remove panels from tracks, in width, 1/16 inch (1.5 mm) per hinge and in height, 5/64 inch (2 mm) up and down.
- C. Weatherstripping: Manufacturer's double layer EPDM between panels, EPDM gasket and Q-lon gasket, or brush seal between panel and frame, or brush seals with a two-layer fiberglass reinforced polyamide fin attached at both inner and outer edge of bottom of door panels with a recessed sill or on frame for sealing between panels and between panel and frame.
- D. Locking Hardware and Handles:
1. Main Entry Panel(s) for Models WITH a Swing Panel: Provide manufacturer's standard lever handles on the inside and outside, and a lockset with a lockable latch, and multi-point locking with a dead bolt and rods at the top and bottom on primary panel.
 - a. Rods to be concealed and not edge mounted.
 - b. After turn of key or thumbturn, depression of handles withdraws latch.
 - c. Lifting of handles engages rods and turn of key or thumb turn engages deadbolt and operates lock.
 - d. Lever handle in brushed stainless steel finish.
 - e. Locking: Cylinder with adapter for interchangeable core, compatible with Owner's system.
 - f. Provide a panic device on the interior side of the door.
 2. Secondary Panels and Pairs of Folding Panels: Provide manufacturer's flat handles and concealed one or two-point locking hardware operated by 180° turn of handle between each pair. Face applied flush bolt locking not acceptable.
 - a. Flat handle in brushed stainless steel finish.
 3. Handle Height: 41-3/8 inch (105 cm) centered from bottom of panel or as otherwise indicated.
 4. Aluminum locking rods with standard fiberglass reinforced polyamide end caps at the top and bottom. Rods to have a stroke of 15/16 inch (24 mm).
 5. Additional profile cylinders to be keyed alike.

- E. Fasteners: Tapered pins or stainless steel screws for connecting frame components.
- F. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
- H. Insulating Materials: Provide fiberglass batts for stuffing in openings and cracks.

2.4 FABRICATION

- A. Folding Glass Wall: Extruded aluminum frame and panel profiles, corner connectors and hinges, sliding and folding hardware, locking hardware and handles, glass and glazing and weatherstripping components needed to construct a folding glass wall.
 - 1. Each unit factory pre-assembled and shipped with complete system components and installation instructions.
 - 2. Exposed work to be carefully matched to produce continuity of line and design with all joints.
 - 3. No raw edges visible at joints
- B. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- C. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- D. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
- E. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes
- D. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: Kawneer Permafluor Charcoal UC109852.

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 entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 07 Section "Joint Sealants."
 - 1. Install sill flashings with allowance for expansion and contraction at 12 feet on center. Seal expansion joint with manufacturer's recommended pliable sealing tape.
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Lubricate operating hardware and other moving parts according to manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install perimeter sealant to comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.
- H. Install insulation materials in locations indicated, and at head and jamb of storefront system stuffed into openings, held above sill 1 inch (25 mm).
- I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
 2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084133

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Glazed aluminum curtain wall, captured 4 sides.
 - 2. Operable vents, including rescue windows, installed in curtainwall framing system.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 07 Section "Joint Sealants" for joint sealants installed as part of glazed aluminum curtain wall system.
 - 2. Division 08 Section "Glazing."

1.2 DEFINITIONS

- A. Rescue (emergency-access/egress) windows are side-hinged, single hung or sliding units that provide emergency exit

1.3 ACTION SUBMITTALS

- A. Product Data for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain-wall systems.
 - 1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 - 2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
- C. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Cutaway Sample of each vertical-to-horizontal intersection of system, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Installer.
2. For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

B. 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 from a qualified independent testing agency evidencing compliance of glazed aluminum curtain wall system with requirements based on comprehensive testing of manufacturer's current system.

D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.

E. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of glazed aluminum curtain wall systems that are similar to those indicated for this Project in material, design, and extent.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

C. Source Limitations: Obtain glazed aluminum curtain wall system, aluminum-framed entrances and storefronts, glass vent windows, and aluminum-framed entrance doors and framing from one source and by a single manufacturer for the Project.

D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.
- E. Mockups: Prior to installing glazed aluminum curtain wall system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.
1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 2. Include operable vents and glazing in mock-up.
 3. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before start of Work.
 6. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.
- F. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to glazed aluminum curtain wall system including, but not limited to, the following:
1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 2. Review structural loading limitations.
 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review required inspecting, testing, and certifying procedures.
 5. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
 6. Review requirements for coordinating installation of curtainwall framing with installation of electrical wiring and electrified hardware concealed in framing members
- 1.7 PROJECT CONDITIONS
- A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of a glazed aluminum curtain wall system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
1. Warranty Period: 10 years from date of Substantial Completion for:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Failure of system to meet specified performance requirements.
 - c. Failure of operating components to function normally.
 - d. Water leakage through fixed glazing and frame areas.
 - e. Sealant failure.
 - f. Excessive noise or vibration of system
 2. Warranty Period: 20 years from date of Substantial Completion.
 - a. Deterioration of metal finishes beyond normal weathering.
 3. Warranty Period for Operable Vents: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in "Quality Assurance" Article above, 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. Glazed aluminum curtain wall system, including anchorage, shall accommodate dimensional tolerances of building frame and other adjacent construction.
 3. 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.
- f. Sealant failure.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans of greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less, or 3/4 inches (19 mm), whichever is smaller, unless otherwise indicated.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

E. Structural: Test in accordance with ASTM E330/E330M 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. Duration: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Provide glazed aluminum curtain wall system with permanent resistance to air leakage through system of not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.2 lbf/sq. ft. (300 Pa).

1. Operable Vents: When tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa) air leakage rate shall not exceed 0.01 cfm/sq. ft.

G. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft. (20 psf for triple glazed curtainwall)

H. Thermal Movements: Provide glazed aluminum curtain wall system, including anchorage, that accommodates thermal movements of system and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without

buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- I. Condensation Resistance: Provide condensation-resistance factor (CRF) of not less than the amounts indicated below when tested according to AAMA 1503.1.
 1. Aluminum Curtain Wall System: 75 (framing) and 72 (glass.).
 2. Aluminum Curtainwall System with Triple Glazing: 80 (framing) and 80 (glass)
 3. Operable Vents: 73 (frame) and 60 (glass)
- J. Average Thermal Conductance: When tested according to AAMA 507 or NFRC 100 the overall U-factor (project specific) shall be no more than the following:
 1. Aluminum Curtain Wall System: 0.36
 2. Aluminum Curtainwall System with Triple Glazing: 0.24
 3. Operable Vents: 0.38
- K. Window Performance Class and Grade: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440 Performance Class and Grade AW-PG90-C. Window units shall successfully pass life-cycle test requirements specified in AAMA 910.

2.2 MANUFACTURERS

- A. Manufacturers: Provide specified products of Kawneer Company, Inc., an Arconic Company or equivalent products by one of the following:
 1. EFCO Corporation
 2. YKK AP America Inc.

2.3 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
- B. Steel Reinforcement: ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.
- C. Glazing as specified in Division 08 Section "Glazing."

- D. Glazing Gaskets: EPDM sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; in hardness recommended by manufacturer.
- E. Glazing sealants and fillers as specified in Division 08 Section "Glazing."
- F. Framing system gaskets and joint fillers as recommended by manufacturer for joint type.
- G. Sealants and joint fillers for joints within glazed aluminum curtain wall system as specified in Division 07 Section "Joint Sealants."
- H. Firestop materials as specified in Division 07 Section "Fire-Resistive Joint Systems."
- I. Insulating Materials: Provide fiberglass batts for stuffing in openings and cracks as specified in Division 07 Section "Thermal Insulation."
- J. Weather Stripping: Manufacturer's standard replaceable weather compression weather stripping of molded PVC complying with ASTM D 2287 requirements.
- K. 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.
- L. Emergency Rescue Labels: 3 inch tall by 5 inch wide decal with bright yellow background, and black letters (Helvetica Medium type), with the following words: RESCUE WINDOW, centered on decal.
 - 1. Provide all designated rescue windows with a permanent decal located on the sash (centered at bottom of lower sash or window) readable from both sides.

2.4 COMPONENTS

- A. Curtain Wall System: Manufacturer's standard extruded-aluminum framing members for multi-story curtainwall application of thickness required and reinforced as required to support imposed loads. Provide outside glazed system, with pressure plate, captured horizontal and vertical mullions.
 - 1. Provide mullion configuration with pockets at the inside glazing face to receive fixed resilient elastomeric glazing seal; flexible silicone-compatible elastomer thermal barrier that provides a minimum of 1/4" separation; EPDM exterior glazing seals secured by extended pressure plates fastened to tongue of back member; provisions to lead moisture accumulation to exterior at all sealed horizontals; and a cover that snaps over pressure plate to show only a sharp, uninterrupted exterior profile.
 - 2. Pressure Plate Material: Fiberglass
 - 3. Glazing Plane: Front
 - 4. Aluminum vertical and horizontal main frame extrusions shall have a minimum wall thickness of .070.

5. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
 6. Dimensions of Framing Members: Provide framing with vertical and horizontal framing members having a nominal face dimension of 2-1/2 inches, and overall depth of 6 inches and 10-1/2 inches, as indicated on Drawings.
 7. Finish: Three-Coat PVDF
 8. Basis of Design Product: Provide 4-sided captured system 1600¹ Wall System by Kawneer Company, Inc., an Arconic Company, or equal products by one of the following:
 - a. EFCO Corp
 - b. YKK
- B. Curtain Wall System for Triple Glazing Manufacturer's standard extruded-aluminum framing members for multi-story curtainwall application of thickness required and reinforced as required to support imposed loads. Provide outside glazed system, with pressure plate, captured horizontal and vertical mullions.
1. Provide mullion configuration with pockets at the inside glazing face to receive fixed resilient elastomeric glazing seal; flexible silicone-compatible elastomer thermal barrier that provides a minimum of 1/4" separation; EPDM exterior glazing seals secured by extended pressure plates fastened to tongue of back member; provisions to lead moisture accumulation to exterior at all sealed horizontals; and a cover that snaps over pressure plate to show only a sharp, uninterrupted exterior profile.
 2. Glazing Plane: Front
 3. Aluminum vertical and horizontal main frame extrusions shall have a minimum wall thickness of .070.
 4. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
 5. Dimensions of Framing Members: Provide framing with vertical and horizontal framing members having a nominal face dimension of 2 inches, and overall depth of 6-3/4 inches, as indicated on Drawings.
 6. Finish: Three-Coat PVDF
 7. Basis of Design Product: Provide 4-sided captured system 1620UT Wall System by Kawneer Company, Inc., an Arconic Company, or equal products by one of the following:
 - a. EFCO Corp
 - b. YKK
- C. Brackets and Reinforcements: Provide manufacturer's standard high-strength aluminum brackets and reinforcements. Provide nonstaining, nonferrous shims for aligning system components.
1. Provide all required accessories (fasteners, clips, brackets, supports, etc.) required for adjustment and installation as required by field conditions.

- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Finish exposed portions to match glazed aluminum curtain wall.
 - 1. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
 - 2. Where fasteners anchor into aluminum less than 0.125 inch (3.2 mm) thick, provide reinforcement to receive fastener threads.
 - 3. Use concealed fasteners, unless otherwise indicated.
 - 4. Provide all required accessories (fasteners, clips, brackets, supports, etc.) required for adjustment and installation as required by field conditions.
- E. Anchors: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- F. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system..
- G. Insulating Materials: Provide fiberglass batts for stuffing in openings and cracks.

2.5 PROJECTED WINDOWS

- A. Basis of Design Product: Provide GLASSvent UT Windows, Outswing Casement by Kawneer or equal.
- B. Rescue Windows: Fabricate all window units designated as "Rescue" windows on drawings to comply with local and state codes for emergency egress windows. Provide a minimum clear opening of 6 square feet, with minimum 24" clearance for opening width and height. Rescue window maximum 54" to operating hardware.
- C. Provide outswing casement windows designed for insertion in storefront framing with minimal sightlines and interior face of the intermediate mullion in alignment and flush with storefront horizontal.
- D. Hardware: Provide the following equipment and operating hardware:
 - 1. Hinges: Concealed stainless steel heavy-duty 4-bar friction hinges with adjustable slide shoe (2 per ventilator); *Truth Series 301*.
 - 2. Lock: Three Cam-action, sweep lock handles with surface-mounted strike.
 - 3. Limit Device: Stay bar with adjustable hold-open device.
 - 4. Screen Hinge: Continuous stainless steel.
 - 5. Screen Latch: Cast aluminum, operable from interior or exterior.

- E. Fabrication: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide interior aluminum frame adapter of mitered and screw splined that is attached to the storefront framing with concealed fasteners, with tubular vent frame with screw splined corners construction, containing three sided concealed structural silicone glazed system with fourth side exposed structural glazed silicone that does not add to the exterior sightlines of the storefront framing, with bulb and fin type weather stripping that is mounted to extrusions that fits into the storefront framing glass pocket.
- F. Depth: 4-3/8 inches.
- G. Finish: Kawneer Permafluor (70% PVDF) Fluoropolymer coating meeting AAMA 2605, or equal, in Charcoal UC109852.
- H. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier, located between exterior materials and window members exposed on interior, in a manner that eliminates direct metal-to-metal contact.
 - 1. Provide exterior glazed units with minimal or no aluminum exposed to the exterior or poured-in-place two part polyurethane thermal-break construction that has been in use for not less than three (3) years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention and compliance with the CRF indicated in Part 1, Article Performance Requirements.
 - 2. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior. Pressure equalized each vent utilizing two rows of weather-stripping installed in specifically designed dovetail grooves in the extrusion, omit on bottom of vent to allow pressure equalization and drainage.
 - 3. Subframes Frames: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.125-inch- thick extruded aluminum. Cope and screw spline corners.
 - 4. Vent Frames: Provide vents of tubular extrusions of profile and dimensions indicated but not less than 0.156-inch- thick extruded aluminum. Miter corners, angle reinforce, crimp cold, epoxy weld, seal and dress smooth with concealed mechanical joint fasteners.
- I. Preglazed Fabrication: Preglaze projected window units at the factory. Comply with glass and glazing requirements of Division 08 Section "Glazing" of these Specifications and AAMA 101.
 - 1. Glaze all units with four-sided structural glazed silicone. Only factory glazing of the structural silicone shall be acceptable..
 - 2. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - 3. Install structural silicone sealant according to sealant manufacturer's written instructions.
 - 4. Mechanically fasten glazing in place until structural sealant is cured.

5. Remove excess sealant from component surfaces before sealant has cured.
 6. Absolutely no field application of structural sealant for operable units is permitted.
- J. Insect Screens: Provide insect screens for each operable exterior ventilator. Locate screens on the inside of the window sash or ventilator. Design windows and hardware to accommodate screens in a tight-fitting removable arrangement, with a minimum of exposed fasteners and latches.
1. Wickets: Provide full height screen hinged-type wickets, framed and trimmed for a tight fit and durability during handling. Provide continuous full side hinge screens. Mount continuous hinge to screen frame and window frame, so that hinge leaves are concealed, when viewed from exterior and interior. Provide appropriate size hinge leaf width to facilitate maintenance re-screening. Hinge length to be flush with top and bottom of screen frame. Provide one latch, which matches hinge finish, at mid span of each screen.
 2. Screen Frames: Fabricate frames of tubular-shaped extruded aluminum members of 0.040-inch minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Finish frames to match window units.
 - a. Provide removable extruded PVC spline-anchor concealing the edge of the screen frame

2.6 CURTAINWALL FABRICATION

- A. General: Fabricate glazed aluminum curtain wall system according to Shop Drawings. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- E. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
- F. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- G. Frame Units: Factory assemble frame units according to Shop Drawings to greatest extent possible. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated.

- H. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.
 - 1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
 - 2. Do not preglaze framing system. Refer to Division 08 Section "Glazing" for specifications.
- I. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

2.7 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: Kawneer Permafluor Charcoal UC109852.

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 glazed aluminum curtain wall system. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to Architect have been made.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.
- B. Metal Protection: 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. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- D. Install factory-assembled frame units plumb and true in alignment with established lines and grades.
- E. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.
 - 1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Install windows in curtainwall framing in compliance with manufacturer's directions and approved shop drawings.
- G. Install glazing according to Shop Drawings. Comply with requirements of Division 08 Section "Glazing," unless otherwise indicated.
- H. Install sealant according to Shop Drawings. Comply with requirements of Division 07 Section "Joint Sealants," unless otherwise indicated.
- I. Install insulation materials in locations indicated, and at perimeter of curtainwall system stuffed into openings. Comply with requirements of Division 07 Section "Building Insulation," unless otherwise indicated.
- J. Install firestop in locations indicated. Comply with requirements of Division 07 Section "Firestop Joint Systems," unless otherwise indicated.
- K. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm); where a reveal or protruding element separates aligned surfaces by less than 2 inches (50.8 mm), limit offset to 1/2 inch (12.7 mm).

4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.3 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of systems that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not allow soil to accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore system units damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 1. Touch-up minor abrasions with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure glazed aluminum curtain wall system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084413

SECTION 085656 - TRANSACTION WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sliding transaction windows.

1.2 COORDINATION

- A. Coordinate installation of anchorages for transaction windows. 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 adjacent construction. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for window units.
- B. Shop Drawings: For transaction windows.
 - 1. Include plans, elevations, sections, and attachments to other work.
 - 2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
 - 3. Glazing details.
 - 4. Keying information
- C. Samples for Initial Selection: Of manufacturer's available colors for powder paint finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Operation and Maintenance Data: To include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack transaction windows in wood crates for shipment.
- B. Label transaction window packaging with drawing designation.
- C. Store crated transaction windows on raised blocks to prevent moisture damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Horizontal sliding steel windows shall conform to the HS-C30 voluntary specifications in AAMA/NWWDA 101/I.S.2-97 and be designed to meet the performance requirements listed herein.

2.2 FABRICATION

- A. General: Fabricate self-closing and self-latching horizontal sliding transaction windows to provide a complete system for assembly of components and anchorage of window units.

- 1. Provide factory preglazed transaction windows.

- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

- C. Fabricate from 6063-T6 aluminum extrusions with one fixed and one sliding panel (OX or XO); refer to drawings for locations of sliding panels at each opening. Units shall be self-closing and self-latching with a thumbturn deadlock and a locked/unlocked indicator. Removable header access panel shall house heavy-duty anti-lift ball bearing carrier for operable panel. Bottom track for operable panel shall be vinyl.

- 1. Provide unit with aluminum half bottom track with clear service opening and no track under slider.

- 2. Dimensions:

- a. Frame depth 4-1/2"

- b. Header height 2-7/8"

- c. Center sightline 1-1/2"

- d. Center and end stiles, top rail and bottom rail 15/16"

- e. Width and height of unit shall be as indicated on Drawings for each location.

- 3. Basis of Design Product: CRL SCDW1801P by CR Laurence, or equal.

- D. Glazing: Factory glaze with SG5 security glazing by School Guard Glass.

- E. Finish: Provide powder coat painted finish, manufacturer's standard system, in RAL color selected by Architect.

2.3 ACCESSORIES

- A. Anchors, Fasteners, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B 633.

- B. Sealants: For sealants required within fabricated transaction windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

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 transaction windows.
- B. Examine in-place construction for compliance with manufacturer's installation requirements before transaction window installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of transaction windows.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing transaction windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
- B. Fasteners: Install transaction windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners.
- C. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

3.3 ADJUSTING

- A. Remove and replace defective work, including transaction windows that are warped, bowed, or otherwise unacceptable.
- B. Adjust for smooth operation of sliding windows

3.4 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of transaction windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
- B. Clean glass of preglazed transaction windows promptly after installation.
- C. Provide temporary protection to ensure that transaction windows are without damage at time of Substantial Completion.

END OF SECTION 085656

SECTION 086200 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes factory-assembled unit skylights for installation in flat roof areas.
 - 1. Type: Double-dome, metal-framed, curb-mounted unit.
 - 2. Glazing: Impact modified plastic glazing domes and 10mm multiwall laylight panel filled with Lumira™ aerogel.
 - 3. Safety Screens: Metal mesh safety screen mounted on exterior of unit.
 - 4. Pre-fabricated curbs for unit skylights.
- B. Related Sections include the following:
 - 1. Division 6 Section "Miscellaneous Carpentry" for wood framing and blocking at unit skylights.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for flashing at unit skylights.
 - 3. Division 08 Section "Metal-Framed Skylights" for site-erected, metal-framed, nonunitized, monumental units.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Loads: Provide unit skylights, including glazing and anchorage, meeting requirements of uniform load test per ASTM E330 capable of withstanding the effects of the following design loads:
 - 1. Positive and Negative Pressure (Uplift) Load: As indicated on Structural Drawings.
 - 2. Snow Load: As indicated on Structural Drawings.
- B. Fall Protection: Tested to meet or exceed the intent of OSHA29CFR 1910.23(e)(8) for fall protection.
- C. Unit skylights must be tested and certified by NFRC for thermal performance. Products must be listed on the NFRC Certified Products directory.
- D. Glazing System Performance:
 - 1. U-factor shall be .61 BTU/HR-ft²-F maximum per NFRC 100.
 - 2. SHGC shall be .45 maximum per NFRC 200
 - 3. Visible Light Transmission shall be 60% per ASTM E972

1.3 SUBMITTALS

- A. Product Data: For unit skylights. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: For unit skylights. Include plans, elevations, sections, details, and attachments to other Work.

1.4 QUALITY ASSURANCE

A. Fire-Test Response Characteristics:

1. Provide thermoformed domes fabricated from sheets identical to those tested for the following fire-test-response characteristics, per ASTM test method indicated below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction. Identify plastic sheets with appropriate markings of applicable testing and inspecting organization.
 - a. Self-Ignition Temperature: 651 deg F (343 deg C) or greater for plastic sheets in thickness indicated for use when tested per ASTM D 1929.
 - b. Smoke Density: 75 or less when tested per ASTM D 2843 on plastic sheets in thickness indicated for use.
 - c. Relative-Burning Characteristics: Tested per ASTM D 635; Class CC2, burning rate of 2-1/2 inches (64 mm) per minute or less for nominal thickness of 0.060 inch (1.5 mm) or thickness indicated for use.
2. Provide flat cellular polycarbonate panel fabricated from an approved cellular polycarbonate glazing (light transmitting) material identical to that tested with a CC1 fire rating classification per ASTM D-635 and filled with Lumira™ Aerogel insulation in the thickness (10mm) intended for use.
 - a. Self-Ignition Temperature: 1110° F (599 deg. C) or greater when tested per ASTM 1929 on multi-wall cellular panel filled with Lumira™ aerogel Insulation in the thickness (10mm) intended for use.

1.5 WARRANTY

- A. Skylight Special Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship and guaranteeing weather-tight and leak-free performance. "Defects" is defined as uncontrolled leakage of water and abnormal aging or deterioration.
 1. Warranty Period: 5 years from date of Substantial Completion.
- B. Plastic Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work that has or develops defects in the plastic. "Defects" is defined as abnormal aging or deterioration.
 1. Warranty Period: 5 years from date of Substantial Completion against yellowing or breakage.
- C. Finish Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects. "Defects" is defined as peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required.

1. Warranty Period for Anodized Finish: 1 year from date of Substantial Completion.
2. Warranty Period Polyester Powder Coat: 5 year from date of Substantial Completion.
3. Warranty Period for Kynar 500 Finish: 5 years from date of Substantial Completion. (10 and 20 year available if specified).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Curb Frame: High performance PVC with minimum effective thickness of 0.060 inch (1.5mm). Provide integral condensation gutter system with corners fully welded.
- B. Retainer Frame: Extruded aluminum alloy 6063-T5 (min). ASTM B 221 (ASTM B 221 M) with minimum effective thickness of 0.60 inch (1.5 mm).
- C. Dome Glazing: Thermoformed acrylic.
- D. Interior Laylite: 10mm multi-wall flat cellular polycarbonate panel filled with Lumira™ aerogel insulating material.
- E. Thermal Break: Fabricate skylight units with thermal chambered PVC.
- F. Gaskets: Structural glazing tape to form adhesive bond between PVC curb and inner laylite, between inner laylite and inner dome, and between inner and outer dome. Butyl tape between outer dome and extruded aluminum retainer. Gaskets shall form an air and water impenetrable barrier between adjacent surfaces.
- G. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other non-corrosive metal as recommended by manufacturer.

2.2 UNIT SKYLIGHTS

- A. General: Factory-assembled curb-mounted units consisting of impact modified plastic glazing and polycarbonate panel filled with Lumira™ aerogel, gasketing, and inner frame designed to mount on separate curb that is capable of withstanding design loads indicated.
 1. Basis of Design Products: Provide EcoSky3 Model CLC3 by Wasco Skylights, part of the Velux commercial Group or equal products by one of the following:
 - a. American Skylights
 - b. Kingspan Light + Air, LLC
- B. Condensation Control: Fabricate skylight units with integral internal gutters and weeps to collect and dispose of condensation.
- C. Thermal Break: Fabricate skylight units with thermal chambered PVC.

- D. Shape and Size: 48" x 48" square.
- E. Outer Glazing: Dome thermoformed translucent IR reflecting Acrylite® SatinSky 2.
- F. Middle Glazing: Dome thermoformed clear acrylic.
- G. Inner Laylite: 10mm Multi-wall flat cellular polycarbonate panel filled with Lumira™ aerogel insulation material.

2.3 FABRICATION

- A. Framing Components: As follows:
 - 1. Factory fit and assemble components.
 - 2. Fabricate components to drain condensation and moisture occurring or migrating within skylight system to the exterior.
 - 3. Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.
 - 4. Fabricate components to ensure that glazing is thermally and physically isolated from framing members.
 - 5. Fit and secure joints in aluminum by heliarc welding
- B. Glazing: Factory glaze all glazing units.

2.4 SAFETY SCREENS

- A. Safety Screens: Fabricate from welded steel wire mesh, 4" x 4" spacing, wire diameter - .188" min. hot dipped galvanized finish on carbon steel attached to extruded aluminum alloy 6063-T5 (min) . ASTM B 221 (ASTM B 221 M) with minimum effective thickness of 0.090 inch (2.2 mm), with extruded aluminum adjustment bar.
 - 1. Basis of Design Product: Provide Model CAEW Skylight Protection Screen by Wasco Skylights, part of the Velux commercial Group or equal products by one of the following:
 - a. American Skylights
 - b. Kingspan Light + Air, LLC

2.5 PRE-FABRICATED CURBS FOR UNIT SKYLIGHTS

- A. Provide thermally broken sheet aluminum curb with aluminum liners, 1-1/2" thick rigid insulation, 2" x 2" wood nailer and HS adhesive clamping at corners.
 - 1. Curb Height: 16"
 - 2. R-Value: 5.8
 - 3. Interior aluminum liners paint color as selected by Architect.

4. Basis of Design Product: Provide Model CCAW Thermally Enhanced Curb by Wasco Skylights, part of the Velux commercial Group or equal products by one of the following:
 - a. American Skylights
 - b. Kingspan Light + Air, LLC

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate unit skylight and prefabricated curb installation with installation of substrates, vapor retarders, roof insulation, roofing, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
- B. Where metal surfaces of units will contact incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.
- C. Anchor unit skylights and curbs securely to supporting substrates.
- D. Set unit skylight flanges in thick bed of roofing cement to form a seal, unless otherwise indicated.
- E. Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

3.2 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 086200

SECTION 086300 - METAL-FRAMED SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes aluminum-framed skylights with the following characteristics:
 - 1. Glazing is glass.
 - 2. Glazing is retained by field-installed pressure caps on four sides
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealants installed at perimeters of metal-framed skylights.
 - 2. Division 08 Section "Glazing" for glass units installed in metal-framed skylights.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality and Code Requirements," to design metal-framed skylights.
- B. Provide metal-framed skylights, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure.
 - 4. Dimensional tolerances of building frame and other adjacent construction.
- C. Failure includes the following:
 - 1. Deflection exceeding specified limits.
 - 2. Water leakage.
 - 3. Thermal stresses transferred to building structure.
 - 4. Noise or vibration created by wind and thermal and structural movements.
 - 5. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - 6. Loosening or weakening of fasteners, attachments, and other components.
 - 7. Sealant failure.
- D. Structural Loads:
 - 1. Wind Loads, Snow Loads, Earthquake Loads: As indicated by structural design data on Drawings.

2. Concentrated Live Loads: 300 lbf applied to framing members at locations that will produce greatest stress or deflection.
3. Load Combinations: Calculate according to requirements of applicable code indicated on Drawings.

E. Deflection of Framing Members:

1. Deflection Normal to Glazing Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to $L/360$ of clear span or 1/8 inch (3.2 mm), whichever is smaller.

F. Lateral Bracing of Framing Members: Compression flanges of flexural members are laterally braced by cross members with minimum depth equal to 50 percent of flexural member that is braced. Glazing does not provide lateral support.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 PERFORMANCE TESTING

- A. Provide metal-framed skylights that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.
- B. Structural-Performance: Provide metal-framed skylights, including anchorage, capable of withstanding pressures indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.
- C. Air-Infiltration: Metal-framed skylights with maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. (0.05 L/s per sq. m) of surface when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa)
- D. Water Penetration under Static Pressure Metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (718 Pa).

- E. Condensation Resistance: Provide aluminum-framed systems that when tested with fixed glazing, have a frame condensation-resistance factor (CR) of not less than 46 when tested according to NFRC 500 when clear over clear insulated glass is used.
- F. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:
 - 1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.40 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal-framed skylights.
- B. Shop Drawings: For metal-framed skylights. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate structural loadings and reactions to be transmitted to supporting curbs.
 - 2. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior..
- C. Delegated-Design Submittal: For metal-framed skylights indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Fabrication Sample: Of each framing intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for metal-framed skylights.
- F. Maintenance Data: For metal-framed skylights to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of metal-framed skylights required for this Project.

- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal skylights that are similar to those indicated for this Project in material, design, and extent
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for skylights' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Where metal-framed skylights are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-framed skylights 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 caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Finish Special Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects. "Defects" is defined as peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required.

1. Warranty Period for Kynar 500 Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for metal-framed skylights is based on Pinnacle 350 Skylight manufactured by Wasco Division, Velux Commercial. Subject to compliance with requirements, provide the named product or a comparable product by one of the following, or equal:
 1. Kawneer
 2. Super Sky Products Inc.

2.2 FRAMING MATERIALS

- A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Framing members shall have a minimum effective thickness of 0.125 inches.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing, with minimum effective thickness of 0.109 inches.
 1. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
- D. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.
 1. Aluminum Retaining Cap Fasteners and Framing Members Fasteners: ASTM A 193/A 193M, Series 300 stainless-steel screws; type as recommended by manufacturer.
 2. Connections to Supporting Structure: Series 300 Stainless Steel or ASTM A 307, hot dipped galvanized steel fasteners by installer.
 3. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

- E. 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.
- F. Anchor Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- G. Concealed Flashing: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.032 inch thick for apron flashing and 0.062 inch for closures..
- I. Framing Gaskets: Manufacturer's standard.
- J. Framing Sealants: As recommended in writing by manufacturer.
 - 1. Sealant shall have a VOC content of 250 g/L or less.

2.3 GLAZING MATERIALS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Spacers, Setting Blocks, and Gaskets: Manufacturer's standard elastomeric types.
- C. Glazing Sealants: As recommended in writing by manufacturer.
 - 1. Sealant shall have a VOC content of 250 g/L or less.

2.4 ACCESSORY MATERIALS

- A. 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.

2.5 FABRICATION

- A. Basis of Design Products: Pinnacle 350 Double Pitch Skylight by Wasco Division, Velux Commercial, or equal.
- B. Fabricate aluminum components before finishing.
- C. Fabricate aluminum 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. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within skylight to exterior.
 4. Physical and thermal isolation of glazing from framing members.
 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
- D. Attach retainer bars with gasketed stainless steel fasteners spaced at a maximum of 12 inches on center.
- E. Weld components before finishing and in concealed locations to greatest extent practicable to minimize distortion.
- F. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
- G. Reinforce aluminum components as required to receive fastener threads.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Kynar Fluoropolymer Two-Coat System: (70% PVDF) complying with AAMA 2605. Color as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.

3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
- D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within skylight to exterior.
- E. Install components plumb and true in alignment with established lines and elevations.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:
1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
 2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 10 feet but no greater than 1/4 inch over total length.

END OF SECTION 086300

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Fiberglass Doors",
 - 4. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. 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. 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.
 - h. Warranty information for each product.
 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.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of

the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- 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 Procedures.
- 1.4 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. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
 - C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door 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.
 - D. 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 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 Owner concerning both standard and electromechanical door hardware and keying.

- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: 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, conduct 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 aluminum, hollow metal and wood 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

- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 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.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 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: 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.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner 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 Owner. 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:
1. Ten years for mortise locks and latches.
 2. Five years for exit hardware.
 3. Twenty five years for manual overhead door closer bodies.
 4. Five years for motorized electric latch retraction exit devices.
 5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. 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:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: 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, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. 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.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. 5" heavy weight anchor hinges, , ball bearing or oil impregnated bearing.
 3. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, 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 all out-swinging lockable doors.
 4. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Hager Companies (HA).
 - c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs. Provide custom screw pattern where required by door manufacturer.
1. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Hager Companies (HA).
 - c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Manufacturers:
 - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) - EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
 2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.

4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. Door Controls International (DC).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU).
 - b. Sargent Manufacturing (SA).
- C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.

2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. 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.
 6. Keyway: Match Facility Standard.
- D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. Medeco (MC) – X4 (Exterior).
 - b. Corbin Russwin – CR8000 (Interior).
 - c. No Substitution.
- F. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- G. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Three (3).
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- H. Construction Keying: Provide construction master keyed cylinders.
- I. Construction Keying: Provide temporary keyed construction cores.
- J. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
 1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 1. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.

2.8 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below and in the hardware sets.
 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling.

Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML20900 Series.

2.9 AUXILIARY LOCKS

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DL4000 Series.

2.10 LOCK AND LATCH 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.
4. Short-lipped strikes: For locks at double doors.

- B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 3. Except on fire rated doors, provide exit devices with key cylinder dogging device to hold the pushbar and latch in a retracted position.
 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Extended cycle test: Devices to have been cycle tested to 9 million cycles.
 11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

- A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
1. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
 2. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 3. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.
- B. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
1. Provide keyed removable feature where specified in the Hardware Sets.
 2. Provide stabilizers and mounting brackets as required.
 3. Manufacturers:
 - a. Same as exit device manufacturer.

2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.
1. Manufacturers:
 - a. Norton Door Controls (NO) - Unitrol Series.
- C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.

2.14 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: Certified ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate 12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
1. Manufacturers:
 - a. Rixson (RF) - 980/990 Series.
 - b. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM

- A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide Rixson 9 Series overhead type stops and holders.
 1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.17 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. 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.
- C. 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. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.
 - 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 - 2. Manufacturers:

- a. Securitron (SU) - AQD Series.

2.19 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

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. Installers are to be trained and certified by the manufacturer 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 or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- 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. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 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.

3.5 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.

- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner 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. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. RU - Corbin Russwin
6. AD - Adams Rite
7. MC - Medeco
8. HS - HES
9. NO - Norton
10. RF - Rixson
11. SU - Securitron

Hardware Sets

Set: 1.0

Description: Exterior Alum Pair - Card Access

2	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D	PE
1	Key Removable Mullion	L980S	PC SA

1	Exit Device (rim, NL, EL, CD)	16 43 56 64 8804	US32D	SA
1	Exit Device (rim, EL, CD)	16 43 56 64 8810	US32D	SA
2	Pull (offset)	862	US32D	SA
4	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Mullion Cylinder	64 980C1	US26D	SA
2	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
2	Door Wiring Harness	QC Series (hinge to device)		MK
2	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Remote Control Switch	By Security Vendor		
2	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes:

Operation: Door is normally closed and locked. Valid card at reader or signal from remote switch retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 1.1

Description: Exterior; Vestibule Alum Pair - Card Access; Auto

2	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D		PE
1	Key Removable Mullion	L980S	PC	SA
1	Exit Device (rim, NL, EL, LX, CD)	16 43 53 56 64 8804	US32D	SA
1	Exit Device (rim, EL, LX,CD)	16 43 53 56 64 8810	US32D	SA
2	Pull (offset)	862	US32D	SA
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Mullion Cylinder	64 980C1	US26D	SA
1	Door Closer (HD stop, TJ)	UNIJ7500 M	689	NO
1	Automatic Opener	6061; 6071 D	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
2	Door Wiring Harness	QC Series (hinge to device)		MK
2	Frame Wiring Harness	QC Series (jamb to J-box)		MK
2	Door Switch	501		NO
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Remote Control Switch	By Security Vendor		
2	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes:

Operation: Doors are normally closed and locked. Valid card at reader or signal from remote switch retracts latch for momentary access, then enables outside actuator. Inside actuator

retracts latch, then auto opens one door. Monitoring by door position switch. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 2.0

Description: Exterior Alum Pair

2	Continuous Hinge	CFM-HD1 Series		PE
1	Key Removable Mullion	L980S	PC	SA
1	Exit Device (rim, CD)	16 43 64 8810	US32D	SA
1	Exit Device (rim, NL, CD)	16 43 64 8804	US32D	SA
2	Pull (offset)	862	US32D	SA
4	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Mullion Cylinder	64 980C1	US26D	SA
2	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
2	Position Switch (concealed)	By Security Vendor		SU
1	Weather Seals	Supplied with door/frame assembly		

Set: 3.0

Description: Exterior; Vestibule Alum - Card Access

1	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D		PE
1	Exit Device (rim, NL, EL, CD)	16 43 56 64 8804	US32D	SA
1	Pull (offset)	862	US32D	SA
2	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Remote Control Switch	By Security Vendor		
1	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes: Owner to confirm which cylinder/core is used for vestibule doors (typ).

Operation: Door is normally closed and locked. Valid card at reader or signal from remote switch retracts latch for momentary access. Monitoring by door position switch. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 3.1

Description: Exterior; Vestibule Alum - Card Access; Auto

1	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D		PE
1	Exit Device (rim, NL, EL, LX, CD)	16 43 53 56 64 8804	US32D	SA
1	Pull (offset)	862	US32D	SA
2	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Automatic Opener	6061; 6071 D	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
2	Door Switch	501		NO
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Remote Control Switch	By Security Vendor		
1	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes: Owner to confirm which cylinder/core is used for vestibule doors (typ).

Operation: Door is normally closed and locked. Valid card at reader or signal from remote switch retracts latch for momentary access, then enables outside actuator. Inside actuator unlatches, then auto opens door. Monitoring by door position switch. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 4.0

Description: Exterior; Vestibule Alum at Main Entrance

1	Continuous Hinge	CFM-HD1 Series		PE
1	Exit Device (rim, CD)	16 43 64 8810	US32D	SA
1	Pull (offset)	862	US32D	SA
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Position Switch (concealed)	By Security Vendor		SU
1	Weather Seals	Supplied with door/frame assembly		

Notes: Provide door position switches for exterior doors (coordinate w/ security).

Set: 5.0

Description: Alum Vestibule Pair

2	Continuous Hinge	CFM-HD1 Series		PE
1	Key Removable Mullion	L980S	PC	SA
1	Exit Device (rim, CD)	16 43 64 8810	US32D	SA
1	Exit Device (rim, NL, CD)	16 43 64 8804	US32D	SA
2	Pull (offset)	862	US32D	SA
4	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Mullion Cylinder	64 980C1	US26D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU

2	Door Stop RO	404 Wall; 441CU Floor (or per spec)	US26D
1	Threshold (coord w/ details)	271A FHSL14SS	PE
1	Mullion Gasket	5110BL	PE
1	Weather Seals	Supplied with door/frame assembly	

Notes: Owner to confirm which cylinder/core is used for vestibule doors.

Set: 6.0

Description: Exterior FRP Pair - Card Access

1	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D	PE
1	Continuous Hinge	CFM-HD1 Series	PE
1	Key Removable Mullion	L980S	PC SA
1	Exit Device (rim, DT, CD)	16 43 8810 ETP	US32D SA
1	Exit Device (rim,NL,EL,CD)	16 43 56 64 8804 ETP	US32D SA
4	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26 MC
1	Mullion Cylinder	64 980C1	US26D SA
2	Door Closer (HD stop)	UNI7500 M	689 NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS	PE
1	Mullion Gasket	5110BL	PE
2	Sweep	315CN	PE
2	Astragal	305CN	PE
1	Door Wiring Harness	QC Series (hinge to device)	MK
1	Frame Wiring Harness	QC Series (jamb to J-box)	MK
1	Power Supply	AQD4 Series (coord w/ security)	SU
2	DPS & REX Devices	By Security Vendor	
1	Weather Seals	Supplied with door/frame assembly	
1	Card Reader	By Security Vendor	

Notes:

Operation: Door is normally closed and locked. Valid card at reader retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 7.0

Description: Exterior FRP Pair - Loading

2	Continuous Hinge	CFM-HD1 Series	PE
1	Dust Proof Strike	570	US26D RO
2	Flush Bolt (manual)	555	US26D RO
1	Storeroom Lock	ML2057 PSA LFIC	626 RU
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26 MC
1	Cylinder (Corbin exterior devices)	LFIC to suit device	US15 SA
2	Door Closer (HD stop, hold open)	UNI7500H M	689 NO
1	Threshold (coord w/ details)	1716AK FHSL14SS	PE
2	Sweep	315CN	PE

1	Astragal	355CPK		PE
2	Position Switch (concealed)	By Security Vendor		SU
1	Weather Seals	Supplied with door/frame assembly		

Set: 8.0

Description: Exterior FRP - Card Access

1	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D		PE
1	Exit Device (rim,NL,EL,CD)	16 43 56 64 8804 ETP	US32D	SA
2	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Sweep	315CN		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes:

Operation: Door is normally closed and locked. Valid card at reader retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 9.0

Description: Exterior FRP Loading - Card Access

1	Continuous Hinge	CFM-HD1 Series EL-CEPTx32D		PE
1	Mortise Lock (fail-secure)	ML20906-SEC PSA LFIC	626	RU
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Cylinder (Corbin exterior devices)	LFIC to suit device	US15	SA
1	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Sweep	315CN		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Remote Control Switch	By Security Vendor		
1	DPS & REX Devices	By Security Vendor		
1	Weather Seals	Supplied with door/frame assembly		
1	Card Reader	By Security Vendor		

Notes:

Operation: Door is normally closed and locked. Valid card at reader or signal from remote switch retracts latch for momentary access. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when

the fire detection / suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 10.0

Description: Exterior FRP

1	Continuous Hinge	CFM-HD1 Series		PE
1	Exit Device (rim, storeroom, CD)	16 43 64 8804 ETP	US32D	SA
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Door Closer (HD stop)	UNI7500 M	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS		PE
1	Sweep	315CN		PE
1	Position Switch (concealed)	By Security Vendor		SU
1	Weather Seals	Supplied with door/frame assembly		

Set: 11.0

Description: Exterior FRP - Roof

1	Continuous Hinge	CFM-HD1 Series		PE
1	Storeroom Lock	ML2057 PSA LFIC	626	RU
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Cylinder (Corbin exterior devices)	LFIC to suit device	US15	SA
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Threshold (coord w/ details)	1716AK FHSL14SS		PE
1	Sweep	315CN		PE
1	Position Switch (concealed)	By Security Vendor		SU
1	Weather Seals	Supplied with door/frame assembly		

Notes: Free egress from roof.

Set: 12.0

Description: Corridor Pair - Card Access (both directions); Hold Open; Alarmed

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (SVR,LBR,FSE,AL)	LD (12 if rated) 43 AL NB8774 ETP		US32D
	SA			
1	Exit Device (SVR,LBR,storerm,AL)		LD (12 if rated) 43 AL	
	NB8706 ETP		US32D	SA
3	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
3	Cylinder (Sargent interior devices)			LFIC to suit device
	626		RU	
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE
2	Wiring Harness	546		SA
2	Frame Wiring Harness	QC Series (jamb to J-box)		MK

1	Power Supply (9V)	3267	SA
1	Power Supply	AQD4 Series (coord w/ security)	SU
2	Electric Power Transfer	EL-CEPT	SU
2	DPS & REX Devices	By Security Vendor	
2	Card Reader	By Security Vendor	

Notes: Interface with building fire alarm system to release door(s) from hold open.

Operation: Doors can be closed, locked and armed or held open. When closed, valid card at reader unlocks outside lever for momentary access or disarms alarm(s) for momentary passage. Monitoring by door position switches. During a loss of power the door will default to secure. Free (alarmed) egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Approaching doors on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 12.1

Description: Vestibule Pair (Rated) - Card Access; Auto

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Key Removable Mullion	12-L980	PC	SA
1	Exit Device (rim, exit only)	12 43 8810 EO	US32D	SA
1	Exit Device (rim,NL,EL,LX)	12 43 53 56 64 8804 ETP	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)		LFIC to suit device	
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Automatic Opener	6061; 6071 D	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
2	Door Switch	501		NO
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Electric Power Transfer	EL-CEPT		SU
2	DPS & REX Devices	By Security Vendor		
1	Card Reader	By Security Vendor		

Notes:

Operation: Doors are normally closed and locked. Valid card at reader retracts latch for momentary access, then enables outside actuator. Inside actuator retracts latch, then auto opens one door. Monitoring by door position switches. During a loss of power the door will default to secure. Free egress at all times. Door status will default to closed and locked when

the fire detection/suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 13.0

Description: Corridor; Stair Pair - Hold Open

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
2	Exit Device (SVR,LBR,passage)	12 NB8715 ETP	US32D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.
Provide floor mounted magnetic holder at one leaf of door SG1a.

Set: 13.1

Description: Corridor Double Egress Pair - Hold Open

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
2	Exit Device (SVR,LBR,passage)	12 NB8715 ETP	US32D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
4	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal	357SS		PE
1	Astragal (adhesive, edge mount)	S772C		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.

Set: 14.0

Description: Corridor; Stair Pair

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
2	Exit Device (SVR,LBR,passage)	12 NB8715 ETP	US32D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Door Stop	404 Wall; 441CU Floor (or per spec)	US26D	
	RO			
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE

Set: 15.0

Description: Corridor Double Egress Pair - Hold Open

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
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2	Exit Device (SVR,LBR,passage)	12 NB8715 ETP	US32D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE
1	Astragal	357SP		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.

Set: 16.0

Description: Stair - Hold Open

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, passage)	12 8815 ETP	US32D	SA
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.
 Review locking requirements for stair to basement.

Set: 17.0

Description: Stair (Level of exit discharge) - Card Access

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, fail-secure)	12 43 64 8876 ETP	US32D	SA
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Electric Power Transfer	EL-CEPT		SU
1	DPS & REX Devices	By Security Vendor		
1	Card Reader	By Security Vendor		

Notes:

Operation: Door is normally closed and locked. Valid card at reader unlocks outside lever for momentary access. Monitoring by door position switch. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire

detection/suppression systems are activated. Approaching door on egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 18.0

Description: Elev Vestibule - Hold Open

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Passage Latch	ML2010 PSA	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE

Notes: Interface with building fire alarm system to release door(s) from hold open.

Set: 19.0

Description: Assembly

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, intruder)	LD (12 if rated) 43 49 8816 ETP	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 20.0

Description: Assembly Pair

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Key Removable Mullion	L980S	PC	SA
2	Exit Device (rim, intruder)	LD (12 if rated) 43 49 8816 ETP	US32D	SA
3	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Mullion Cylinder	64 980C1	US26D	SA
2	Door Closer (HD stop)	UNI7500 M	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE

1 Astragal (adhesive, edge mount) [S772C](#) PE

Notes: Coordinate seals with frame material/Mfr. Door stops should be reviewed, overhead vs floor mount.

Set: 20.1

Description: Assembly Pair - Hold Open (floor)

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
2	Exit Device (SVR,LBR,classrm,CD)		16 43 64	NB8713 ETP
	US32D	SA		
4	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
4	Cylinder (Sargent interior devices)		LFIC to suit device	
	626	RU		
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Electromagnetic Holder (floor)	980M	689	RF
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE

Notes: Coordinate seals with frame material/Mfr.
 Interface with building fire alarm system to release door(s) from hold open.

Set: 21.0

Description: Single w/ Card Access

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Mortise Lock (fail-secure)	ML20906-SEC PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Door Wiring Harness	QC Series (hinge to device)		MK
1	Frame Wiring Harness	QC Series (jamb to J-box)		MK
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Electric Power Transfer	EL-CEPT		SU
1	Card Reader	By Security Vendor		

Notes:

Operation: Door is normally closed and locked. Valid card at reader unlocks outside lever for momentary access. Monitoring by door position switch. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Approaching door from egress side will activate request to exit switch for appropriate monitor by EAC systems. Outside key override.

Set: 22.0

Description: Classroom - Hold Open

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock (inside indicator)	ML2052 PSA V01 LFIC	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE

Notes: Interface with building fire alarm system and remote release switch to release doors from hold open (typ).

Provide Finger guards for all doors in K and Pre-K areas, MK1A/MK1B x door height, color to be selected (fingersafe.com).

Review panic hardware requirement with code official for doors 405 and 406.

Set: 23.0

Description: Classroom - Hold Open; Panic

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, intruder)	LD (12 if rated) 43 49 8816 ETP	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE

Notes: Interface with building fire alarm system and remote release switch to release doors from hold open (typ).

Set: 24.0

Description: Music Vestibule - Hold Open; Panic

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, intruder)	LD (12 if rated) 43 49 8816 ETP	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF

1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Door Bottom (concealed, auto)	434ARL		PE

Notes: Interface with building fire alarm system and remote release switch to release doors from hold open (typ).

Set: 25.0

Description: Music - STC43; Hold Open; Panic

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, intruder)	LD (12 if rated) 43 49 8816 ETP	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Door Bottom (concealed, auto)	434ARL		PE

Notes: Interface with building fire alarm system and remote release switch to release doors from hold open (typ).

Coordinate hardware with STC assembly manufacturer.

Set: 26.0

Description: Classroom / Resource - Connecting

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Security Lock (2 indicators)	ML2022 PSA V11 LFIC	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 27.0

Description: Classroom Connecting - Surface Slider

1	Mortise Deadlock (hook bolt)	MS1850SN 45	628	AD
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices)			LFIC to suit device
	626	RU		
1	Door Pull	RM3301-24" Mtg-Type 1XHD	US32D	RO
2	Lock Status Indicator	4089 less signage	130	AD

Notes: Track; sliding hardware; perimeter seals and door bottom supplied with door assembly.

Set: 28.0

Description: Classroom Storage; Prep; Kiln; Copy

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock	ML2055 PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 29.0

Description: Servery - Hold Open

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock (inside indicator)	ML2052 PSA V01 LFIC	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Electromagnetic Holder	998M (or to suit details)	689	RF
3	Silencer	608		RO

Notes: Interface with building fire alarm system and remote release switch to release doors from hold open (typ).

Set: 30.0

Description: Kitchen

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock (inside indicator)	ML2052 PSA V01 LFIC	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Sweep	18061CNB		PE

Set: 31.0

Description: Storage; Bldg Services Pair

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555	US26D	RO
1	Storeroom Lock	ML2057 PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU

1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Door Stop RO	404 Wall; 441CU Floor (or per spec)		US26D
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE
1	Astragal	357SP		PE

Set: 32.0

Description: Storage; Bldg Services

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Storeroom Lock	ML2057 PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop RO	404 Wall; 441CU Floor (or per spec)		US26D
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 33.0

Description: Electric; Generator Pair

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Key Removable Mullion	12-L980	PC	SA
1	Exit Device (rim, storeroom)	12 43 64 8804 ETP	US32D	SA
1	Exit Device (rim, exit only)	12 43 8810 EO	US32D	SA
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Cylinder (Sargent interior devices) 626			LFIC to suit device RU
1	Mullion Cylinder	64 980C1	US26D	SA
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Mop Plate	K1050 6" 4BE CSK	US32D	RO
2	Door Stop RO	404 Wall; 441CU Floor (or per spec)		US26D
1	Mullion Gasket	5110BL		PE
1	Head & Jamb Seal (adhesive)	S88BL		PE
1	Astragal (adhesive, edge mount)	S772C		PE

Set: 34.0

Description: Electric

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Exit Device (rim, storeroom)	12 43 64 8804 ETP	US32D	SA

1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Cylinder (Sargent interior devices)		LFIC to suit device	
			626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
				RO
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 35.0

Description: Stage Lift Pair

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Dust Proof Strike	570	US26D	RO
1	Flush Bolt Set (self-latching)	2845; 2945	US26D	RO
1	Classroom Lock	ML2055 PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
				RO
2	Silencer	608		RO

Set: 36.0

Description: Office; Conf; Nurse; Counsel

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock	ML2055 PSA LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
				RO
3	Silencer	608		RO

Set: 37.0

Description: Office w/ Closer

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Classroom Lock (inside indicator)	ML2052 PSA V01 LFIC	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
				RO
1	Head & Jamb Seal (adhesive)	S88BL		PE

Set: 38.0

Description: Restroom (Faculty)

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Staff Toilet Lock (2 indicators)	ML2029 PSA V21 LFIC	626	RU
1	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
3	Silencer	608		RO
1	Coat Hook	RM823	US32D	RO

Set: 39.0

Description: Restroom (single user)

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Privacy Lock w/ Indicator	ML2060 PSA V20	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
3	Silencer	608		RO

Set: 40.0

Description: Restroom (multi-user); Lockers

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Deadbolt (dbl cyl classrm)	DL4122 CT6	626	RU
2	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
1	Push Pull	111x73C/73CL (deadbolt prep)	US32D	RO
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop	404 Wall; 441CU Floor (or per spec)		US26D
	RO			
3	Silencer	608		RO

Set: 41.0

Description: Restroom (K and Pre-K)

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Passage Latch	ML2010 PSA	626	RU
1	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO

1	Door Stop RO	404 Wall; 441CU Floor (or per spec)	US26D
3	Silencer	608	RO
1	Finger Guard Set	MK1A & MK1B (fingersafe.com)	

Set: 42.0

Description: Exam; Dentist

1	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
1	Passage Latch	ML2010 PSA	626	RU
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 6" 4BE CSK	US32D	RO
1	Door Stop RO	404 Wall; 441CU Floor (or per spec)	US26D	
3	Silencer	608	RO	

Set: 43.0

Description: Overhead or Specialty Door Assembly

1	Hardware	Supplied with door assembly	
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Set: 44.0

Description: Misc Items; Owner Stock

2	Anchor Hinge Set, Hvy Wt	TA792 5" x 4-1/2" (qty per part 2)	US26D	MK
2	Classroom Lock (inside indicator)	ML2052 PSA V01 LFIC	626	RU
6	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
6	Removable Core (interior)	CR8000 Keyed to existing system	626	RU
2	Door Closer (HD stop)	UNI7500 M	689	NO
2	Surface Closer (interior)	DC6200 A10 or DC6210 A3; M73	689	RU
2	Electromagnetic Holder	998M (or to suit details)	689	RF
10	Wiring Diagram (as required)	Elevation & Point-to-Point		
100	Key Blanks	Bldg Std Keyway		
1	Key Cabinet (per spec)	Including Set-up		
1	Finger Guard Set	MK1A & MK1B (fingersafe.com)		

Notes: Provide Finger guards for all doors in K and Pre-K areas, MK1A/MK1B x door height, color to be selected (fingersafe.com).

Set: 45.0

Description: Gate w/ Panic

1	Exit Device (rim,NL,CD)	16 43 64 8504	US32D	SA
1	Pull (offset)	862	US32D	SA
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC

Notes: Coord hardware with gate mfr. Gate needs to be designed/constructed to accommodate panic hardware.

Remainder of hardware supplied with gate assembly.

Set: 46.0

Description: Gate w/ Panic - Card Access

1	Exit Device (rim,NL,CD)	16 43 64 8504	US32D	SA
1	Pull (offset)	862	US32D	SA
1	Removable X4 Core (exterior)	322401-N (to fit Sargent LFIC)	26	MC
1	Electric Strike	9400; 9600-LBM	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Power Supply	AQD4 Series (coord w/ security)		SU
1	Card Reader	By Security Vendor		

Notes: Coord hardware with gate mfr. Gate needs to be designed/constructed to accommodate panic and electrified hardware.

Remainder of hardware supplied with gate assembly.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
1. Windows.
 2. Doors.
 3. Interior borrowed lites, sidelights and transoms.
 4. Glazed entrances.
 5. Curtainwall framing.
 6. Storefront framing.
 7. Metal-framed skylights.
 8. Transaction windows.
 9. Folding glass storefronts.

1.2 DEFINITIONS

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **Deterioration of Coated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. **Deterioration of Laminated Glass:** Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- E. **Deterioration of Insulating Glass:** Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Where glass thicknesses are indicated these are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Where glass thickness is not indicated design glass thickness and types of glass required by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Wind Loads: Provide glazing capable of resisting wind positive and negative pressures calculated according to the New York Building Code Section 1609.6 and the following criteria:
 - 1) Basic Wind Speed (3 second gust) = as indicated on Structural Drawings
 - 2) Wind Load Importance Factor I_w = as indicated on Structural Drawings
 - 3) Wind Speed Category = as indicated on Structural Drawings
 - 4) Other applicable criteria indicated on Structural Drawings.
 - b. Specified Design Snow Loads: As indicated on Structural Drawings
 - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
 - 1) Load Duration: 30 days
 - e. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - f. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For insulating glass.
 - 2) For laminated glass
 - 3) For monolithic-glass lites heat treated to resist wind loads.
 - g. Minimum Glass Thickness for Exterior Lites: Not less than 1/4" (6 mm).
 - h. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6 mm thick, unless otherwise indicated.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- (13-mm-) wide interspace, unless otherwise indicated.
 4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
 6. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
1. Insulating glass for each designation indicated.
 2. Each type of laminated glass specified.
 3. Each type of fire-rated glass specified.
 4. For each color (except black) of exposed glazing sealant indicated.
 5. Spandrel glass
 6. Silk screened ceramic fritted glass, for each pattern indicated
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer
- E. 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.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
 1. Insulating glass.
 2. Coated float glass.
 3. Glazing sealants.
 4. Fire resistive glazing
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of glass from one primary-glass manufacturer.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - a. Perform tests under normal environmental conditions replicating those that will exist during installation.
 2. Submit not fewer than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 252.
- H. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257.
- I. Glazing for Fire-Rated Wall Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257, ASTM E119.
- J. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 2. Safety glass includes fully tempered glass, laminated glass and fire-resistant glass.

- K. Fire-Rated Glass: Permanently mark fire-rated glass with certification label of certification agency acceptable to authorities having jurisdiction indicating manufacturer name, test standard and fire-rating.
- L. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
 - 2. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 3. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- M. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:
 - 1. Insulating Glass Certification Council.
 - 2. Associated Laboratories, Inc.
 - 3. National Accreditation and Management Institute.
- N. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner 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. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- D. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five years from date of Substantial Completion.
 - 2. Warranty Period for Security Glass: Ten years from date of Substantial Completion.
- E. Manufacturer's Special Warranty on Fire Rated Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); Class 1 unless otherwise indicated in schedules at the end of Part 3.

2.2 HEAT-TREATED FLOAT GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.

2.3 COATED FLOAT GLASS

- A. General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
 - 1. Provide Kind HS (heat-strengthened) coated float glass in place of coated annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
- B. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified in schedules at the end of Part 3.
 - 1. Basis of Design Product: Solarban 70 by Vitro Architectural Glass (formerly PPG Industries, Inc.) or equal.
- C. Silicone-Coated Spandrel Glass: ASTM C 1048, Condition C, Type I, Quality-Q3, and complying with other requirements specified.
 - 1. Basis of Design Product: Opacicoat-300 by ICD Coatings or equal
 - 2. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Thickness of Coating: 6.50 mils dry, for fallout protection
- D. Ceramic-Coated Silk Screened Fritted Glass: ASTM C 1048, Type I, Condition B, Quality-Q3, and complying with other requirements specified.
 - 1. Basis of Design Product: Viraspan by Viracon or equal
 - 2. Color(s): As scheduled.
 - 3. Pattern: As scheduled.

2.4 FIRE RATED GLAZING

- A. Fire-Rated Glazing Product (Laminated Ceramic Glazing Material): Proprietary Category I and II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch nominal thickness; polished on both surfaces, weighing 4 lb/sq. ft.; and as follows:
 - 1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Polished on both surfaces, transparent.
 - 3. Product: "FireLite Plus Premium" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.
- B. Fire-Rated Glazing Product (Laminated Ceramic Glazing Material): Proprietary Category I and II safety glazing product in the form of multiple sheets of Pilkington Optiwhite high visible light transmission glass laminated with an intumescent interlayer.

1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Interior Glazing Thickness for 90 Minute Openings: Single lite, 1-7/16" thick (Product Designation 90-102 with minimum 84% daylight transmission).
3. Polished on both surfaces
4. Product: "Pilkington Pyrostop" by Nippon Sheet Glass Co., Ltd., and distributed by Technical Glass Products.

2.5 LAMINATED GLASS

- A. Laminated Glass: Comply with ASTM C 1172 for kinds of laminated glass indicated and other requirements specified, including those in the Laminated-Glass Schedule at the end of Part 3.
- B. Interlayer: Interlayer material as indicated below, clear or in colors, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 1. Interlayer Material: Polyvinyl butyral sheets
 2. Interlayer Thickness: .030" except provide .060" thickness for laminating two lites of heat strengthened glass together, and where scheduled.
 3. Interlayer Color: Clear.
- C. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets as follows:
 1. Laminate lites with polyvinyl butyral interlayer in autoclave with heat plus pressure.
- D. Security Glazing: laminated glass product consisting of outer layers of glass with a custom security, heat strengthened, chemically bonded core. The patent pending core reacts to physical abuse like metal and will bend, but will not tear or rip like other security products. Security glazing shall be designed to replace glass used in openings that would normally be glazed with 1/4" or 5/16" glass.
 1. Basis of Design Product: SG5 by School Guard glass, or equal.
 2. Ratings:
 - a. UL972
 - b. 5-aa1 rated for 12 minutes
 - c. ASTM F1233 Class 1.4 (tested to 5 minutes of class 1.5 until failure)

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated. Provide heat soaked glass where scheduled.
- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. Sealing System: Dual seal, with primary and secondary sealants as follows:
 1. Manufacturer's standard sealants.
- D. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 1. Aluminum with mill or clear-anodized finish.
 2. Desiccant: Molecular sieve or silica gel, or blend of both.
 3. Corner Construction: Manufacturer's standard corner construction.

2.7 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.
 4. Field-applied sealants shall have a VOC content of not more than 250 g/L.
- B. Single-Component Neutral-Curing Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 50; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
 1. Products:
 - a. Dow Corning Corporation; 791.
 - b. Dow Corning Corporation; 795.
 - c. GE Silicones; SilPruf NB SCS9000.
 - d. GE Silicones; UltraPruf II SCS2900.
 - e. Pecora Corporation; 865.
 - f. Pecora Corporation; 895.
 - g. Pecora Corporation; 898

- C. Glazing Sealants for Fire-Resistive and Fire Protective Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
- B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- C. Glazing Tapes for Fire-Resistive and Fire Protective Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.9 GLAZING GASKETS

- A. Glazing gaskets for storefront and entrance systems are specified in Division 08 Section "Aluminum-Framed Storefronts and Entrances".
- B. Glazing gaskets for glazed aluminum curtain wall systems are specified in Division 08 Section "Glazed Aluminum Curtain Walls."
- C. Glazing gaskets for all other sliding and swinging glazed doors and panels systems and glazed walls are specified in their respective Division 08 Sections.
- D. Glazing gaskets for metal-framed skylights are specified in Division 08 Section "Metal-Framed Skylights."

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Silicone elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating

2.11 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.8 GLASS SCHEDULE

A. Exterior Glazing:

- 1. Exterior Doors: Provide 1 inch insulated tempered glass as follows:
 - a. Outboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass
 - d. Performance Characteristics:
 - 1) Visible Light Transmittance: Min 64%.
 - 2) Winter Nighttime U-Value: Max. 0.24
 - 3) Solar Heat Gain Coefficient (SHGC): Max. 0.27
 - 4) Light to Solar Gain: 2.37
 - 5) Outdoor Visible Light Reflectance: 12%
- 2. Bottom Panels of Storefront and Entrance Framing and Bottom Panels of Curtainwall Framing (including sidelites and transoms): Provide 1 inch insulated tempered glass as follows:
 - a. Outboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass, low-E coated on the second surface.

- 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) glass
 - d. Performance Characteristics:
 - 1) Visible Light Transmittance: Min 64%.
 - 2) Winter Nighttime U-Value: Max. 0.24
 - 3) Solar Heat Gain Coefficient (SHGC): Max. 0.27
 - 4) Light to Solar Gain: 2.37
 - 5) Outdoor Visible Light Reflectance: 12%
3. Storefront Framing used for Fixed Windows, Operable Vents and Upper Panels of Curtainwall Framing and Storefront Framing: Provide 1 inch insulated glass as follows:
- a. Outboard Lite: 1/4-inch thick clear, annealed glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, annealed glass
 - d. Performance Characteristics:
 - 1) Visible Light Transmittance: Min 64%.
 - 2) Winter Nighttime U-Value: Max. 0.24
 - 3) Solar Heat Gain Coefficient (SHGC): Max. 0.27
 - 4) Light to Solar Gain: 2.37
 - 5) Outdoor Visible Light Reflectance: 12%
4. Curtainwall and Storefront Spandrel Glazing: Provide 1 inch insulated glass, as follows:
- a. Outboard Lite: 1/4-inch thick clear, heat strengthened (Kind HS) float glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, heat strengthened (Kind HS) float glass, with silicone coating on the #4 surface
 - 1) Silicone Coating: Opacicoat-300 by ICD Coatings
 - 2) Color: As selected by Architect.
5. Entrance Framing and Doors at Gymnasium Locations: Provide 1 inch insulated laminated and tempered glass units as follows:
- a. Outboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) low-E coated on the second surface.

- 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, laminated glass.
 - d. Performance Characteristics:
 - 1) Visible Light Transmittance: Min 64%.
 - 2) Winter Nighttime U-Value: Max. 0.24
 - 3) Solar Heat Gain Coefficient (SHGC): Max. 0.27
 - 4) Light to Solar Gain: 2.37
 - 5) Outdoor Visible Light Reflectance: 12%
6. Clerestory Windows at Gymnasium Locations: Provide 1 inch insulated laminated and heat strengthened glass units as follows:
- a. Outboard Lite: 1/4-inch thick clear, heat strengthened (Kind HS) low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, laminated glass with white translucent interlayer (by Viracon or equal.)
7. Storefront Used for Fixed Windows at Transom Locations: Provide 1-inch insulated fritted glass, as follows:
- a. Outboard Lite: 1/4-inch thick clear, heat strengthened (Kind HS) float glass, low-E coated on the second surface and ceramic-coated silk screen fritted pattern on second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - 2) Ceramic-Coated Silk Screened Pattern: Viraspan 30% or 40% coverage (as selected by Architect), 1/8" dot pattern
 - a) Pattern: Screen 5006
 - b) Color: White opaque frit V175
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, annealed glass.
8. Storefront Framing used for Fixed Windows and Operable Vents (for acoustic ratings, where indicated): Provide 1-3/4 inch triple glazed insulated glass as follows:
- a. Outboard Lite: 1/4-inch thick clear, annealed glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: 1/2 inch, argon filled.

- c. Center Lite: 1/4-inch thick clear, annealed glass
 - d. Air Space: 1/2 inch, argon filled.
 - e. Inboard Lite: 1/4-inch thick clear, annealed glass
9. Metal-Framed Skylights: Provide 1-7/16 inch insulated glass, as follows:
- a. Outboard Lite: 3/8-inch thick clear, heat strengthened (Kind HS) float glass, low-E coated on the second surface and ceramic-coated silk screen fritted pattern on second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.).
 - 2) Ceramic-Coated Silk Screened Pattern: Viraspan 30% or 40% coverage (as selected by Architect), 1/8" dot pattern
 - a) Pattern: Screen 5006
 - b) Color: White opaque frit V175
 - b. Air Space: 1/2 inch, argon filled.
 - c. Inboard Lite: 9/16-inch thick clear, laminated glass.
 - 1) Provide two lites of annealed glass laminated together unless two lites of heat strengthened glass are required for strength.
 - 2) Interlayer Thickness: 0.060"
10. Insulated Tempered Glass for Folding Glass Storefront: Provide 15/16 inch insulated glass, as follows:
- a. Outboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) float glass, low-E coated on the second surface.
 - 1) Low-Emissivity Sputter Coating: Solarban 70; by Vitro Architectural Glass (formerly PPG Industries, Inc.)
 - b. Air Space: Argon filled.
 - c. Inboard Lite: 1/4-inch thick clear, fully tempered (Kind FT) float glass
- B. Interior Glazing, as Scheduled:
- 1. Non-Fire Rated Doors, Transoms, Sidelights and Borrowed Lights: 1/4 inch clear tempered glass.
 - 2. Fire Rated Doors, Transoms, Sidelights and Borrowed Lights: Laminated ceramic glazing material 5/16 inches thick; "FireLite Plus Premium" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.
 - 3. Fire Rated Doors Where Specifically Scheduled: 90 minute Pilkington Pyrostop glazing material, 1-7/16" thick, by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.
 - 4. Acoustic Rated Wood Doors: Dual glazed acoustic glazing with 1/4" and 3/8" laminated glass; adjust as required to match tested door assembly used on project.
 - 5. Security Glazing for Doors and Transaction Windows as Scheduled: SG5 laminated glass product by School Guard Glass, or approved equal.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the Following:

1. Fixed, extruded-aluminum louvers.

B. Related Sections Include the Following:

1. Division 07 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
2. Division 23 Sections for louvers that are a part of mechanical equipment.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: Uniform pressure (velocity pressure) of 18 lbf per sq. ft. acting inwards.

B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by

testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
- C. Samples for Verification: For each type of metal finish required.
- D. Product Certificates: Signed by manufacturers stating the location of the material manufacturer and the distance from the manufacturer to the Project site.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Product: The design for each louver is based on the product named. Subject to compliance with requirements, provide either the named product or approved equivalent by one of the other manufacturers specified.
 - a. Construction Specialties.
 - b. Airolite Co.
 - c. Reliable Metal Products.
 - d. Industrial Acoustics Company.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.T-52.

- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.
- D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.
 - 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.
- F. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Single Drainable-Blade Louver:
 - 1. Basis-of-Design Product: Ruskin Model ELF375DX Drainable Stationary Louvers.
 - 2. Finish: Fluoropolymer 3-Coat System.
 - 3. Depth: 4-inches.

4. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.081 inch.
5. Mullion Type: Fixed, hidden mullions shall allow for continuous line appearance for up to 120"
6. Performance Requirements:
 - a. Free Area: 54%.
 - b. Point of Beginning Water Penetration: 873 fpm at .01 oz/sf.
7. Sizes: Refer to Contract Drawings for sizes, configurations, and locations.
8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening. NO Insect screening allowed.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
- D. Louver Screening for Aluminum Louvers:
 1. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

2.6 BLANK-OFF PANELS

- A. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
 1. Thickness: 1 inch (25 mm).
 2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch (0.81-mm) nominal thickness.
 3. Insulating Core: Rigid, glass-fiber-board insulation.
 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard channel frames, with corners mitered and with same finish as panels.
 5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
 6. Panel Finish: As selected by Architect.
 7. Attach blank-off panels with clips.

2.7 FINISHES, GENERAL

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

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - a. Color(s): As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.

- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assembly.

1.3 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.

1.4 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: 1 hour and 2 hours 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: 2-1/2 inches (64 mm), 4 inches (102 mm) and 6 inches (152 mm) as indicated on the Partition Type Drawing.
 - 2. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
- 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. Room-Side Finish: As indicated.
- F. Shaft-Side Finish: Gypsum shaftliner board, moisture- and mold-resistant Type X.
- G. 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, 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 one of the following:
 - a. Lafarge North America, Inc.; Firecheck Type X Shaftliner.
 - b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
 - c. USG Corporation; Sheetrock Brand Gypsum Liner Panel.
 - d. American Gypsum; Shaft Liner.
 - 2. Thickness: 1 inch (25.4 mm).
 - 3. Long Edges: Double bevel.
- C. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Lafarge North America, Inc.; Firecheck Moldcheck Type X Shaftliner.
 - b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
 - c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.
 - 2. Thickness: 1 inch (25.4 mm).
 - 3. Long Edges: Double bevel.

4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. 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: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

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: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool; Provide mineral-fiber SAFB.

F. Acoustical Sealant: As specified in Section 079200 "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 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."
- B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 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. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) 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. 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.
 - 1. Install control joints on 30 foot maximum centers, for all partitions, at locations indicated, and as detailed. Align control joints with door frames wherever possible, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- G. 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.
- H. 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.
- I. 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.

3.4 IDENTIFICATION

- A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces.
 - 2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition.
 - 3. Include lettering not less than 0.5 inch (12.7 mm)) in height, incorporating the followings wording: "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other wording to reflect the wall type as indicated on the Code Summary Drawings.

3.5 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 092116.23

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- 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.
1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.0296 inch, 20 ga. (0.752 mm).
 - b. Depth: As scheduled on Drawings for each location.
- C. Slip-Type Head Joints: Provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous cold rolled channel bridging

- attached to each stud located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) ClarkDietrich; MaxTrak Slotted Deflection Track
 - 2) Steel Network Inc. (The); VertiClip SLD Series.
 - 3) Telling Industries; True-Action™ Slotted Track.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.033 inch, 20 ga. (0.84 mm).
- E. Cold-Rolled Channel Bridging and Bracing: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 1-1/2 inches (38 mm) unless otherwise indicated.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 2. Depth: 7/8 inch (22.2 mm) unless otherwise indicated.
- G. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical.
- H. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: 3/4 inch (19 mm) unless otherwise indicated.
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, chemical anchor or postinstalled, expansion anchor.
 - 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: 1-1/2 inches (38 mm) unless otherwise indicated on Drawings.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
 - 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.018 inch, 25 ga. (0.45 mm).
 - b. Depth: As indicated on Drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
 - 4. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 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. Armstrong World Industries, Inc.; Drywall Grid Systems.

- b. Chicago Metallic Corporation; Drywall Grid System.
- c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.
- C. Pre-compressed Spring Hangers for Sound Isolation: Ceiling Hangers shall be fail safe and include a steel frame containing an AASHTO Bridge Bearing Quality LDS Rubber Element at the top and a nominal 1" deflection steel spring at the bottom. Springs shall be seated in an LDS cup with a rubber bushing extending through the box to prevent metal to metal contact between the steel suspension rod and the frame. Dynamic Stiffness of Cup and Element shall not exceed 1.4. The ID of the bushing must allow a 30° swing from side to side before rod contact. Springs shall be factory precompressed to 70% of the assigned deflection.
 - 1. Basis of Design product: Mason Industries 30NCC for 1-1/2 x 1/2 channel,.
 - 2. Submittals shall confirm AASHTO Quality and Dynamic Stiffness in addition to deflection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- E. Cutting, Notching and Boring Holes in Nonstructural Steel Wall Framing:
 1. Flanges and lips of nonstructural steel wall studs shall not be cut or notched.
 2. Holes in webs of nonstructural steel wall studs shall be permitted along the centerline of the web of the framing member, shall not exceed 1-1/2 inches (38 mm) in width or 4 inches (102 mm) in length, and the holes shall not be spaced less than 24 inches (610 mm) center to center from another hole or less than 10 inches (254 mm) from the bearing end.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 1. Space studs at 16 inches (406 mm) o.c. unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions

are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - a. Sound Isolation pads shall be installed as a continuous resilient layer separating the base and/or top plate of the stud wall assembly from the non-isolated floor and/or ceiling deck where shown on drawings. Wallboard shall be cut and installed to allow a 1/4" to 3/8" gap at the isolation joint for the installation of resilient non-hardening acoustical caulking.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.
- D. Install steel studs used as furring with clip angles at midpoint of wall span. Install additional clips to limit deflection to L/240 for walls finished with gypsum wall board and L/360 for walls finished with tile or plaster when subject to 5 psf (239 Pa) lateral load.
- E. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Isolate suspension systems from building structure to provide sound dampening using spring hangers where indicated on Drawings.
- D. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to 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.
- E. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092800 - GLASS-REINFORCED GYPSUM FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following preformed products for interior use, fabricated in glass-reinforced gypsum:
 - 1. Column covers.
- B. Related Work include the following:
 - 1. Framing and furring for items requiring anchorage are specified in Division 05 Section "Metal Fabrications."
 - 2. Blocking, nailers, and shims for items requiring anchorage are specified in Division 06 Section "Miscellaneous Carpentry."
 - 3. Finishing of column covers is specified in Division 09 Section "Ceramic Tile."

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Fabricate and install glass-reinforced gypsum units to withstand, without failure or cracking, loads from gravity and structural movement, including thermally induced movement, and to resist other conditions of in-service use that the building will experience.

1.3 ACTION SUBMITTALS

- A. Product data for each type of product specified.
- B. Shop drawings showing thickness, finish, ornamentation, tolerances, and anchorage details. Indicate attachment methods, imbedded supports, reinforcement, fabrication, joint treatments, and supports.
- C. Samples for verifying glass-reinforced gypsum units. Show the full range of variations in detail expected.
 - 1. Glass-Reinforced Gypsum Units: 2-foot- (0.50-m-) long section with finished joint, typical of the units specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer certificates signed by manufacturer certifying that Installers comply with requirements under "Quality Assurance" Article.

- B. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed glass-reinforced gypsum installations similar in material, design, and extent to that indicated for this Project and with a construction record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer must be able to show that he has at least 5 years experience in this type of work, has experienced personnel, physical facilities, established quality control procedures and management capacity sufficient to produce the required parts without causing delay of the project.
- C. Single Source Responsibility for Glass-Reinforced Gypsum Materials: Obtain glass-reinforced gypsum fabrications from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum units with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- E. Mockups: Prior to installing glass-reinforced gypsum units, construct mockups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Locate mockups on site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Apply specified tile finish to column covers.
 - 4. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 5. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.
- F. Engineering Responsibility: Engineer glass-reinforced gypsum units by qualified professional engineer legally authorized to practice in the jurisdiction where Project is located.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver glass-reinforced gypsum units in factory-wrapped crates, packaged to keep units dry and free of moisture.
- B. Store glass-reinforced gypsum units at Project site to prevent cracking, distortion, warping, staining, or other physical damage.
- C. Comply with manufacturer's recommendations for storing and handling units.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabricating glass-reinforced gypsum units and show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Enclosure and Environmental Limitations: Do not install glass-reinforced gypsum units until space is enclosed and weatherproof, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
 - 1. Acclimatize glass-reinforced gypsum units by removing packaging and storing in the installation space not less than 48 hours before installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by Castle Access Panels and Forms Inc. or equal products of one of the following:
 - 1. Decoform Corporation
 - 2. Casting Designs, Inc.
 - 3. GRG Technologies
 - 4. Plastrglas.

2.2 MATERIALS

- A. Gypsum Material: Provide alpha-based, calcined gypsum produced from materials complying with ASTM C 22.
- B. Glass Fibers: Comply with ASTM D 578 "E" glass type chopped into 1 inch lengths.
- C. Glass-Reinforced Gypsum Units: Glass fiber shall be 5 to 6 percent by weight of gypsum and glass mixture. Provide units identical to those tested for the following performance characteristics, per test method indicated below, by testing and inspecting organizations acceptable to authorities having jurisdiction.
 - 1. Hardness: 95 RH min Rockwell Scale.

2. Modulus of Rupture 3200 - 3500 psi when tested in accordance with ASTM C 109.
3. Modulus of Elasticity: 2.7 - 3.8 x 10⁶ psi when tested in accordance with ASTM C 109.
4. Coefficient of Linear Thermal Expansion: 8 x 10⁻⁶ inch/inch/deg F when tested in accordance with ASTM D 696.

- D. Material Compatibility: Provide GFRG products with surface characteristics prepared for mortar attachment of ceramic tile.

2.3 MISCELLANEOUS MATERIALS

- A. Embedded or Inserted Hardware: Complying with ASTM A 641, and integrated into the members without visibility on the finish face.
- B. Fasteners: Self-tapping gypsum wallboard screws.
- C. Adhesives: As recommended in manufacturer's printed instructions, and meeting VOC requirements of jurisdiction.
- D. Sealants: Refer to Section 079200 for sealant materials.

2.4 FABRICATION

- A. Basis of Design Product: GFRG Column Covers by Castle Access Panels & Forms, Inc. or equal.
1. Shape: Round
 2. Diameter: 30" and 28" (capital)
 3. Column Base: Mounted on concrete base.
 4. Column Top: Recessed capital, as indicated on Drawings.
 5. Shaft: Straight
 6. Shell Thickness: Minimum 1/4", and minimum 1/2" at edges.
 7. Appearance: Seamless.
- B. Fabricate units as large as possible to minimize joints.
- C. Fabricate units with smooth finished surfaces, prepared to accept application of ceramic tile finish. Repair hollows, voids, scratches, and finish surface imperfections.
- D. Dimensional Tolerances of Units: As follows:
1. Warpage or Bowing: Plus or minus 1/16 inch.
 2. Dimensional, all Directions: Plus or minus 1/8 inch.
 3. Plane Surface Straightness: Plus or minus 1/8 inch.
 4. Overall Assembled Length and Width: Plus or minus 1/8 inch per 10 feet.
 5. Out of Round: Plus or minus 1/16 inch.
 6. .

- E. Construct molds for column cover units of materials resulting in smooth, finished products conforming to profiles and dimensions indicated.
- F. Combine glass fiber and matrix slurry at rates to achieve desired mix proportions and glass content, and sprayed in accordance with manufacturer's instructions.
- G. Embed indicated or required inserts in matrix to develop full strengths. Embed items after required minimum body thickness have been achieved.
- H. Form columns to dimensions indicated. Tolerance as specified. Curved panels accurately formed to radii. Fabricate column covers in two sections with vertical butt joint, suitable for field finishing.
- I. Carefully remove units from molds and repair hollows, voids, scratches and other surface imperfections. Surface shall be primer ready.
- J. Factory fabricate accessories and trim components, hardware, including attachment devices, ready for installation.
- K. Provide base and ceiling joints as indicated, or if not indicated, as per manufacturer's standard detail.

2.5 FINISH

- A. Column cover panels shall be free of scratches and blemishes; column covers to be field finished as specified in Division 09 Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions with Installer present for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of glass-reinforced gypsum units. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install glass-reinforced gypsum units plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
- B. Erection Tolerances: As follows:
 - 1. Plane Alignment (Panel to Panel): 1/16 inch (1.6 mm).
 - 2. Variation from Plumb: Plus or minus 1/8 inch (3.2 mm) per 10 feet (3 m).
 - 3. Variation from Straightness: Plus or minus 1/4 inch (6.3 mm) per 25 feet (7.6 m).
 - 4. Assembly Deflection: Not greater than the length of the assembly divided by 240.

5. Joint Alignment: Not more than 1/8 inch (3.2 mm).
 6. Joint Width: Not more than 3/8 inch (9.5 mm).
- C. Predrill fastener holes in ornamentation. Clean fastener holes, removing dirt and oil.
 - D. Screw fasteners in place by hand. Do not use pneumatic staple guns. Countersink flathead screws.
 - E. Fasteners as required to comply with dimensional tolerances and not less than 5/16 inch (7.9 mm) from edge and end.
 - F. Patch fastener holes with bedding compound and fiberglass tape applied flush with finish face. Sand patch smooth and level.
 - G. Attach pieces at joints with adhesive, and band or brace together until adhesive is cured. Cure adhesive according to manufacturer's printed instructions.
 - H. Joint Finishing: Comply with ASTM C 840. Provide smooth and contiguous surface.

END OF SECTION 092800

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Cement board.
3. Sound-attenuation blankets

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.3 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. 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 recommendations, 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, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corp.
 - 2. Georgia-Pacific Gypsum LLC.
 - 3. Lafarge North America Inc.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch (12.7 mm).
 - 2. Where drawings indicate regular type 5/8 inch (15.9 mm), provide 5/8 inch (15.9 mm) Type X indicated below.
 - 3. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces, in 5/8 inch thickness unless otherwise indicated, with tapered edges; panels shall be classified as Type X

1. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
2. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. National Gypsum Company; Type XP/PR
 - b. United States Gypsum Co.; Mold Tough

E. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Performance Data:
 - a. Surface Abrasion: ASTM C1629. Classification Level 2
 - b. Surface Indentation: ASTM C1629. Classification Level 1
 - c. Soft-body Impact Test: ASTM C1629. Classification Level 1
5. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. Protecta AR 100 Type X with Mold Defense; Lafarge North America Inc.
 - b. ProRoc Gypsum Board Panels; CertainTeed, Division of BPB.

F. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch (6.4 mm).
 - a. Long Edges: Tapered

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. CertainTeed Corp.; ProRoc Type C.
 - b. Lafarge North America Inc.; Firecheck Type C.
 - c. National Gypsum Company; Gold Bond Fire-Shield C.
 - d. USG Corporation; Firecode C Core.
2. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.
3. Long Edges: Tapered.
4. Provide where required by UL Design or NER 258.

B. Acoustic (Sound Dampening) Gypsum Board: Multi-layer gypsum panel engineered to provide maximum sound attenuation across a broad frequency range, meeting ASTM C1396, Federal Specification SS-L-30D Type III & Grade X.

1. Thickness: 1-3/8 inch.
2. Edges: Tapered
3. Core: Type X Core, UL Core Type QR545
4. Faces: 100% recycled paper on front, back and long edges
5. STC-rated Assemblies (per ASTM E90): 60-80
6. Flame Spread (per ASTM E84): Class A
7. Basis of Design product: QuietRock 545 by PABCO Gypsum, or equal.

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 one of the following:
 - a. CertainTeed Corp.; FiberCement BackerBoard.
 - b. Custom Building Products; Wonderboard.
 - c. James Hardie Building Products, Inc.; Hardiebacker 500.
 - d. National Gypsum Company, Permabase Cement Board.
 - e. USG Corporation; DUROCK Cement Board.
 2. Thickness: 1/2 inch (12.7 mm) or 5/8 inch (15.9 mm) as indicated.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized-coated steel sheet or rolled zinc
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. Expansion (control) joint.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 3. Finish:
 - a. Curved Drywall Trim: Corrosion-resistant primer compatible with joint compound and finish materials specified.
 - b. Extruded Aluminum Partition Closures: Clear anodized aluminum.
 4. Basis of Design Products:
 - a. Curved Drywall Trim: Provide Contura curved drywall trim by Gordon Inc. for locations indicated on the Drawings, in sizes required.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use factory mixed drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use factory mixed drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 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: Provide mineral-fiber SAFB where required by the UL assembly.
- E. Acoustical Joint Sealant: As specified in Section 079200 "Joint Sealants"

- F. Sealant for Acoustical (Sound Dampening) Gypsum Board: QuietSeal Pro by PABCO Gypsum, or equal.
- G. Wrap for Electrical Devices in Acoustical (Sound Dampening) Gypsum Board Construction: QuietPutty by PABCO Gypsum, or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
 - 1. Refer to Section 079200 for additional requirements.
 - 2. For assemblies containing acoustical (sound dampening) gypsum board, comply with manufacturer's directions for complete sound sealed installation. Seal room perimeter with recommended sealant and wrap electrical units with putty as per manufacturer's directions.
- 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: Vertical surfaces unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Abuse-Resistant Type: As indicated on Drawings.
 - 4. Moisture- and Mold-Resistant Type: As indicated on Drawings.
 - 5. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 6. Acoustical (Sound Dampening) Type: As indicated on Drawings.
 - 7. Flexible Type: Apply in double layer at curved assemblies.
- 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 vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. 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 (400 mm) 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.

A. 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 recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

B. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
- 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.

1. Install control joints on 30 foot maximum centers, for all partitions, at locations indicated, and as detailed. Align control joints with door frames wherever possible, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
2. Install control joints at 50 foot maximum centers, with areas not to exceed 2,500 sq. ft. for all ceiling areas, at locations indicated, and as detailed.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.

4. L-Bead: Use where indicated.
5. Curved-Edge Cornerbead: Use at curved openings.

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. 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 all panel surfaces that will be exposed to view unless otherwise indicated.
 4. Level 5: Provide Level 5 finish at all areas where wall washed lighting is indicated and at surfaces scheduled to receive gloss paint, and elsewhere specifically indicated on Drawings and schedules.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 IDENTIFICATION

- A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 1. Be located in accessible concealed floor, floor-ceiling or attic spaces.
 2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition.
 3. Include lettering not less than 0.5 inch (12.7 mm)) in height, incorporating the followings wording: "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other wording to reflect the wall type as indicated on the Code Summary Drawings.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093100 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Porcelain tile
2. Ceramic tile
3. Quarry tile
4. Trim and edge accessories.
5. Waterproof membrane for tile installations
6. Stone thresholds.

B. Sealing of expansion, contraction, control, and isolation joints in tile surfaces is specified in Division 07 Section "Joint Sealant."

1.2 ACTION SUBMITTALS

A. Product data for each type of product specified.

B. Samples of each color of tile, marble threshold, or accessory to be provided, for verification purposes.

C. Samples of grout demonstrating full range of colors available, for initial selection purposes.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, plus other information specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer Qualifications: Engage an experienced Installer who has successfully completed tile installations similar in material, design, and extent to that indicated for Project.

- D. Unit Mock-up: Provide mock-up on a board min. 2' x 2' in size, one for each different tile and grout color to be provided in the work; for final approval of grout color before ordering grout.
- E. In-Place Mock-up: Prepare mock-ups of types indicated below following requirements of this section. Reprepare mock-ups as many times as required by Architect until satisfactory result is obtained, as judged solely by Architect. Obtain Architect's approval of visual qualities before proceeding with work. Protect approved mock-ups until all work has been completed. Approved mock-ups will represent the minimum standard of acceptability for each portion of the work.
 - 1. Provide in-place sample minimum 5' x 5' of typical flooring layout in location directed by Architect.
 - 2. Provide mock-up of mosaic tile installed on one GFRG column as specified in Section 092800.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.7 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as ceramic tile installed. Furnish 5% of each type and color of flooring material and 2% of each type and color of wall tile material provided in the work. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturers: The design for each tile type and other material specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
1. Tile:
 - a. American Olean; Div. of Dal-Tile International Corp
 - b. Creative Materials Corp.
 - c. Crossville Inc
 - d. Daltile; Div. of Dal-Tile International Inc.
 - e. Garden State Tile
 - f. Olympia Tile
 - g. Florida Tile Industries, Inc.
 - h. Summitville Tiles, Inc.
 - i. United States Ceramic Tile Company
 2. Mortars and Grouts:
 - a. Bostik Construction Products Div. (Hydroment)
 - b. Laticrete International Inc.
 - c. Mapei Corp.
 - d. TEC Specialty Construction Brands Inc.
 3. Waterproofing Membranes: The Noble Co.
 4. Termination, Trim and Transition Strips: Schluter

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.
1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Match color, texture, and pattern indicated by reference to manufacturer's standard designations for these characteristics.
 2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

- E. Large Format Tiles: Large format tiles are defined to be tiles with any one single side larger than 15".

2.3 TILE PRODUCTS

- A. Porcelain Floor Tile FT1: Provide flat tile complying with the following requirements:

1. Module Size: 12" x 24"
2. Thickness: 3/8"
3. Finish: Matte
4. Color: Park Lane Gray SO47
5. Basis of Design Product: Daltile "Society" or equal.
6. Location: Single user toilet rooms
7. Pattern: Running bond 1/3 overlap.
8. Grout Color: Laticrete #78 Sterling Silver

- B. Porcelain Floor Tile FT2: Provide flat tile complying with the following requirements:

1. Module Size: 12" x 24"
2. Thickness: 9.5mm
3. Finish: Velvet
4. Color: Grigio
5. Basis of Design Product: "Purestone" by Ceramiche Piemme or equal.
6. Location: At ramps where scheduled.
7. Pattern: Running bond 1/3 overlap.
8. Grout Color: Laticrete #89 Smoke Grey

- C. Quarry Tile Floor QT: Provide flat tile complying with the following requirements:

1. Module Size: 8" x 8"
2. Thickness: 1/2"
3. Finish: Textured, matte finish
4. Surface: Non-abrasive
5. Color: Ashen Grey OTO3
6. Basis of Design Product: Daltile "Quarry Tile Textures" or equal.
7. Location: Kitchen/food service
8. Grout Color: Laticrete #24 Natural Grey

- D. Porcelain Wall Tile WT1 through WT4: Provide flat tile complying with the following requirements:

1. Module Size: 12" x 24" rectified
2. Thickness: 8 mm
3. Finish: Polished
4. Colors: See Drawing A508 for wall finish elevation types which include a combination of the colors for all walls; combination vary on each level. Colors include:
 - a. PT1-Grey #11
 - b. PT2-Grey #12

- c. PT5-Turquoise 11
 - d. PT3-Blue 12
 - e. PT4-Bright Green 11.
 5. Basis of Design Product: Creative Materials Corp. "Bellissimo" or equal.
 6. Location: Corridors
 7. Pattern: Running bond 1/3 overlap.
 8. Grout Color: Laticrete #89 Smoke Grey and/or #78 Sterling Silver as determined during mock-up preparation.
- E. Porcelain Mosaic Wall Tile WT6 through WT8: Provide flat tile complying with the following requirements:
1. Module Size: 1 by 1 inches
 2. Sheet Size: 12" x 12"
 3. Nominal Thickness: 3/16 inch.
 4. Mount Type: Mesh mounted.
 5. Shape: Penny rounds
 6. Finish: Gloss
 7. Colors:
 - a. WT6: RR07 Yellow
 - b. WT7: RR11 Cobalt Circle
 - c. WT8: RR12 Smoky Gray
 8. Basis of Design Product: Daltile "Retro Rounds" or equal.
 9. Location: Accent at Cafeteria.
 10. Grout Color:
 - a. WT6: Laticrete #44 Bright White
 - b. WT7 and WT8: Laticrete #42 Platinum and/or #88 Silver Shadow as determined during mock-up preparation
- F. Ceramic Wall Tile WT9: Provide flat tile complying with the following requirements:
1. Module Size: 3" x 9"
 2. Thickness: 10mm
 3. Finish: Glossy
 4. Color: White
 5. Basis of Design Product: Creative Materials Corp. "Coloration" or equal.
 6. Location: Multiuser toilet room field
 7. Pattern: Running bond 1/3 overlap.
 8. Grout Color: Laticrete #42 Platinum, final approval as determined during mock-up preparation.
- G. Ceramic Wall Tile WT10: Provide flat tile complying with the following requirements:
1. Module Size: 3" x 9"
 2. Thickness: 10mm
 3. Finish: Gloss
 4. Colors:

- a. CT1 Accent on Second Floor: Green 03
 - b. CT2 Accent on Third Floor- Blue 02)
 - c. CT3 Accent on 4th floor- Blue 05
 - d. CT4 Accent at Entry on First Floor Classrooms- Coloration Yellow 01
5. Basis of Design Product: Creative Materials Corp. "Coloration" or equal
 6. Location: Accent at toilet rooms, unless otherwise indicated.
 7. Pattern: Running bond 1/3 overlap.
 8. Grout Color: Laticrete #44 Bright White
- H. Ceramic Wall Tile WT11: Provide flat tile complying with the following requirements:
1. Module Size: 3" x 6"
 2. Thickness: 5/16"
 3. Finish: Glossy
 4. Color: Arctic White 0190
 5. Basis of Design Product: Daltile "Colorwheel Collection - Classic" or equal.
 6. Location: Single user toilet rooms field
 7. Pattern: Running bond 1/3 overlap.
 8. Grout Color: Laticrete #44 Bright White
- I. Ceramic Wall Tile WT12: Provide flat tile complying with the following requirements:
1. Module Size: 8" x 8"
 2. Finish: Matte
 3. Color/Pattern: Sapphire Colours
 4. Basis of Design Product: Wayne Tile "Valencia" or equal.
 5. Location: Circulation desk in Learning Commons.
 6. Grout Color: Laticrete #88 Silver Shadow
- J. Porcelain Wall Tile WT13: Provide flat tile complying with the following requirements:
1. Module Size: 12" x 24"
 2. Thickness: 8 mm
 3. Finish: Matte
 4. Color: Linen
 5. Basis of Design Product: Garden State Tile "Quill" or equal.
 6. Location: Lobby walls
 7. Installation: Install on end (vertically) running bond
 8. Grout Color: Laticrete #90 Light Pewter, final approval as determined during mock-up preparation.
- K. Trim Units: Provide tile trim units with inside and outside corners and to comply with following requirements:
1. Ceramic Wall Base WTB: Sanitary cove base Daltile Classic Collection , 6"H Color: Desert Grey X114.
 - a. Base with Flat Top: Provide at all single user toilet rooms.

- b. Base with Bullnose Cap: Provide at Community Building basement (locker rooms) toilet rooms.
 - c. Grout Color: Match floor tile; provide Laticrete #78 Sterling Silver.
2. Quarry Tile Base: Daltile cove base Q3585 4" x 8" matching quarry tile floors.
 - a. Grout Color: Match floor tile; provide Laticrete #24 Natural Grey.
 3. For Coordination Purposes: Precast terrazzo sanitary base 6"h at Multiuser toilet rooms to match specified flooring color (terrazzo base is specified in Section 096623.)
 4. Single User Toilet Room: At wainscot height tile cap with Daltile Jolly S-1/212J, ½" x 12" in Arctic White

2.4 STONE AND PRE-CAST TERRAZZO THRESHOLDS

- A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.
 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.
 1. Provide white marble thresholds.
 2. Provide at single-user toilet rooms, locker room, gender neutral loading dock toilet room, and elsewhere as scheduled.
- C. Precast Terrazzo Thresholds: Provide at toilet room locations where scheduled, thresholds shall match adjacent terrazzo floors; terrazzo thresholds are specified in Section 096623.

2.5 WATERPROOFING/CRACK ISOLATION FOR TILE INSTALLATIONS

- A. General: Provide products that comply with ANSI A118.10 and the descriptions in this Article.
- B. Polyethylene-Sheet Waterproofing: Manufacturer's standard proprietary product consisting of composite sheets, 60 inches (1524 mm) wide by a nominal thickness of 0.030-inch (0.76 mm), composed of an inner layer of nonplasticized, chlorinated polyethylene sheet faced on both sides with laminated, high-strength, nonwoven polyester material, designed for embedding in latex-portland cement mortar and as the substrate for latex-portland cement mortar setting bed. Provide at all locations for thin-setting.
 1. Products: Provide Nobleseal TS manufactured by the Noble Company, or approved equal.

2. Location: Use at all thin set tile floors in bathrooms.

2.6 SETTING MATERIALS

- A. Medium-Bed, Latex-Portland Cement Mortar. Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of up to 3/4 inch. Provide one of the following, or approved equal:
 1. MegaLite® Ultimate Crack Prevention Large Format Tile Mortar by Custom Building Products.
 2. 4-XLT by Laticrete.
 3. Large Tile and Stone Mortar by Mapei
- B. Latex-Portland Cement Mortar: Two component mortar system, comply with ANSI A118.4. Provide one of the following, or approved equal:
 1. Laticrete 317 with Laticrete 333 additive; Laticrete International, Inc.
 2. Kerabond with Keralastic; Mapei Corp.
 3. Or equivalent.

2.7 GROUTING MATERIALS

- A. Water-Cleanable Epoxy Grout for General Use: ANSI A118.3. with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Grout shall be stain resistant, color fast, mold and mildew inhibiting, non-sag, suitable for joints 1/16" to 1/2" and sanded type suitable for installing with glazed tiles.
 1. Basis of Design Product: Laticrete "Spectralock Pro Epoxy Grout" or equal.
 2. Colors: As selected by Architect.
- B. Chemical-Resistant Epoxy Grout for Unglazed Quarry Tile: ANSI A118.3; provide the following, or approved equal, in colors as selected by Architect:
 1. SP-100 Stainless Epoxy Grout; Laticrete International, Inc.
 2. Kerapoxy; Mapei Corp

2.8 MISCELLANEOUS MATERIALS

- A. Metal Edge Strips: Zinc alloy or stainless steel terrazzo strips, 1/8-inch wide at top edge with integral provision for anchorage to mortar bed or substrate unless otherwise indicated.
- B. Notched Trowel: Use type recommended by tile manufacturer for setting large-format tiles, for setting bed thickness utilized.
- C. Termination, Trim and Transition Strips: Provide Schluter units in Type 304 stainless steel as scheduled below, or indicated on Drawings.
 1. At all floor tile color transitions provide Schluter "SCHIENE E-100".

2. Wall Tile Outside Corners Trim and Top Cap of Corridor Wall Tile: RONDEC by Schluter or equal.
- D. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- E. Grout Release: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 1. Mapei "UltraCare Grout Release".
 2. Miracle Sealants Co. "511 Impregnator"
- F. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- G. Grout Sealers: Water-based sealer for tile for protection from stains, as follows:
 1. Mapei "UltraCare Grout Sealer".
 2. Miracle Sealants Co. "511 Impregnator"

2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 4. Perform moisture test at rate of one per 2,000 sq.ft.

5. Verify that concrete substrates are within the flatness tolerances required for setting large format tiles.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.

- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for tile application.

- C. Remove coatings, including curing compounds, and other substances that could interfere with adhesion of tile by using a grinder, sander, or polishing machine with a heavy-duty wire brush.

- D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

- E. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in 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.

- F. Transitions: Transitions of floor surfaces must be level. Use transition and edge pieces as required to obtain level abutting surfaces, meeting ADA requirements.

- G. For large format tiles thin-set with medium bed mortar, provide the following surface preparation:

1. Level substrates to 1/8-inch variance in 10 feet, with no more than 1/16 inch variation in 24 inches by one of the following methods:
 - a. Provide self-leveling hydraulic cement underlayment throughout project where new floor tile is installed.
 - b. Grind concrete floor substrates and patch with trowelable leveling and patching compound to achieve indicated flatness.
 - c. Skim coat and patch wall surfaces using manufacturer approved trowel-applied cement-based compound to bring surface into acceptable tolerances.

2. There shall be no abrupt irregularities greater than 1/32"

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation

of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation"; comply with TCNA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. 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 that plates, collars, or covers overlap tile.
 - 1. Cut and grind tile edges where they abut curved surfaces to produce a close and uniform abutting joint.
- E. Jointing Pattern: Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work
- F. Tile Patterns: Comply with pattern indicated on drawings.
- G. Expansion Joints: Provide expansion joints, control joints and pressure relieving joints of widths and at locations as per TCNA Handbook Construction #EJ171. Do not saw cut joints after installation of tiles.
 - 1. Sealing of joints is included in Division 07 Section "Joint Sealers."
- H. Apply grout release to tile surfaces prior to grouting. Prepare a small mock-up area of grout release application for Architect's approval before proceeding with application of grout release to installed tile surfaces.
- I. Grout tile to comply with ANSI A108.10.

3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR INSTALLATION METHODS

- A. Floor Tile: Install tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to types of subfloor construction, and grout types:
1. Concrete subfloor, TCNA F205, modified to comply with tile manufacturer's installation instructions, and as follows:
 - a. Bond Coat for Tile: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over subfloor.
 - b. Grout: Epoxy grout specified for general use.
 - c. Setting bed thickness shall be as required to produce finished floor surface at correct level for project.
 - d. Provide at non-wet floors.
 2. Concrete subfloor with waterproofing/crack suppression membrane, TCNA F205 modified to comply with membrane manufacturer's installation instructions, details on drawings and as follows:
 - a. Bond Coat for Membrane: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over subfloor.
 - b. Sheet membrane over bond coat, extend up walls 4 inches
 - c. Bond Coat for Tile: Medium-Bed, Latex-Portland Cement Mortar—ANSI A108.5 over membrane
 - d. Grout: Epoxy grout specified for general use.
 - e. Provide at toilet room floors.
 3. Quarry Tile, Concrete subfloor, TCNA F113 (thin set application), and as follows:
 - a. Bond Coat for Tile: Latex-portland cement mortar, ANSI A108.5 over subfloor.
 - b. Apply grout release prior to grouting.
 - c. Grout: Epoxy grout specified for quarry tile.
- B. Joint Widths:
1. Porcelain Tile: 3/32".
 2. Quarry Tile: 3/8"
- C. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- D. Transition Strips: Install at all edges where new tile meets existing flooring to ensure a smooth transition meeting ADA requirements.
- E. Stone and Pre-Cast Terrazzo Thresholds: Install stone thresholds at tile transitions at restrooms. Allow for bevel/chamfer as required. Set in same type of setting bed as abutting field tile unless otherwise indicated. Sealant is specified in Section 079200.

3.6 WALL INSTALLATION METHODS

- A. Wall Tile: Install tile to comply with requirements indicated below for setting-bed methods, TCNA installation methods related to subsurface wall conditions, and grout types:
 - 1. Gypsum Board and Cement Board - TCNA W243, and as follows:
 - a. Bond Coat for Tile: Latex-portland cement mortar, ANSI A108.5 over gypsum board.
 - b. Grout: Epoxy.
 - 2. Concrete Masonry Units - TCNA W202, and as follows:
 - a. Bond Coat for Large Format Tile: Medium-Bed, Latex-Portland Cement Mortar, ANSI A108.5 over concrete masonry units.
 - b. Bond Coat for Other Tile: Latex-portland cement mortar, ANSI A108.5, over concrete masonry units.
 - c. Grout: Epoxy
- B. Joint Widths: 1/16".

3.7 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.
 - 1. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 093100

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.
- B. Related Sections include the following:
 - 1. Acoustical sealants are specified in Division 07 Section "Joint Sealants"

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product specified
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1:100
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on samples of size indicated below.
 - 1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.
- B. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- C. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer..
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency .
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as acoustical ceiling panels installed. Furnish 5% of each type and color of material provided in the work. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide specified products by Armstrong World Industries or equivalent products.

2.2 ACOUSTICAL PANELS

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
 - 2. Provide fire-resistance rated panels where indicated.
- B. Acoustical Panels for Acoustical Panel Ceiling ACT 1: Where this designation is indicated, provide panels complying with the following:
 - 1. Classification: Panels fitting ASTM E 1264 for Type IV, wet-formed mineral fiber with membrane-faced overlay; Form 2, water felted.
 - 2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) E (lightly textured).
 - 3. Color: White.
 - 4. Light Reflectance Coefficient: Not less than LR 0.85.
 - 5. Noise Reduction Coefficient: 0.85
 - 6. Ceiling Attenuation Class: 35
 - 7. AC: 170
 - 8. Fire Rating: Class A
 - 9. Sag Resistance Treatment: Armstrong HumiGuard Plus
 - 10. Anti-Mold and Mildew Treatment: BioBlock+
 - 11. VOC: GREENGUARD Gold Certified low VOC emissions
 - 12. Warranty: 30 year
 - 13. Edge Detail: Square tegular.
 - 14. Thickness: 1 inch.
 - 15. Size: 24 by 24 inches.
 - 16. Basis of Design Product: Armstrong CALLA #2822.
 - 17. Location: Corridors.

- C. Acoustical Panels for Acoustical Panel Ceiling ACT 2: Where this designation is indicated, provide panels complying with the following:
1. Classification: Panels fitting ASTM E 1264 for Type IV, wet-formed mineral fiber with membrane-faced overlay; Form 2, water felted.
 2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) E (lightly textured).
 3. Color: White.
 4. Noise Reduction Coefficient: 0.85
 5. Ceiling Attenuation Class: 35
 6. AC: 170
 7. Fire Rating: Class A
 8. Sag Resistance Treatment: Armstrong HumiGuard Plus
 9. Anti-Mold and Mildew Treatment: BioBlock+
 10. VOC: GREENGUARD Gold Certified low VOC emissions
 11. Warranty: 30 year
 12. Edge Detail: Square tegular.
 13. Thickness: 1 inch.
 14. Size: 24 by 48 inches.
 15. Basis of Design Product: Armstrong CALLA #2823.
 16. Location: Cafeteria
- D. Acoustical Panels for Acoustical Panel Ceiling ACT3: Where this designation is indicated, provide acoustical panels complying with the following:
1. Classification: Panels fitting ASTM E 1264 for Type III, wet-formed mineral fiber with painted finish; Form 1, nodular.
 2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) E (lightly textured).
 3. Color: White.
 4. Surface: Factory-applied latex paint
 5. Light Reflectance Coefficient: Not less than LR 0.85.
 6. Noise Reduction Coefficient: 0.75
 7. Ceiling Attenuation Class: 35
 8. AC: 170
 9. Fire Rating: Class A
 10. Sag Resistance Treatment: Armstrong HumiGuard Plus
 11. Anti-Mold and Mildew Treatment: BioBlock
 12. Low VOC Emissions: GREENGUARD Gold Certified
 13. Warranty: 30 year
 14. Edge Detail: Angled tegular
 15. Thickness: 7/8 inch.
 16. Size: 24 by 24 inches.
 17. Basis of Design Product: Armstrong Cirrus High NRC Tegular #556, or equal.
 18. Location: Classrooms.
- E. Acoustical Panels for Acoustical Panel Ceiling ACT4: Where this designation is indicated, provide panels complying with the following:

1. Classification: Panels fitting ASTM E 1264 for Type IX, mineral base with scrubbable pigmented or clear finish; Form 2, water felted.
2. Pattern: Panels fitting ASTM E 1264 pattern designation (description) G (smooth).
3. Color: White
4. Light Reflectance Coefficient: Not less than LR 0.89.
5. Noise Reduction Coefficient: N/A
6. Ceiling Attenuation Class: 33
7. AC: N/A
8. Fire Rating: Class A
9. Sag Resistance Treatment: Armstrong HumiGuard Plus
10. Anti-Mold and Mildew Treatment: BioBlock
11. Low VOC Emissions: GREENGUARD Gold Certified
12. Warranty: 30 years
13. Edge Detail: Square Lay-in.
14. Thickness: 5/8 inch.
15. Size: 24 by 24 inches.
16. Basis of Design Product: Armstrong Kitchen Zone #673.
17. Location: Kitchen/ Servery

F. Acoustical Panels for Music Room Ceiling: Panel consists of a 6 to 7 pcf density acoustically absorptive core, with a special high acoustic performance layer laminated to the face (1-1/16" overall thickness) which is designed to receive a non-bridging acoustically transparent coating. A 1 mil clear vapor barrier is adhered to panel back. Provide mounting clips on panel back to accommodate suspension system.

1. NRC: 0.85
2. L/R: 90%
3. Fire Rating: Class A
4. Weight: 1.05 psf.
5. Size: 3' x 8'.
6. Color: White CSW-100
7. Quantity: 9
8. Basis of Design Product: Decoustics Claro finish panels by CertainTeed Ceilings, or equal.

2.3 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

1. Provide fire-resistance rated metal suspension system where indicated

B. Suspension System for Acoustical Panel Ceilings ACT1, ACT-2, ACT3 and ACT4: Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 (Z120) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
 2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
 3. Face Design: Flush face.
 4. Cap Material:
 - a. Steel sheet for ACT1 and 3.
 - b. Aluminum for ACT4.
 5. Cap Finish: Manufacturer's standard factory-applied painted finish in white.
 6. Basis of Design Product: Armstrong Prelude XL.
- C. Suspension System for Acoustical Ceiling in Music Room: Direct mount (attach with clips) F5 mounting.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish and color as that used for exposed flanges of suspension system runners.
- G. Hold-Down Clips: Where indicated or required for fire-rating, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.
- 2.4 ACOUSTICAL SEALANT
- A. Refer to Division 07 Section "Joint Sealants".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 - 2. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not attach hangers to steel deck tabs.
 - 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.

7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
 2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095116 - ACOUSTIC BOARD CEILING PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes Tectum acoustical board panels installed as follows:
 - 1. Direct mounted to ceiling surfaces.
- B. Related Sections include the following:
 - 1. Acoustical sealants are specified in Division 07 Section "Joint Sealants"
 - 2. Concealed suspension systems for Tectum panels are specified in Division 09 Section "Non-Structural Metal Framing"
 - 3. Field painting of Tectum panels is specified in Division 09 Section "Painting."

1.2 ACTION SUBMITTALS

- A. Product data for each type of product specified. Include data on physical characteristics, material densities, fastening and attachment methods, acoustical performance data, and flame resistance characteristics.
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1:100

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates signed by acoustic board manufacturer certifying materials furnished comply with specified requirements.
- B. Certified test reports showing compliance with requirements for fire performance characteristics and physical properties.
- C. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustic boards with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.

Identify acoustic boards with appropriate markings of applicable testing and inspecting organization.

1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less.

B. Installer Qualifications: Arrange for installation of acoustic boards by a firm that can demonstrate successful experience in installing similar in type and quality to those required for this Project.

C. Source Limitations: Obtain each type of acoustical board and supporting suspension system through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect units during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.6 PROJECT CONDITIONS

A. Maintain a constant temperature not less than 70°F in installation areas for at least ten (10) days before and ten (10) days after installation.

B. Field Measurements: Where units are indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical board panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies..

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide acoustic board and suspension systems manufactured by Armstrong World Industries or an approved equivalent.

2.2 ACOUSTIC BOARDS:

- A. Acoustic Board Ceiling Panels: Aspen wood fibers bonded with inorganic hydraulic cement. Product shall comply with the following:
 - 1. Size: 4' x 8'.
 - 2. Thickness: 1".
 - 3. Surface Burning/Flame Spread Characteristics: Class A.
 - 4. Edges: Long edges beveled, square ends.
 - 5. NRC: .90
 - 6. Color: Natural, for field painting.
 - 7. Mounting Method: For direct application to ceiling surfaces using 3/4" furring channels (similar to D20 mounting).
 - 8. Warranty: 30 years.
 - 9. Basis of Design Product: "Tectum Finale" by Armstrong World Industries, or approved equivalent

2.3 MOUNTING SYSTEMS AND MATERIALS

- A. Concealed Suspension Systems for Tectum Panels: Armstrong World Industries, Inc.; Drywall Grid Systems; refer to Division 09 Section "Non-Structural Metal Framing" for specifications. Provide all required hangars and all other components as specified in this section.
- B. Fasteners: Provided by or approved by manufacturer for installation conditions indicated.
- C. Adhesive: Manufacturer's standard low odor, VOC compliant, non-flammable latex based adhesive recommended for use and substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical board ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

- A. For direct application, clean substrates of projections and substances detrimental to application of panels. Follow manufacturer's printed instructions for surface preparation.
- B. Acclimate acoustic boards to room temperature for 48 hours prior to installation.
- C. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

- D. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
- E. Field paint Tectum panels prior to installation.
 - 1. Field painting is specified in Division 09 Section "Painting".

3.3 INSTALLATION

- A. Do not use materials that are unsound, warped, bowed or twisted.
- B. Install acoustic boards plumb, level, true, and aligned with adjacent materials.
 - 1. Scribe and cut acoustic boards to fit adjoining work.
 - 2. Install to tolerance of 1/32 inch in 8 feet for plumb and level.
 - 3. Coordinate with materials and systems that may be in or adjacent to acoustic boards. Provide cutouts for mechanical and electrical items that penetrate.
 - 4. Install in accordance with approved shop drawings.
- C. Surface Application of Tectum Panels: Plan acoustic board layout, balancing acoustic board sizes at corners. Mechanically fasten and adhere acoustic boards to substrate in accordance with manufacturer's written instructions. Stagger joints between acoustic boards and substrate material.
- D. Concealed Suspension System Mounting of Tectum Panels: Install concealed drywall suspension system as specified in Division 09 Section "Non-Structural Metal Framing". Mechanically fasten acoustic boards to framing system in accordance with manufacturer's written instructions.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Comply with manufacturer's written installation instructions.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged or defective acoustic boards where possible to eliminate functional or visual defects. Where not possible to repair, replace acoustic boards.
- B. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- C. Use cleaning methods recommended by the acoustic board manufacturer.
- D. Replace acoustic boards that cannot be cleaned.

3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure acoustic boards are without damage or deterioration at time of Substantial Completion.

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Yonkers Joint Schools Construction Board
Community School 35

END OF SECTION 095116

SECTION 095429 - WOOD PANEL ACOUSTICAL CEILING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes acoustical wood perforated panels and suspension system.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product specified
- B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1:100
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on samples of size indicated below.
 - 1. 12-inch- (300-mm-) square samples of each panel type, pattern, and color.
 - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicate compliance of panel ceilings system with requirements based on comprehensive testing of current products.
- B. Research/Evaluation Reports: Evidence of panel ceiling's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- C. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed wood acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of wood acoustical panel system through one source from a single manufacturer.

- C. Fire-Test-Response Characteristics: Provide wood acoustic panel ceilings and walls that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Provide wood acoustic panels meeting Class A requirements tested per ASTM E 84.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood acoustic panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing wood acoustic panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle wood acoustic panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wood acoustic panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of wood acoustic panels and suspension system with other construction that penetrates ceilings or walls or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as acoustical ceiling panels installed. Furnish 5% of each type and color of material provided in the work. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 WOOD ACOUSTIC PANELS

- A. Perforated Wood Veneer Acoustic Panels: Wood veneer of the following species, cut and matching applied to a core material.

1. Wood Species and Cut for Transparent Finish: Grade A Select Maple, plain sawn/sliced.
2. Face Profile: 8/8/2 (Where the first two numbers describe the distance between holes vertically and horizontally and the third number describes the diameter of the perforation. Where two numbers are listed with a dash, the first number describes the rear hole and the second number describes the face hole.)
3. Rear Perforation: T-hole perforation - dual diameter holes on panel, smaller diameter hole at the face of the panel meeting the larger diameter hole at rear of panel. This option will serve to increase low frequency absorption performance.
4. Core: Class A fire rated medium density fiberboard (MDF) core (when tested according to ASTM E-84 procedures)
5. Panel Size: As indicated on Drawings.
6. Panel Edges: Edgebanding on all sides of panel.
7. Backing: Black, nonwoven glass fiber matt (60 g/m² density) shall be adhered to rear of panel.
8. Acoustic insulation to be included behind panels shall be 1" thick, 6 lb/ft³ density fiberglass
9. No edge molding required.
10. Cutouts factory completed with full finished edges at cut.
11. Finish: Factory finish with clear natural lacquer with matte finish.
12. Basis of Design Product: Topperfo 8/8/2T by Topakustik, or equal.

2.2 SUSPENSION SYSTEMS

- A. Suspension System: Full accessibility suspension grid system consisting of a primary U-profile grid member, a secondary Omega Profile, spring bar, and torsion springs to support the weight of the panels. The panel edge profile can be dictated by design and returns or trim are possible with this system as the panels are downwardly accessible. Attachment to structure is the responsibility of the installing contractor to meet all local codes and regulations. It is recommended that the attachment be achieved with a threaded rod supplied by the installing contractor.
1. Hardware included in this system consists of the U-profile main runner, Omega profile secondary runner with slots to accept springs, spring bar mounted to panels with custom profile to allow sliding of springs as necessary to fit Omega profile slots, torsion springs, special screws to attach hardware to rear perforations, transverse panel stiffening hardware, and any wall connection profiles required.
 2. Panels remove with a special tool provided with material that allows for a simple downward release of the spring from the grid. Panels can then be fully removed from the grid by pressing the springs to release from the Omega profile slot.
 3. Basis of Design Product: S-11 (Torsion Spring)
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling

construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which wood acoustic panels and suspension systems attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of panel ceilings and walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other anchors whose installation is specified in other Sections.
- B. Measure each area and establish layout of panels to balance border widths at opposite edges of each ceiling or wall. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans and shop drawings.

3.3 CEILING INSTALLATION

- A. General: Install panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support

- standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Do not attach hangers to steel deck tabs.
 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of ceiling area and where necessary to conceal edges of panels.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned panels as indicated on reflected ceiling plans.
 2. Install clips to attach panels to suspension system in conformance with manufacturer's directions..

3.4 CLEANING

- A. Clean exposed surfaces of wood acoustic panels, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095429

SECTION 096466 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Solid-wood strip flooring.
 - 2. Subfloor panels with resilient pads and metal anchor channels.
 - 3. Vapor barrier.
 - 4. Finishing wood floors.
 - 5. Floor markings
 - 6. Ventilating wall base.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details including location and layout of each type of wood flooring and accessory. Include expansion provisions and trim details. Include scaled layout drawing of game line markings and locations of floor sleeves for equipment.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Floor finish.
 - 2. Game line paint.
- D. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work. Include sample sets showing the full range of normal color and texture variations expected.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: for installer and manufacturer.
- B. Test Reports: Independent testing report showing the flooring system has passed all performance criteria.
- C. Maintenance instructions.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood athletic flooring systems similar in material, design, and extent to that indicated for this Project and is approved by the flooring manufacturer to install their flooring system.
- B. Manufacturer Qualifications: Manufacturer shall be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).
- C. Source Limitations: Obtain each type of material and product from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- D. Maple Flooring: Comply with MFMA grading rules for grade and cut.
 - 1. Certification: Provide flooring that carries MFMA Certification Mark on each piece.
- E. Wood flooring system shall meet or exceed the following performance criteria:
 - 1. MFMA PUR
 - 2. DIN 18032 Part2 2001
 - 3. DIN 18032 Part2 1991
 - 4. ASTM F2772 Sport Floor Standards
 - 5. FIBA International Standards
 - 6. EN 14904 Standards

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood flooring materials in a dry, warm, well-ventilated, weathertight location.
- D. Move wood flooring into spaces where it will be installed, at least seven days before installation.

1.6 PROJECT CONDITIONS

- A. Conditioning: Maintain relative humidity of 35% to 50% and an ambient temperature between 55 and 80 deg F in spaces to receive wood flooring for at least seven days before installation, during installation, and for at least seven days after installation. After post-installation period, maintain relative humidity and ambient temperature planned for building occupants.
 - 1. For unfinished products, open sealed packages to allow wood flooring to acclimatize.
 - 2. Do not install flooring until it adjusts to the relative humidity of and is at the same temperature as the space where it is to be installed.

3. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by flooring and finish manufacturers.
- B. Moisture Testing of Concrete Substrates: Perform moisture tests recommended by manufacturer and as follows:
1. Testing Procedures: Perform moisture meter tests as required by wood flooring manufacturers.
 - a. Moisture Meter Testing: Relative humidity test using in situ probes, ASTM F 2170.
 2. Proceed with installation only after substrates do not exceed maximum relative humidity level measurement acceptable to flooring material manufacturer.
- C. Do not install floor system until concrete has been cured 60 days, unless otherwise permitted by flooring manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide Basis of Design system manufactured by Robbins Sport Surfaces or equal system by one of the following:
1. Action Floor Systems
 2. Conner Sports.

2.2 WOOD ATHLETIC FLOORING SYSTEM

- A. Basis of Design System: provide Robbins Bio-Channel Star floor system by Robbins, Inc. or equal. system consists of maple strip flooring, subflooring, resilient pads, and metal anchor channels.
- B. Maple Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried.
1. Grade: Second & Better.
 2. Cut: Flat grain.
 3. Type: Finger-jointed
 4. Lengths: Nominal 15 to 96 inches complying with MFMA grading rules, unless otherwise required for patterns indicated.
 5. Matching: Tongue and groove, side matched and end matched.
 6. Expansion Feature: XL Plus technology to reduce or eliminate routine spacing for expansion.
 7. Backs: Channeled (kerfed) for stress relief.
 8. Thickness: 25/32 inch
 9. Face Width: 2-1/4 inches.
 10. Basis of Design Product: Continuous Strip XLPLUS by Robbins, or equal.

- C. Subfloor/Underlayment: Premanufactured plywood panels factory prepared to receive anchor channels.
 - 1. Basis of Design Product: Bio-Channel Star by Robbins or equal.
- D. Resilient Pads: 9/16" Zero/G shock pad by Robbins.
- E. Metal anchor channels.

2.3 FINISHING MATERIALS

- A. Urethane Finish System: Complete system of compatible components that is recommended by finish manufacturer for application indicated.
 - 1. VOC Content: When calculated according to 40 CFR 59, Subpart D (EPA Method 24), as follows:
 - a. Finish Coats and Floor Sealers: Not more than 350 g/L.
 - 2. Type: Solvent-based, oil-modified.
 - 3. Floor Sealer: Pliable, penetrating type.
 - 4. Finish Coats: Formulated for multicoat application on wood flooring.
 - 5. Manufacturers: Provide products by flooring manufacturer or one of the following as approved by flooring manufacturer:
 - a. Bona Sport Poly; Bona.
 - b. DuraSeal Masterline Oil Polyurethane Gloss; Dura Seal.
 - c. 450 Gym Finish; Hillyard Floor Treatments.
- B. Wood Filler: Formulated to fill and repair seams, defects, and open-grain hardwood floors; compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved samples, provide pigmented filler.
- C. Game-Line and Marker Paint: High-gloss enamel compatible with finish and recommended by finish and paint manufacturers for this purpose.
 - 1. Colors: all colors as indicated on Drawings
 - a. 2 colors for game lines of basketball and volleyball.
 - b. 3 additional colors for Y logo

2.4 ACCESSORY MATERIALS

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6.0 mils (0.15 mm) thick.
- B. Fasteners and Adhesives: Type and size recommended by manufacturer, but not less than those recommended by the following:
 - 1. MFMA for application indicated for maple flooring.

2. Channel Anchors: Type recommended by flooring manufacturer.
- C. Wall Base: 6" high molded vented cove base with pre-molded outside corners, in color selected by Architect.
- D. Provide all accessories at door thresholds for a complete installation.

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of wood flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Concrete Slabs: Verify that concrete slabs comply with requirements specified Division 03 Section "Cast-in-Place Concrete."
 1. Grind high spots and fill low spots to provide a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 2. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for flooring application.
- C. Concrete Moisture Testing: Perform moisture meter test as per manufacturer's directions and in accordance with ASTM F 2170, as follows:
 1. Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m) and perform not less than 2 tests in each installation area with test areas evenly spaced in installation area.
 2. Proceed with installation only after substrates have maximum relative humidity of 85% or less.

3.2 INSTALLATION

- A. General: Comply with flooring system manufacturer's written instructions, but not less than recommendations of MFMA applicable to flooring type indicated for maple flooring.
- B. Pattern: Lay flooring parallel with the long dimension of the space to be floored, unless otherwise indicated.

- C. Expansion Space: Provide expansion space at walls and other obstructions and terminations of flooring of not less than 2".
- D. Vapor Retarder: Install a layer of polyethylene sheet over concrete slab with edges overlapped minimum 6" and sealed, and turned up behind baseboards.
- E. Subfloor/Underlayment: Place subfloor assembly in end-to-end manner, staggering end joints in adjacent rows, with 1/4" gap between panels. Place panels on a 45 degree angle to the direction of the maple flooring. Install solid blocking under bleachers in the stacked position, at doorways and elsewhere as recommended by manufacturer.
- F. Anchor Channels: Place metal anchor channels in preformed slots in the subfloor panels., and anchor in pre-routed holes.
- G. Solid-Wood Strip and Plank Flooring: Install maple flooring parallel to main playing court by power nailing at intervals recommended by manufacturer. End joints shall be properly driven up. Provide spacing for humidity control as recommended by flooring manufacturer.
- H. Installation Tolerances: 1/8 inch in 10 feet variance from level.

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.
- B. Apply filler according to manufacturer's written instructions.
 - 1. Fill open-grained hardwood.
 - 2. Fill and repair seams and defects.
- C. Apply floor sealer according to finish manufacturer's written instructions, in number of coats recommended by finish manufacturer.
- D. Apply floor finish according to finish manufacturer's written instructions. Apply in number of coats recommended by finish manufacturer for application indicated, but not less than two.
- E. Lines and Markers: After applying sealer coats, screening, and vacuuming of floor, lay out lines, fields and other markings as indicated for colored enamel application. Mask flooring to provide sharp edges. Apply gym enamel 1.0 mil thick, in colors as indicated. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - 1. For game markings, use current rules of the National Federation of High School Association or other association having jurisdiction.
- F. Install base trim and other cover trim as indicated for expansion spaces at edges and interruptions of flooring. Cement or screw to walls.

3.4 PROTECTION

- A. Cover installed wood flooring to protect it from damage or deterioration, before and after finishing, during remainder of construction period. Use heavy kraft-paper or other suitable covering. Do not use plastic sheet or film that could cause condensation.
 - 1. Do not cover site-finished floors with kraft paper, or any other material, until finish reaches full cure, but not less than seven days after applying last coat.

END OF SECTION 096466

SECTION 096500 - RESILIENT FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Homogeneous sheet vinyl flooring.
2. Luxury vinyl tile
3. Rubber floor tile
4. Rubber wall base.
5. Stair accessories.
6. Resilient flooring accessories.

B. Related Work Specified Elsewhere:

1. Ventilating cove base for wood athletic flooring is specified in Division 09 Section "Wood Athletic Flooring."

1.2 ACTION SUBMITTALS

A. Product data for each type of product specified.

B. Samples for verification purposes in form of actual flooring or sections of accessories for each color and pattern specified.

1. For heat-welding bead, manufacturer's standard-size samples, but not less than 9 inches (230 mm) long, of each color specified.

C. Shop Drawings: Indicate decorative pattern layout, if any. Show location of seams and edges. Indicate location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutout locations.

1.3 INFORMATIONAL SUBMITTALS

A. Maintenance data for resilient flooring and accessories.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who is competent in the technique required by sheet flooring manufacturer for heat-welding seams.

B. Single-Source Responsibility for Floor Tile and Accessories: Obtain each type, color, and pattern of tile and accessory from a single source; all stair accessories shall be from one manufacturer.

- C. Single-Source Responsibility for Sheet Flooring and Accessories: Obtain each type, color, and pattern of sheet floor covering specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- D. Fire Performance Characteristics: Provide resilient flooring with the following fire performance characteristics as determined by testing products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class 1, per ASTM E 648 or NFPA 253.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient materials on flat surface in dry space protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- B. Store rolls of sheet flooring upright.
- C. Move floor coverings and installation accessories into spaces where they will be installed at least 48 hours before installation, unless longer conditioning periods are recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive resilient flooring for at least 72 hours prior to installation, during installation, and for not less than 72 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Moisture Testing of Concrete Substrates: Perform moisture tests recommended by manufacturer and as follows:
 - 1. Testing Procedures: Perform calcium chloride or moisture meter tests as required by floor topping and resilient tile manufacturers.
 - a. Calcium Chloride Testing: Anhydrous calcium chloride test, ASTM F 1869.
 - b. Moisture Meter Testing: Relative humidity test using in situ probes, ASTM F 2170.
 - 2. Proceed with installation only after substrates do not exceed maximum moisture-vapor-emission rate or relative humidity level measurement acceptable to flooring material manufacturer.
- C. Do not install flooring or accessories until they are at the same temperature as the space where they are to be installed.
- D. Close spaces to traffic during flooring installation.

1.7 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS

- A. Extra Materials: Furnished from same production run as resilient tile, base and accessories installed. Furnish 5% of each type and color of material provided in the work. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.

- 1. Extra materials of sheet floor covering is not required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

- 1. Tiles and Sheet:
 - a. Armstrong World Industries
 - b. Mannington
 - c. Mohawk Group
 - d. Patcraft
 - e. Shaw Hard Surface
 - f. Tarkett
- 2. Base and Other Accessories:
 - a. Armstrong
 - b. Endura
 - c. Roppe
 - d. Johnsonite
- 3. Rubber Landing Tiles and Stair Treads:
 - a. Endura Large Tile
 - b. Nora
 - c. Johnsonite
 - d. Roppe

2.2 PRODUCTS, GENERAL

- A. Colors, Textures, and Patterns: Provide tile, sheet goods and accessories in color, texture and pattern to match specified products. Colors and patterns indicated by reference to manufacturer's name and designations are for color and pattern identification only and are not intended to limit selection of other manufacturer's products with similar

colors and patterns. If no colors or patterns are indicated, provide color(s) and pattern(s) as selected by Architect from manufacturer's standards.

- B. Resilient flooring and base shall comply with RFCI FloorScore Program.

2.3 RESILIENT TILE FLOORING

- A. Luxury Vinyl Tile LVT1: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:

1. Basis of Design Product: Tarkett Color Play Collection, Color Beam pattern, or equal.
2. Size: 18" x 18"
3. Wear Layer Thickness: 32 mil
4. Total thickness: 0.120"
5. Finish: Emboss - Quarry
6. Surface Treatment: Techtonic
7. Warranty: 25 years.
8. Color: Manta Grey C114.
9. Installation: Monolithic.
10. Location: Classrooms field tile.

- B. Luxury Vinyl Tile LVT2: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:

1. Basis of Design Product: Tarkett Riot Static, or equal.
2. Size: 18" x 18"
3. Wear Layer Thickness: 32 mil
4. Total thickness: 0.120"
5. Surface Treatment: Techtonic
6. Warranty: 25 years.
7. Color: Sun 10122QU.
8. Installation: Quarter turned.
9. Location: First Floor Classrooms accent tile.

- C. Luxury Vinyl Tile LVT3: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:

1. Basis of Design Product: Tarkett Riot Static, or equal.
2. Size: 18" x 18"
3. Wear Layer Thickness: 32 mil
4. Total thickness: 0.120"
5. Surface Treatment: Techtonic
6. Warranty: 25 years.
7. Color: Lime 10121QU.
8. Installation: Quarter turned.
9. Location: Second Floor Classrooms accent tile.

- D. Luxury Vinyl Tile LVT4: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Tarkett Static, or equal.
 2. Size: 18" x 18"
 3. Wear Layer Thickness: 32 mil
 4. Total thickness: 0.120"
 5. Surface Treatment: Techtonic
 6. Warranty: 25 years.
 7. Color: Cyan 10112QU.
 8. Installation: Quarter turned.
 9. Location: Third Floor Classrooms accent tile.
- E. Luxury Vinyl Tile LVT5: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Tarkett Static, or equal.
 2. Size: 18" x 18"
 3. Wear Layer Thickness: 32 mil
 4. Total thickness: 0.120"
 5. Surface Treatment: Techtonic
 6. Warranty: 25 years.
 7. Color: Dark 10116QU.
 8. Installation: Quarter turned.
 9. Location: Fourth Floor Classrooms accent tile.
- F. Luxury Vinyl Tile LVT6: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Patcraft Mark Making I509V, or equal.
 2. Size: 6" x 48"
 3. Wear Layer Thickness: 20 mil
 4. Total thickness: 0.197"
 5. Finish: Exoguard+
 6. Color: Pure 00500.
 7. Installation: Staggered.
 8. Location: Learning Commons field color.
- G. Luxury Vinyl Tile LVT7: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Patcraft Mark Making I509V, or equal.
 2. Size: 6" x 48"
 3. Wear Layer Thickness: 20 mil
 4. Total thickness: 0.197"
 5. Finish: Exoguard+
 6. Color: Bliss 00250.
 7. Installation: Staggered.
 8. Location: Learning Commons accent color

- H. Luxury Vinyl Tile LVT8: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Patcraft Mark Making I509V, or equal.
 2. Size: 6" x 48"
 3. Wear Layer Thickness: 20 mil
 4. Total thickness: 0.197"
 5. Finish: Exoguard+
 6. Color: Watercolor 00400.
 7. Installation: Staggered.
 8. Location: Learning Commons accent color
- I. Luxury Vinyl Tile LVT9: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Tarkett Contour collection, Modern Stone pattern, or equal.
 2. Size: 18" x 18"
 3. Wear Layer Thickness: 1 mil
 4. Total thickness: 0.120"
 5. Surface Treatment: Techtonic
 6. Warranty: 25 years.
 7. Color: Rialto PCMS0631QU.
 8. Installation: Quarter turned.
 9. Location: Makerspace and Art Room field.
- J. Luxury Vinyl Tile LVT10: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Tarkett Contour collection, Modern Wood pattern, or equal.
 2. Size: 6" x 48"
 3. Wear Layer Thickness: 1 mil
 4. Total thickness: 0.120"
 5. Surface Treatment: Techtonic
 6. Warranty: 25 years.
 7. Color: Canadian Maple PCMD3306NG.
 8. Installation: Plank.
 9. Location: Health suite, Faculty Lounge
- K. Luxury Vinyl Tile LVT11: Luxury vinyl tile complying with ASTM F1700, Class III, Type B and as follows:
1. Basis of Design Product: Tarkett Static, or equal.
 2. Size: 18" x 18"
 3. Wear Layer Thickness: 32 mil
 4. Total thickness: 0.120"
 5. Surface Treatment: Techtonic

6. Warranty: 25 years.
7. Color: Mottle 10016.
8. Installation: Quarter turned.
9. Location: Art Room accent tile.

L. Rubber Floor Tile RF: Rubber floor tile complying with ASTM F1344, and as follows:

1. Basis of Design Product: Norament Grano.
2. Size: 39.53" x 39.53"
3. Tile Thickness: 0.14
4. Colors:
 - a. RF-1: 5317 Agapanthus
 - b. RF-2: 5302 Angelica Road
5. Installation: Monolithic
6. Location: OT room.

2.4 RESILIENT SHEET FLOORING

A. Homogeneous Sheet Vinyl Flooring VSF: High performance homogeneous sheet vinyl flooring

1. Basis of Design Product: Tarkett Melodia collection, Melodia 3.0 pattern.
2. Roll Width: 6.5 ft.
3. Wear Layer Thickness: 0.080" (2mm)
4. Total Thickness: 0.080" (2mm)
5. Surface Treatment: Polyurethane - Reinforced, meeting ASTM F410
6. Color: Mariblu 0979.
7. Location: Health Suite
8. Accessories: Provide blue welding rod.

2.5 RESILIENT WALL BASE

A. Rubber Wall Base: ASTM F 1861, Type TP, Group 1 (solid), 4" high, 1/8" thick, smooth surface, and as follows:

1. Style: Straight (toeless) style for all carpeted areas and cove base with toe (set-on type) elsewhere
2. Lengths: Coils in manufacturer's standard length.
3. Inside and Outside Corners: Preformed.
4. Products: Rubber Base by Johnsonite/Tarkett.
5. Colors: As selected by Architect.

B. Homogeneous Sheet Vinyl Cove Base: Provide integral flash cove wall base using sheet flooring.

2.6 RESILIENT STAIR ACCESSORIES

A. Stair Treads and Risers : Rubber one-piece tread/riser combination meeting ASTM F-2169, Type TS, Class 2, Group 1 and/or 2, Grade 2 and as follows:

1. Nosing Style: Square, hinged.
2. Thickness: 0.20 inches
3. Depth: 19.88 inches.
4. Height: 1.77 inches.
5. Length: As required to fit each stair tread in one piece.
6. Surface Texture: Hammered.
7. Solid Rubber Colored Insert Strip: 2" wide, in contrasting color for visually-impaired.
 - a. Insert Strip Color: Nora 0985.
8. Basis of Design Products and Colors:
 - a. Stair A and C: Norament Grano by Nora, in the following colors:
 - 1) Stair A: 5325 Balsam
 - 2) Stair C: 5318 Blue Tansy.
 - b. Stair B and All Other Stairs (except Cafeteria): Norament Satura by Nora in color 5121 Hydra.

B. Rubber Tile at Stair Landings: Rubber tile matching tread/riser units for each location.

1. Tile Size: 39.53" x 39.53"
2. Tile Thickness: 0.14"
3. Basis of Design Products: Norament Grano and Satura by Nora.
4. Colors: Match adjacent tread/riser units.

2.7 MISCELLANEOUS RESILIENT ACCESSORIES

A. Colors: As selected by Architect from manufacturer's full range of colors produced for accessory molding complying with requirements indicated.

B. Rubber Accessory Moldings: Provide rubber accessory molding complying with the following:

1. Product Description: Carpet edge for glue-down applications, carpet nosing, reducer strip for resilient flooring, and tile and carpet joiner.
 - a. Provide rubber transition strip at resilient floor tile color changes - at doors.
2. Profile and Dimensions: As indicated or required.

C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding seams.

1. Color and Pattern: Match color and pattern of sheet floor covering.

D. Metal Accessories for Homogeneous Sheet Wall Base:

1. Tarkett Covecap CCC-XX-C in color and pattern matching sheet floor covering.

2.8 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Concrete Sealer: Type recommended and approved by resilient flooring manufacturer and adhesive manufacturer to ensure proper adhesion of resilient flooring to substrate.
- C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- D. Adhesives (Cements): Products supplied by resilient flooring and accessory manufacturers, of type recommended to suit resilient products and substrate conditions.
- E. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding seams.
 - 1. Color and Pattern: Match color and pattern of sheet floor covering.
- F. Floor Polish: Acrylic type, as recommended by flooring material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring installation and comply with flooring manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond tests recommended by flooring manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. Concrete Moisture Emission Tests: Perform calcium chloride test and moisture meter test as per manufacturer's directions, as follows, and other tests if recommended by resilient flooring and adhesive manufacturer:
 - 1. Perform moisture test at rate of one per 2,000 sq.ft. of new and existing floor area to be covered.
 - 2. Report test results in writing to Architect, and Contractor within 24 hours after tests are completed. Reports of concrete moisture emission tests shall contain the Project identification name and number, date of test location of test within structure.

3. Perform additional moisture emission tests of in-place concrete when test results indicate specified moisture content has been exceeded, as directed by Architect.
 - a. Repeat test one week after initial test minimally and additionally repeat test if required by field conditions to determine moisture levels in area of resilient flooring application.

- D. Do not proceed with installation until unsatisfactory conditions have been corrected.
- E. Only if it is not possible to provide a concrete substrate with acceptable moisture levels, then a surface applied moisture mitigation system shall be used that meets the requirements of ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring.
- B. Use trowelable leveling and patching compounds per flooring manufacturer's directions to fill cracks, holes, and depressions in substrates and to patch and level floors as required to provide suitable substrate for flooring application.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives by using a grinder, sander, or polishing machine with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by flooring immediately before installation of flooring. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.
- F. Seal concrete substrates as required by moisture test results to ensure proper adhesion of resilient flooring to substrate.

3.3 SHEET FLOORING INSTALLATION

- A. General: Comply with sheet floor covering manufacturer's written installation instructions.
- B. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting, if recommended in writing by manufacturer.
- C. Lay out sheet floor coverings to comply with the following requirements:
 1. Maintain uniformity of sheet floor covering direction.
 2. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 inches (150 mm) away from parallel joints in flooring substrates.

3. Match edges of sheet floor coverings for color shading and pattern at seams according to manufacturer's written recommendations.
 4. Avoid cross seams.
- D. Scribe, cut, and fit sheet floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
 - E. Extend sheet floor coverings into toe spaces, door reveals, closets, and similar openings.
 - F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.
 - G. Install sheet floor coverings on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
 - H. Adhere sheet floor coverings to flooring substrates to comply with floor covering manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 1. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - I. Heat-Welded Seams: Rout joints and heat weld with welding bead, permanently fusing sections into a seamless floor covering. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F 1516 to produce surfaces flush with adjoining floor covering surfaces.
 - J. Hand roll sheet floor coverings in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.4 TILE INSTALLATION

- A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.
- B. Lay out tiles from center marks established with principal walls so tiles at opposite edges of room are of equal width. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles in decorative patterns as indicated on Drawings.

- D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces and edgings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- J. Hand roll tiles where required by tile manufacturer.

3.5 INSTALLATION OF WALL BASE AND ACCESSORIES

- A. General: Install resilient accessories according to manufacturer's written installation instructions.
- B. Provide integral flash cove wall base by extending homogeneous sheet vinyl flooring 4 in. up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer. Install metal cap at top of base.
- C. Apply resilient wall base to walls, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Install preformed corners as per manufacturer's directions.
- D. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

3.6 INSTALLATION OF RESILIENT STAIR TREADS/RISERS

- A. Apply resilient treads/risers to stairs as indicated and according to manufacturer's written installation instructions.

- B. Use stair-tread-nose filler, according to resilient tread manufacturer's written instructions, to fill nosing substrates that do not conform to tread contours.

3.7 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient flooring manufacturer.
 - 4. Damp-mop flooring to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by flooring manufacturer.
 - 1. Apply protective floor polish to flooring surfaces that are free from soil, visible adhesive, and surface blemishes. Coordinate selection of floor polish with Owner's maintenance service requirements.
 - 2. Cover flooring with undyed, untreated building paper until inspection for Substantial Completion.
- C. Clean flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.
 - 1. Strip protective floor polish that was applied after completing installation prior to cleaning.
 - 2. Reapply floor polish after cleaning.

END OF SECTION 096500

SECTION 096623 - RESINOUS MATRIX TERRAZZO FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Epoxy-resin, thin-set terrazzo with integral wall base.
2. Thin-set, precast epoxy terrazzo coved base.
3. Thin-set, precast terrazzo thresholds.
4. Precast epoxy terrazzo stair treads and risers.
5. Precast epoxy terrazzo cladding for seating platforms in Cafeteria
6. Epoxy-resin, thin-set terrazzo logo
7. Crack suppression/isolation membrane.

B. Related Work Specified Elsewhere:

1. Division 03 Section "Cast-in-Place Concrete" for concrete substrate requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of terrazzo, component material, and accessory specified.

B. Shop Drawings: Include terrazzo fabrication and installation requirements. Include plans, elevations, sections, component details, and attachments to other Work. Show layout of the following:

1. Divider and control- and expansion-joint strips.
2. Base and border strips.
3. Precast terrazzo jointing and edge configurations.
4. Terrazzo patterns and logos.
5. Treads and risers on metal stair substrate.
6. Abrasive strip placement.
7. Crack suppression/isolation membrane placement.

C. Samples for Verification: Maximum of three 6-inch- (150-mm-) minimum square samples of each precast and cast-in-place terrazzo color and type required, showing the full range of color, texture, and pattern variations expected. Prepare samples of the same thickness and from the same material to be used for the Work. Provide minimum 6-inch- (150-mm-) long samples of each exposed strip item required.

1. Provide up to three sets of samples for verification of color for epoxy terrazzo flooring and precast units, as required to obtain Architect's approval.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Material Certificates: Certificates signed by suppliers or manufacturers certifying that each material complies with requirements.
- C. Maintenance Data: Submit two copies of maintenance recommendations of NTMA or maintenance product members of NTMA.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer shall be a contractor member of NTMA and shall perform all work in accordance with NTMA standards.
 - 2. Installer not a contractor member of NTMA shall have 10 years experience, completed terrazzo installations similar in material, design, and extent to that indicated for this Project, and shall submit a record of successful in-service performance.
 - 3. Installer shall have successfully completed a minimum of 5 projects involving custom designed logos installed in terrazzo flooring.
- B. Source Limitations: Obtain primary terrazzo materials through one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- C. Source Limitations for Marble: Obtain each color, grade, type, and variety of marble from one source with resources to provide materials of consistent quality in appearance and physical properties without delaying the Work.
- D. NTMA Standards: Comply with the National Terrazzo and Mosaic Association's (NTMA) Guide Specification and written recommendations for terrazzo type indicated, unless more stringent requirements are specified.
- E. Mockups: Before installing terrazzo, construct mockups for each type and color required to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
 - 1. Locate mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Include integral base with poured-in-place floor.

3. Notify Architect 7 days in advance of dates and times when mockups will be constructed.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before proceeding with terrazzo installation.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings." Review methods and procedures related to installation including, but not limited to, the following:

1. Inspect and discuss condition of substrate and preparatory work required to be performed.
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 dust-control procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in suppliers' original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number, if any. Deliver materials in a manner to prevent damage to containers and/or bags.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Storage area temperature to be between 50 deg F (10 deg C) and 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Maintain temperature above 50 deg F (10 deg C) for 72 hours before and during terrazzo installation. The minimum slab temperature for crack suppression system must be conditioned to 60°F before commencing installation, during installation, and for at least 72 hours after installation is complete.
- B. Do not install flooring if subfloor moisture emission rate exceeds indicated amounts when tested by calcium chloride moisture test or relative humidity test, with subfloor temperatures not less than 55 deg F.
 1. Calcium Chloride Moisture Test: Not more than 3 lb/1000 sq. ft./24 hours when tested according to ASTM F1869 using anhydrous calcium chloride.
 2. Relative Humidity Test: Maximum 75 percent relative humidity measurement when tested according to ASTM F2170 using in-situ probes.

- C. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.
 - 1. Provide dustproof partitions and temporary enclosures to limit dust and migration and to separate areas from noise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide one of the following systems or equal:
 - 1. Crossfield Products Corp., Dex-O-Tex Division; Cheminert Terrazzo
 - 2. General Polymers Corporation, a Sherwin Williams Company; Thin-Set Epoxy Terrazzo #1100.
 - 3. Concord Terrazzo Company, Inc.; TERRAZZCO Groutless™ EZPour Epoxy 158
 - 4. Key Resin Company; Key Epoxy Terrazzo #108.
 - 5. Terrazzo & Marble Supply Companies; Terroxy Resin Systems Epoxy Matrix

2.2 MATERIALS

- A. Water: Potable.
- B. Marble Chips: Sizes conforming to NTMA gradation standards for mix and thickness indicated, with Ha 10 minimum abrasive-hardness value when tested according to ASTM C 241, 0.75 percent maximum 24-hour absorption rate, dust content of less than 1 percent by weight, and containing no deleterious or foreign matter. Colors as required to match Architect approved samples.
- C. Other Aggregates: One-sided mirror fragments or glass, as required.
- D. Epoxy-Resin Matrix: Provide matrix complying with NTMA's "Guide Specification for Epoxy Terrazzo" in color required for mix indicated.
 - 1. Shore Hardness at 24 Hours: 85/65 at 24 hours, when tested per ASTM D 2240.
 - 2. 100% concrete failure minimum, with 350 psi minimum tensile strength.
 - 3. Compressive Strength: Minimum of 11,000 psi when tested per ASTM D 695.
 - 4. Tensile Strength: Minimum of 6,000 psi when tested per ASTM D 638.
 - 5. Flexural Strength: Minimum of 10,000 psi when tested per ASTM D 790.
 - 6. Flammability: Self-extinguishing over concrete, tested per ASTM D 635.
 - 7. Abrasion Resistance: 70-90 milligrams lost when tested per ASTM D 4060.
- E. Thin-Set Divider Strips: Angle or T type, 3/8 inch (9.5 mm) deep, and as follows:
 - 1. Material: White zinc alloy.

2. Top Width: 1/8 inch (3.2 mm).
 3. Thickness: 16 gage.
- F. Control-Joint/Expansion Joint Strips: T-type strips with neoprene expansion insert matching material, thickness, and color of divider strips in depth required for topping thickness indicated.
1. Top Width: 1/8 inch (3.2 mm).
- G. Accessory Strips: Match divider-strip width, material, and color, unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Edge beads for exposed edges of terrazzo.
 2. Base-bead strips for exposed top edge of terrazzo base.
- H. Patching and Fill Material for Epoxy Terrazzo: Resinous product of or approved by terrazzo manufacturer and recommended by manufacturer for application indicated.
- I. Joint Sealants: Recommended by terrazzo and sealant manufacturers and complying with requirements in Division 07 Section "Joint Sealants"
- J. Moisture-Vapor-Emission-Control Membrane: Two-component, high-solids, high-density, low-odor, epoxy-based membrane-forming product produced by epoxy terrazzo manufacturer that reduces moisture emission from concrete substrate to not more than 3 lb of water/1000 sq. ft. in 24 hours.
- K. Crack Suppression/Isolation Membrane: As recommended, produced and supplied by approved terrazzo resin formulator, having minimum 120 percent elongation potential per ASTM D 412.
1. Reinforcement: Fiberglass scrim, as required.
- L. Divider-Strip Adhesive: Epoxy-resin adhesive recommended by manufacturer for this use and acceptable to thin-set terrazzo resin manufacturer.
- M. Thin-Set Terrazzo Primer: Two-component resin or other compound recommended by thin-set terrazzo resin manufacturer for priming substrate.
- N. Thin-Set Terrazzo Finishing Grout: Thin-set terrazzo resin manufacturer's resin-based finishing grout.
- O. Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by cleaner manufacturer for use on terrazzo type indicated.
- P. Sealer: Slip- and stain-resistant, penetrating-type sealer that is chemically neutral with pH factor between 7 and 10, does not affect color or physical properties of terrazzo type

indicated, is recommended by sealer manufacturer for this use, and complies with NTMA Guide Specification for terrazzo type indicated.

1. Use sealers that have a VOC content of not more than 200 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

2.3 MIXES

A. Epoxy-Resin, Thin-Set Terazzo: Comply with NTMA's "Guide Specification for Epoxy Terrazzo" and resin manufacturer's written instructions for component proportions and mixing.

1. Colors and Patterns: Provide the following based on Terroxy Resin System colors, or equal products.
 - a. T-1 (Corridor Field): TM21-1433
 - b. T-2 (Corridor Border): TM21-1924
 - c. T-3 (Accent Border, Second Floor): TM21-1468
 - d. T-4 (Accent Border, Third Floor): TM21-1469
 - e. T-5 (Accent Border, Fourth Floor): TM21-1470
 - f. T-6: TM21-1467
 - g. Terrazzo Logo/Emblem in Lobby (7'-0" diameter): Four colors as selected by Architect.
2. Thickness: 1/4" or 3/8" depending on aggregates used.

2.4 LOGOS

A. Create custom logo using waterjet technique to cut shapes into which terrazzo is poured. Comply with design indicated on the Drawings and artwork provided by the Architect.

2.5 PRECAST EPOXY TERRAZZO

A. Manufacturers: Subject to compliance with requirements, provide products one of the following or equal:

1. Romoco Precast Terrazzo Products
2. Wausau Tile, Inc.; Terra Paving Products Division
3. Concord Terrazzo Company, Inc.; TERRAZZCO

B. Precast Epoxy Terrazzo Base Units: 1/4 inch (6.4 mm) thick; cast in maximum lengths possible, but not less than 36 inches (900 mm); with rounded, finished top edge.

1. Type: Cove base.
 - a. Provide curved units at cafeteria columns to fit column radius.
2. Height: 6"
3. Outside Corner Units: With finished returned edges at outside corner.
4. Color and Pattern:

- a. At multi-user toilet rooms, match adjacent tile flooring.
 - b. At cafeteria columns, provide scheduled color.
 - c. At ramps, as selected by Architect.
- C. Precast Terrazzo Stair Tread and Riser Units and Cladding for Seating Platform in Cafeteria: Comply with NTMA's written recommendations for fabricating precast cementitious terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer.
1. Type: One-piece tread/riser units
 2. Basis of Design Product: #E-31 manufactured by Wausau Tile or equal.
 3. Colors and Patterns:
 - a. White T-1, where indicated
 - b. Grey T-2, where indicated.
 4. Sizes: As indicated on Drawings
 5. Thickness: 3/4" thick
 6. Stair Treads and Landings: Three-line abrasive inserts at nosings in black.
 - a. Abrasive Strips: Fabricate with surface of abrasive strip positioned 1/16 inch (1.6 mm) higher than terrazzo surface
 7. Edges at Seating Platforms: Eased radius and polished.
 8. Seams at Precast Stairs and Seating Platforms: As indicated on Drawings.
- D. Precast Terrazzo Thresholds: Comply with NTMA's written recommendations for fabricating precast cementitious terrazzo units in sizes and profiles indicated. Reinforce units as required by unit sizes, profiles, and thicknesses and as recommended by manufacturer. thresholds shall be ADA compliant. Sizes and profiles as indicated on Drawings.
- E. Setting Materials for Precast Terrazzo:
1. Epoxy Adhesive: Two component, compatible with terrazzo units and substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of terrazzo. Do not proceed with installation until unsatisfactory conditions, including levelness tolerances, have been corrected.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of terrazzo
 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
 4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions
- C. Concrete Moisture Emission Tests: Perform calcium chloride test or relative humidity test as per manufacturer's directions, as follows, and other tests if recommended by terrazzo flooring manufacturer:
1. Perform moisture test at rate of one per 2,000 sq.ft. of floor area to be finished.
 2. Report test results in writing to Architect, and Contractor within 24 hours after tests are completed. Reports of concrete moisture emission tests shall contain the Project identification name and number, date of test location of test within structure.
 3. Perform additional moisture emission tests of in-place concrete when test results indicate specified moisture content has been exceeded, as directed by Architect.
 - a. Repeat test one week after initial test minimally and additionally repeat test if required by field conditions to determine moisture levels in area of terrazzo flooring application.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected or after installation of moisture-vapor-emission-control membrane on substrate areas that fail testing.
- 3.2 PREPARATION
- A. Prepare thin-set-terrazzo substrates according to resin manufacturer's written instructions.
1. Clean substrates of substances that impair terrazzo's bond, including oil, grease, and curing compounds.
 2. Repair damaged and deteriorated concrete substrates to acceptable condition.
 3. Level existing concrete subfloor to required flatness tolerances; not to vary more than 1/4 inch from true plane in a 10 foot span.
 4. Roughen concrete substrates before installing terrazzo according to NTMA's and epoxy flooring manufacturer's written recommendations.
 5. Leave surface free of dust, dirt, laitance and efflorescence.
- B. Cracks: Locate cracks and joints in concrete substrates. Verify location of control joints and expansion joints in epoxy terrazzo flooring.
1. After examining existing conditions of substrate, prepare and submit a written report of existing conditions and Installer's proposed plan for installation of crack suppression membrane; include specific recommendations on type and location of crack suppression membrane system to be provided. Obtain Architect's approval

of proposed plan before commencing with installation of crack suppression membrane system.

- C. Moisture-Vapor-Emission-Control Membrane: Install according to manufacturer's written instructions.
 - 1. Install on concrete substrates that fail preinstallation moisture testing.
- D. Substrate-Crack-Suppression Membrane: Install crack suppression/isolation membrane in accordance with manufacturer's recommendations and as per Installer's approved plan.
 - 1. Prepare and prefill substrate cracks with membrane material.
 - 2. Install membrane in areas to receive terrazzo.
 - 3. Reinforce membrane with fiberglass scrim as required.
- E. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with governing environmental protection regulations.
 - 1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

3.3 EPOXY TERRAZZO INSTALLATION

- A. General: Comply with NTMA Guide Specification for terrazzo type indicated and NTMA's written recommendations for substrate preparation and terrazzo installation.
- B. Prime thin-set-terrazzo substrates according to resin manufacturer's written instructions.
- C. Install divider and accessory strips according to NTMA's written recommendations.
- D. Install control-joint strips back-to-back directly above substrate control joints and according to NTMA's written recommendations.
- E. Install angle- or T-type strips and similar accessories in adhesive setting bed without voids below strips. Provide mechanical anchorage of strips as required for adequate attachment of strips to substrate.
- F. Install and finish poured-in-place terrazzo base at the same time the adjacent terrazzo flooring is installed.
- G. Assemble logo template on substrate by installing waterjet cut shapes, shop-fabricated and shipped to the site, as per approved template and layout shop drawing. Logo surface shall be level with surrounding terrazzo floor surface. Fill shapes with terrazzo to match approved colored rendering shop drawing.
- H. Thin-Set Terrazzo: Place, cure, grind, grout, and finish thin-set terrazzo according to resin manufacturer's written instructions and NTMA Guide Specification for thin-set terrazzo

type indicated. Ensure fluids from grinding operations do not react with divider and control-joint strips and stain marble chips. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

- I. Cut out and replace terrazzo areas that evidence lack of bond with substrate or underbed, including areas that emit a "hollow" sound when tapped. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.
- J. Construction Tolerances: Limit terrazzo surfaces' variation from level to 1/4 inch in 10 feet (6.4 mm in 3 m).

3.4 PRECAST EPOXY TERRAZZO

- A. Set units using method recommended by NTMA and manufacturer unless otherwise indicated. Set units with alignment level and true to dimensions, varying 1/8 inch (3.2 mm) maximum in length, height, or width.
 - 1. Use epoxy adhesive to install treads, risers, seating platform units, thresholds and wall base according to ANSI 108.6.
- B. Seal joints between units with joint sealants.

3.5 CLEANING AND PROTECTING

- A. Remove grinding dust from installation and adjacent areas.
- B. Cure the thin-set epoxy terrazzo flooring in compliance with manufacturer's directions, taking care to prevent contamination during stages of the installation and prior to completion of the curing process.
- C. Rinse surfaces with water and allow to dry thoroughly.
- D. Seal surfaces according to NTMA's written recommendations. Apply sealer according to sealer manufacturer's written instructions.
- E. Protect the thin-set epoxy terrazzo flooring system from damage and wear during other phases of the construction operation, using temporary coverings as recommended by the manufacturer, if required. Remove temporary covering just prior to Substantial Completion.
- F. Clean the thin-set epoxy terrazzo flooring system just prior to final inspection, using materials and procedures suitable to the system manufacturer.

END OF SECTION 096623

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Division 09 Section "Resilient Flooring and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 01. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

F. Sustainability: Provide the Statement of the Achievement Level the carpet has attained for Gold, 52 to 70 points, based on specific Sustainable Attribute Performance for all product stages according to ANSI/NSF 140.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Performance Characteristics of Carpet Tile: Provide carpet tile identical to that tested for the following performance characteristics, per test methods indicated:
 - 1. Flammability: Passes DOC FF 1-70 Pill Test.
 - 2. Flame Spread: Meets NFPA Class 1 when tested under ASTM E-648 Glue Down.
 - 3. Smoke Density: 450 or less, Flaming Mode when tested under NBS Smoke Chamber NFPA-258.
 - 4. Static: No more than 3.5 KV when tested under AATCC-134.
 - 5. Specific Optical Density: Not more than 300 in first 4 minutes tested in flaming or non-flaming mode when tested under ASTM E662.
 - 6. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648 or NFPA 253.
- C. Mockups: Before installing carpet tile, install mockups for each type of carpet tile installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be installed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Remove mockups when directed.
 - 7. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion..

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI Carpet Installation Standard 2011.
- B. Store carpeting per manufacturer's recommendations for allowable temperature and humidity range. Products shall not be allowed to become damp.
- C. Remove carpeting from packaging and store in unoccupied, ventilated areas (100% outside air supply, minimum of 1.5 air changes per hour, no recirculation) for 24-72 hours prior to installation. Carpeting shall not be stored with materials which have high emissions of VOCs or other contaminants. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation;

gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders

1.9 FIELD CONDITIONS

- A. Comply with CRI Carpet Installation Standard 2011 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 - 3. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Manufacturers: Provide specified Basis of Design products or equal manufactured by one of the following manufacturers:
 - 1. Interface
 - 2. Mannington
 - 3. Milikin
 - 4. Mohawk Commercial Carpet
 - 5. Shaw
 - 6. Tandus Centiva
- B. Sustainable Carpet Certification: Provide carpet tile that has a NSF/ANSI 140 rating of Gold or better.

- C. Emissions: Provide carpet tile that complies with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
- D. Carpet Tile CPT1:
 - 1. Construction: Stratatec patterned loop pile
 - 2. Fiber Content: Antron Lumina Nylon
 - 3. Dye Method: Solution dyed
 - 4. Machine Gage: 5/64 in.
 - 5. Pile Thickness: 0.080 in
 - 6. Average Pile Height: 0.185 in.
 - 7. Stitches per Inch: 10
 - 8. Primary Backing: Synthetic non woven
 - 9. Secondary Backing: ethos Modular
 - 10. Size: 24 in x 24 in
 - 11. Guarantees: Lifetime limited.
 - 12. Basis of Design Product: Tarkett "2ndPower" 04987.
 - 13. Color(s): Storm Trooper 71607
 - 14. Installation: Vertical Ashlar
 - 15. Location: Offices.
- E. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- F. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
- H. Carpet Edge Guard: Refer to Division 09 Section "Resilient Flooring and Accessories."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer. Do not install flooring if subfloor moisture emission rate exceeds indicated amounts.
 - a. Calcium Chloride Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed the maximum moisture-vapor-emission rate acceptable to flooring manufacturer.
 - b. Moisture Meter Testing: Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have relative humidity level measurement acceptable to flooring material manufacturer.
 - c. Testing Procedures
 - 1) Where flooring is indicated to be applied to structural concrete topping or concrete slab-on-grade substrates, perform moisture meter tests.
 - 2) Where flooring is indicated to be applied to areas where hydraulic cement topping is installed, perform calcium chloride or moisture meter tests as required by topping manufacturer.
2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

- A. General: Comply with CRI Carpet Installation Standard 2011, Section 7, "Site Conditions; All Installations," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI Carpet Installation Standard 2011, Section 18, "Modular Carpet," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders, unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI Carpet Installation Standard 2011, Section 20, "Protecting Indoor Installations."
 - 1. Restrict traffic over adhesive installations for a minimum of 48 hours to allow proper adhesive cure.
 - 2. Restrict exposure to water from cleaning or other sources for a minimum of 30 days.
 - 3. If required to protect the finished floor covering from dirt or paint, or if additional work is to be done after the installation, cover carpeting with a non-staining building material paper.
 - 4. Protect the installation from rolling traffic by using sheets of hardboard or plywood in affected areas.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

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END OF SECTION 096813

SECTION 097750 - FIBER REINFORCED PLASTIC COATED PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fiberglass reinforced polyester (FRP) panels and high pressure laminate (HPL) faced fiberglass reinforced plastic (FRP) for cladding walls, columns and casework.

1.2 ACTION SUBMITTALS

- A. Product data for each type of product specified. Include data on physical characteristics, durability, fade resistance, and flame resistance characteristics.
- B. Samples for initial selection purposes of each type and color available for fiber reinforced plastic coated panels and molding accessory required of size indicated below:
 - 1. 3 inch square sample of each fiber reinforced plastic coated panel specified.
 - 2. 6-inch long sample of each molding accessory.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates signed by fiber reinforced plastic coated panel manufacturer certifying materials furnished comply with specified requirements.
- B. Certified test reports showing compliance with requirements for fire performance characteristics and physical properties.
- C. Maintenance data for inclusion in Division 01 Section "Closeout Procedures." Include the following:
 - 1. Methods for maintaining fiber reinforced plastic coated panels.
 - 2. Precautions for use of cleaning materials and methods that could be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide fiber reinforced plastic coated panels with the following surface burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify fiber reinforced plastic coated panels with appropriate markings of applicable testing and inspecting organization.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.

- B. Installer Qualifications: Arrange for installation of fiber reinforced plastic coated panels by a firm that can demonstrate successful experience in installing similar in type and quality to those required for this Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect units during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

1.6 PROJECT CONDITIONS

- A. Maintain a constant temperature not less than 70°F in installation areas for at least ten (10) days before and ten (10) days after installation.
- B. Field Measurements: Where units are indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide FRP products as manufactured by Marlite, Division of Commercial and Architectural Products, Inc. or an approved equivalent by one of the following:
 - 1. Crane Composites, Inc.
 - 2. Kal-Lite.

2.2 FRP PANELS:

- A. FRP Panels: High gloss fiberglass reinforced polyester panels 0.09" thick with pebbled embossed textured surface, Class A fire rating, 4-feet wide by height required.
 - 1. Color: As selected by Architect.
 - 2. Basis of Design Product: Standard FRP by Marlite, or equal.
 - 3. Location: Wall cladding in kitchen, food prep areas and elsewhere as scheduled.
- B. High Pressure Laminate (HPL) faced Fiberglass Reinforced Plastic (FRP): Exceptionally high wear resistant panel fabricated by thermally bonding melamine impregnated surfacing materials directly to the FRP core.
 - 1. Panel Size: 47-1/2" x 95-1/2" x 3/32" (nominal)
 - 2. Class A fire rating
 - 3. Impact Test: ASTM D5420-04 product on 1/2" Drywall; minimal damage

4. Colors:
 - a. Blond Echo #7939 at Cafeteria booths.
 - b. Custom color Formica Sarum Twill #8827-58 oriented horizontally in the Library/Learning Commons for desk and column wrap.
5. Basis of Design Product: Induro by Marlite, or equal.
- C. Accessories: Provide inside corner, outside corner, division molding and edge trim moldings by same manufacturer, matching wall panels.
- D. Adhesive: Manufacturer's standard low odor, VOC compliant, non-flammable latex based adhesive for use and substrate.
- E. Sealant: Manufacturer's standard clear silicone sealant meeting local VOC requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of fiber reinforced plastic coated panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Acclimate panels to room temperature for 48 hours prior to installation.
- C. Follow manufacturer's printed instructions for surface preparation.

3.3 INSTALLATION

- A. Do not use materials that are unsound, warped, bowed or twisted.
- B. Install fiber reinforced plastic coated panels plumb, level, true, and aligned with adjacent materials.
 1. Scribe and cut panels to fit adjoining work.
 2. Install to tolerance of 1/32 inch in 8 feet for plumb and level.
 3. Coordinate with materials and systems that may be in or adjacent to panels. Provide cutouts for mechanical and electrical items that penetrate.
- C. Plan fiber reinforced plastic coated panel layout, balancing panel sizes at corners.
 1. Adhere division molding and work from center of wall to corners.

2. Adhere FRP panels to substrate in accordance with manufacturer's written instructions.
3. Stagger joints between panels and substrate material.
4. Provide moldings at all sides of panels. Adhere ceiling line and curb moldings in place with sealant, and provide sealant in molding channels prior to insertion of panels.
5. Remove excess sealant from panel surfaces immediately.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged or defective fiber reinforced plastic coated panels where possible to eliminate functional or visual defects. Where not possible to repair, replace fiber reinforced plastic coated panels.
- B. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- C. Use cleaning methods recommended by the fiber reinforced plastic coated panel manufacturer.
- D. Replace panels that cannot be cleaned.

3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure panels are without damage or deterioration at time of Substantial Completion.

END OF SECTION 097750

SECTION 098413 - ACOUSTICAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fabric-wrapped acoustical wall panels.

1.2 SUBMITTALS

- A. Product Data: For each type of fabric, panel edge, acoustical fill and core material specified.
- B. Shop Drawings: Include attachment devices; and details at head, base, joints, corners, and intersections with shelves, countertops, doors, electrical outlets and switches, thermostats, and other components. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave.
- C. Samples for Verification: For the following products. Prepare Samples from the same material to be used for the Work.
 - 1. Fabric: Full-width by 36-inch- (1000-mm-) long Sample from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
 - 2. Sample Panels: No larger than 36 by 36 inches (1000 by 1000 mm). Show joints, panel edges, and attachment methods.
- D. Maintenance Data: For acoustical wall panels to include in maintenance manuals specified in Division 01. Include fabric manufacturers cleaning and stain-removal recommendations.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in installation with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.

- C. Fabric facing shall meet NFPA 701.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical wall panels from excessive moisture in shipment, storage, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation.
- B. Before installing acoustical wall panels, permit them to reach room temperature and a stabilized moisture content.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical wall panels until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify acoustical wall panels sizes by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 COORDINATION

- A. Coordinate layout and installation of acoustical wall panels with other construction that penetrates panels, including light fixtures, electrical outlets, HVAC thermostats and similar assemblies.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner 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. Special Warranty: Written warranty, signed by acoustical wall panel manufacturer agreeing to repair or replace panels that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, fabric sagging, distorting, or releasing from panel edge.

- 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL WALL PANELS

- A. Acoustical Panels: Provide acoustical wall panels as follows:

1. Edge Profile: Square.
2. Edge Material: Resined
3. Nominal Panel Thickness: 2 inch
4. Core: 6 to 7 pcf medium density core glass fiber board
5. Fabric Facing: 56" W Guliford of Maine FR701 Style 2100 in two colors as follows:
 - a. 2' x 2' Panels: Sky 740.
 - b. 1' x 2' Panels: Sapphire 745.
6. Shapes: Flat wall panels in rectangular shape.
7. Size: As indicated on Drawings for each location.
8. Mounting Method: Manufacturer's standard mounting clips and leveling clips concealed attachment system.
9. Basis of Design Product: Decoustics Type AP Acoustic Panels, or equal.

2.2 MATERIALS

- A. Glass-Fiber Board: ASTM C 612, Type IA or Types IA and IB; 6-7 pcf density, unfaced, dimensionally stable, molded rigid board, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively
- B. Fasteners: Types and sizes recommended by core manufacturer, steel drill screws complying with ASTM C 1002 for applications over steel framing.

2.3 FABRICATION

- A. Acoustical Wall Panels: Fabric straight and on the grain. No seams are allowed.
- B. Apply fabric to smooth side of panel.
- C. Stretch fabric tight and square without puckers, ripples, sagging, or distortions. Adhere fabric to panel face.
- D. Mounting Devices: Concealed mounting clips and leveling clips on back of panel, as supplied by manufacturer to support weight of panel and for substrate being fastened to.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, substrates, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of acoustical wall panels.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations; and with fabric installed square to the grain. Comply with panel core manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.
 - 1. Coordinate panel layout with steel framing locations for fastener placing and spacing
- B. Panel Joints: No greater than 1/16-inch expansion space between adjoining panels, and 1/4-inch at floor, ceiling and around windows and door frames, etc.
- C. Take care in handling panels with clean hands, so as not to soil fabric material.
- D. Attach acoustical wall panels to underlying construction according to manufacturer's written instructions, by mechanically fasten panels to metal framing members, through use of z-clip system, or adhesively fasten to substrate as per manufacturer's directions.
- E. At exterior corners, butt panels together with light contact to produce close fitting, uniform joints. Do not force panels into place.
- F. At interior corners, butt adjoining panels together with light contact to produce close fitting, uniform joints. Do not force panels into place.
- G. At vertical joints between panels in the same plane, butt panels at edges with light contact to produce close fitting, uniform joints. Do not force panels into place.
- H. Cut holes in panels for services according to manufacturer's written instructions to avoid loosening facing at openings.

3.3 CLEANING AND PROTECTING

- A. Clean exposed faces of installed panels, and related materials, and adjacent surfaces. Comply with fabric manufacturer's recommendations for cleaning methods and materials.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure installation is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 098413

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint and stain systems on the following interior and exterior substrates:
1. Concrete masonry units (CMU).
 2. Concrete
 3. Steel and iron.
 4. Galvanized metal.
 5. Gypsum board.
 6. Wood
 7. Metal decking and framing at ceilings
 8. Tectum panels at ceilings.
- B. Related Sections include the following:
1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shp Drawings: Provide for individually painted numerals in stairwell. Include elevations, and full-size templates of typical numeral.
- C. Samples for Initial Selection: For each type of topcoat product indicated.
- D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- 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 in Part 2, with the proposed product highlighted.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualifications of applicator of painted numerals on stairwell walls.

1.4 QUALITY ASSURANCE

- A. MPI Standards: Maintain copy of this standard at the Project site at all times.
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples 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. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
 - b. Stained Concrete Floor: Provide samples of at least 100 sq. ft.
 - c. Painted Numerals in Stairwell: Provide one full size numeral.
 - d. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
- C. Applicator Qualifications for Painted Numerals in Stairwell: Professional sign painter with minimum 5 years of sign painting experience similar in nature to work of this project.

1.5 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.

1.6 PROJECT 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 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. 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.

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. PPG Architectural Finishes, Inc.
 - 3. Sherwin-Williams Company (The).
 - 4. Tnemec

2.2 PAINT, GENERAL

- A. 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.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the OTC (Ozone Transport Commission) restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 - 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 - 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - 4. Floor Coatings: VOC not more than 100 g/L.
 - 5. Shellacs, Clear: VOC not more than 730 g/L.
 - 6. Shellacs, Pigmented: VOC not more than 550 g/L.
 - 7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
 - 8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 - 9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - 10. Floor Coatings: VOC not more than 100 g/L.
 - 11. Shellacs, Clear: VOC not more than 730 g/L.
 - 12. Shellacs, Pigmented: VOC not more than 550 g/L.
 - 13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.

14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
17. Fire Retardant Paint: VOC content of not more than 60 g/L.

- C. Colors: As scheduled on the Paint Color List following this section. Colors listed are for color matching purposes only.

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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Masonry: 12 percent.
 3. Gypsum Board: 12 percent.
 4. Wood: 15 percent
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers 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. Concrete Masonry Substrates: Remove 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.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- I. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - 1. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - 2. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - 3. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. When transparent finish is required, backprime with spar varnish or polyurethane.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. Application Procedures: Apply paints and coatings by brush or roller according to the manufacturer's directions, except as noted below. Spray application is not permitted for trim, ceilings and walls, unless specifically approved by Architect in advance for each individual situation. Roller application on woodwork is not permitted.
 - 1. 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.
 - 2. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 - 3. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

- C. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

- D. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- E. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- F. 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.

- G. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

 - 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
1. Owner will engage the services of a qualified testing agency to sample paint materials 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 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.

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. General: Provide listed products or equal products of other named manufacturers in Part 2.
- B. Steel and Iron Substrates: Polyurethane, Pigmented, Epoxy Zinc Rich Primer and High-Build Epoxy Coating System: Gloss or Semi-Gloss as selected by the Architect.
1. Prime Coat: Epoxy Zinc Rich Primer. Tnemec: Tneme-Zinc Series 90-97 or equal.
 2. Intermediate Coat: High-performance, polyamide-epoxy coating; High-Build Epoxy Marine Coating, Low Gloss: Tnemec: Hi-Build Epoxoline, Series 66, tinted slightly lighter than top coat., or equal
 3. Topcoat (Gloss)t: Aliphatic Acrylic Polyurethane, Two-Component, Pigmented, Gloss: Tnemec Endura-Shield II Series 1074.
 4. Topcoat (Semi-Gloss)t: Aliphatic Acrylic Polyurethane, Two-Component, Pigmented, Semi-Gloss: Tnemec Endura-Shield II Series 1075.

- C. Zinc-Coated (Galvanized) Metal: Full-gloss, acrylic latex enamel finish - 2 coats - self-priming.
 - 1. Prime Coat: Gloss acrylic latex enamel paint; MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
 - a. Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28
 - 2. Top Coat: Gloss acrylic latex enamel paint; MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
 - a. Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28

3.7 INTERIOR PAINTING SCHEDULE

- A. General: Provide listed products or equal products of other named manufacturers in Part 2.
- B. Gypsum Board Ceilings: Eggshell acrylic finish.
 - 1. Prime Coat: Latex-based, interior primer; MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Primer N534
 - 2. Intermediate Coat and Topcoat: Low-luster (eggshell or satin), acrylic-latex, interior enamel; MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009 LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Eggshell N538.
- C. Gypsum Drywall Walls: Semi-gloss, acrylic finish.
 - 1. Prime Coat: Latex-based, interior primer; MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Primer N534
 - 2. Intermediate Coat and Topcoat: Semigloss acrylic-latex, interior enamel; MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Latex Semigloss N539.
- D. Gypsum Drywall Walls at Bathrooms and Janitor's Closets (and where scheduled): Semi-Gloss, waterborne acrylic epoxy finish.
 - 1. Prime Coat: Latex or two component epoxy-based, interior primer; MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
 - a. Benjamin Moore; Fresh Start Multi-Purpose Primer N023.

2. Intermediate Coat and Topcoat: Two component semi-gloss acrylic-epoxy; Interior/Exterior Epoxy (water based), LEED 2009.
 - a. Benjamin Moore; Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341.
- E. Hollow Metal Doors, Frames, and Sidelights, and Ferrous Metals: Semigloss, acrylic- enamel finish.
1. Prime Coat: Rust-Inhibitive Primer (Water Based), MPI #107, X-Green 107, 134, LEED 2009, CHPS Certified.
 - a. Benjamin Moore; Super Spec HP Acrylic Metal Primer P04.
 2. Intermediate Coat and Topcoat: Factory-formulated semigloss acrylic-latex enamel for interior application; MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
 - a. Benjamin Moore; Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29
- F. Exposed Structural Steel Coated with Intumescent Fireproofing: Semigloss, acrylic- enamel finish. Note: Paint must be compatible with intumescent coating and must be approved by the intumescent fireproofing manufacturer for topcoating their product
1. Topcoat: Factory-formulated semigloss acrylic-latex enamel for interior application; MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
 - a. Benjamin Moore; Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29
- G. Concrete Masonry Units (CMU): Alkyd, water-based finish; in sheen as selected by Architect.
1. Prime Coat/Block Filler: MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore Super Spec Masonry Interior/Exterior Hi-Build Block Filler 206.
 2. Intermediate Coat and Topcoat: Alkyd, water-based finish; LEED 2009, LEED V4, CHPS Certified. One of the following:
 - a. Satin: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792.
 - b. Semi-Gloss: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793.
 - c. High Gloss: Benjamin Moore Advance Waterborne Interior Alkyd Gloss 794.
- H. Concrete Masonry Units (CMU) at Bathrooms and Janitor's Closets (and where scheduled): Semi-Gloss, waterborne acrylic epoxy finish.
1. Prime Coat: Acrylic block filler primer; LEED 2009.
 - a. Benjamin Moore; Corotech Acrylic Block Filler V114..
 2. Intermediate Coat and Topcoat: Two component semi-gloss acrylic- epoxy; Interior/Exterior Epoxy (water based), LEED 2009.

- a. Benjamin Moore; Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341
- I. Painted Woodwork: Semigloss, acrylic finish.
 1. Prime Coat: Latex-based, interior primer; MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Interior Latex Primer N534
 2. Intermediate Coat and Topcoat: Semigloss acrylic-latex, interior enamel; MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.
 - a. Benjamin Moore; Ultra Spec 500 Latex Semigloss N539.
 - J. Stained Wood and Woodwork: Satin, waterborne clear acrylic urethane over stain.
 1. Stain Coat: Penetrating wood stain, water-based; MPI # 186 LEED Credit.
 - a. Lenmar (Benjamin Moore); Waterborne Interior Wiping Stain 1WB.1300 (240 g/L)
 2. Intermediate Coat and Topcoat: Satin, interior waterborne clear acrylic urethane varnish; MPI # 121, 128.
 - a. Lenmar (Benjamin Moore); Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L)
 - K. Natural-Finish Wood and Woodwork: Satin, waterborne clear acrylic urethane.
 1. Three Finish Coats: Satin, interior waterborne clear acrylic urethane varnish; MPI # 121, 128.
 - a. Lenmar (Benjamin Moore); Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L).
 - L. Metal Decking and Framing Exposed at Ceilings: Flat dryfall finish.
 1. Prime Coat: Benjamin Moore; Corotech Prep All Universal Metal Primer V132.
 2. Top Coat: Benjamin Moore; Coronado Super Kote 5000 Dry Fall Alkyd Flat 105, MPI # 55.
 - M. Tectum Ceilings: Flat dryfall finish. Prime if required by manufacturer.
 1. First and Second Coat: Benjamin Moore; Coronado Super Kote 5000 Dry Fall Alkyd Flat 105, MPI # 55.
 - N. Concrete Floors: Semigloss, waterborne epoxy Polyamide self-priming finish - VOC Range <250; with slip resistant additive.
 1. Intermediate Coat and Topcoat: Benjamin Moore; I.M.C. Acrylic Epoxy Gloss #M43/M44. Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 2. Additive: H&C Sharkgrip Slip Resistant Additive, or equal.

- O. Concrete Floors, Stained: Waterborne acrylic stain; apply one coat or two coats as directed by Architect based on mock-up approval. (one coat is more transparent, two coats is opaque)
 - 1. First Coat: Insul-X (Benjamin Moore) TuffCrete Waterborne Acrylic Concrete Stain CST-2000 (153 g/L), MPI # 58.
 - 2. Second Coat (If required): Insul-X (Benjamin Moore) TuffCrete Waterborne Acrylic Concrete Stain CST-2000 (153 g/L), MPI # 58.

END OF SECTION 099100

PAINT COLORS. IF SUBSTITUTED DRAWDOWNS WITH THE CLOSEST MATCH TO BE SUBMITTED FOR REVIEW.

TAG	GENERAL LOCATION	COLOR NO.	COLOR NAME	COMMENTS
P1	WALLS THROUGHOUT	SW7056	RESERVED WHITE	BASE COLOR EVERYWHERE BUT COMMUNITY WING ROOMS, ART ROOM, & MAKERSPACE.
P2	HM DOOR FRAMES	SW7649	SILVERPLATE	
P3	SOFFITS, GWB CEILINGS	SW7007 - CEILING BRIGHT WHITE		NOT AT CLASSROOM ENTRY NICHE, MULTI-USER TOILET ROOMS OR CORRIDOR NOOKS, EXTERIOR SOFFIT EIFS
P4	<u>DARK ACCENTS</u>			CLASSROOM ENTRY CEILINGS, CORRIDOR NICHE,
P4a	FIRST FLOOR	SW6906	LEMON TWIST	FIRST FLOOR
P4b	SECOND FLOOR	SW6711	PARAKEET	SECOND FLOOR
P4c	THIRD FLOOR	SW9048	SURFIN'	THIRD FLOOR
P4d	FOURTH FLOOR	SW6804	DIGNITY BLUE	FOURTH FLOOR, LOCKER ROOMS
P5	<u>LIGHT ACCENTS</u>			CLASSROOM ACCENT WALLS, MULTIUSER TOILET ROOM CEILINGS, STAIRWELL ACCENTS
P5a	PREK, K SINGLE USER TOILET ROOMS WALLS	SW1666	VENETIAN YELLOW	
P5b	2ND FLOOR	SW9031	PRIMAVERA	ALSO IN ART ROOM & MAKERSPACE
P5c	3RD FLOOR	SW6779	LIQUID BLUE	ALSO IN ART ROOM & LIBRARY
P5d	4TH FLOOR	SW7071	GRAY SCREEN	
P5e	SINGLE USER GENDER NEUTRAL	SW9055	BILLOWY BREEZE	
P6	STRIPE @ COMMUNITY WING	SW6683	BEE	
P7	COMMUNITY WING	SW7004	SNOWBOUND	BASE COLOR FOR ALL ROOMS IN COMMUNITY WING AS WELL AS ART ROOM & MAKERSPACE
P8	OFFICE ACCENT 1	SW9053	AQUA FRIA	FAULTY ROOM, COPY ROOM, & HEALTH SUITE
P9	OFFICE ACCENT 2	SW6521	NOTABLE HUE	MAIN OFFICE, PRINCIPAL SECRETARY OFFICE, & CONFERENCE ROOM
P10	STEEL STAIR B BEAM ONLY VISABLE FROM OUTSIDE			
P10a	LOWEST BEAM	SW6717	LIME RICKEY	
P10b	MIDDLE BEAM	SW6794	FLYWAY	
P10c	UPPER BEAM	SW6959	BLUE CHIP	
P11	LIBRARY ACCENT	SW 6695	MIDDAY	
P12	LIBRARY WALLS	SW7628	WINDFRESH WHITE	
P13	DOWNSPOUT PAINT COLOR	TBD		
P14	EXTERIOR PIPE RAIL	SW7068	GRIZZLE GREY	
P15	EIFS ROOF AREA	SW7017	DORIAN GRAY	
P16	CONCRETE FLOOR	SW7650	ELLIE GRAY	LOADING DOCK
P17	STAIR STRINGER	SW6256	SERIOUS GRAY	INC.UNDERSIDE, BUT NOT AT GWB
P18-20	open colors TBD			
	plus black and white			

SECTION 101000 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of visual display boards:
 - 1. Porcelain enamel markerboards.
 - 2. Cork tackboards
 - 3. Sliding whiteboards on track system with hanging hardware.
 - 4. Magnetic boards.
- B. Related Work Specified Elsewhere:
 - 1. Sliding whiteboard doors for Makerspace and Learning Commons are specified in Division 06 Section "Interior Architectural Woodwork."

1.2 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for each type of visual display board specified.
- B. Shop Drawings: For each type of visual display board required, including dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length. Include sections of typical trim members. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors available for tackboards.
- D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.
 - 1. Markerboards: Actual sections of porcelain enamel finish for each type of markerboard required not less than 8-1/2 by 11 inches, mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
 - 2. Tackboards: Sample panels of actual materials to be supplied in the finished Work, not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
 - 3. Magnetic Boards: One full-size sample of finishes magnetic board, which upon approval may be used in the Work.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide materials with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Class A
- C. Provide GREENGUARD certified products.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating markerboards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.5 WARRANTY

- A. General Warranty: The special porcelain enamel warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Porcelain Enamel Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
 - 1. Warranty Period: 50 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Porcelain Enamel Markerboards:
 - a. Claridge Products and Equipment, Inc.
 - b. Greensteel, Inc.
 - c. Lemco, Inc.
 2. Tackboards:
 - a. Best-Rite Chalkboard Co.
 - b. Carolina Chalkboard Co.
 - c. Claridge Products and Equipment, Inc.
 - d. Ghent Manufacturing, Inc.
 - e. Greensteel, Inc.
 - f. Lemco, Inc.
 - g. Marsh Chalkboard Company.
 3. Sliding Whiteboards on Track System with Hanging Hardware: Track Technology Systems Inc.
 4. Magnetic Boards: Hale Manufacturing or Media Technologies.

2.2 MATERIALS, GENERAL

- A. Low-Emitting Materials: All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI)
- B. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
 2. Contact Adhesive: 80 g/L

2.3 TACKBOARDS

- A. Cork Tackboards: Color impregnated cork board composed of 1/4" thick self-healing, burlap backed cork laminated to a 1/4" hardboard backing, surrounded by 5/8" wide aluminum face trim.
1. Color(s): As selected by Architect for each location.
 2. Size(s): As indicated on Drawings. Refer to Tackboard and Whiteboard Schedule.
 3. Frame Style: 5/8" face, mitered corners, clear satin anodized aluminum finish.
 4. Corkboard Material: Claridge Cork
 5. Basis of Design Product: 800 Series Type CO by Claridge or equal.

2.4 MARKERBOARDS, FIXED

- A. Porcelain Enamel Markerboards: Provide balanced, high-pressure-laminated porcelain enamel boards of 3-ply construction consisting of face sheet, core material, and backing.
- B. Face Sheet: 0.024-inch (0.61-mm) enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).
 - 1. Cover Coat (Markerboards): Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.
- C. Core: Core: 3/8-inch- (9.5-mm-) thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
- D. Backing Sheet: Backing Sheet: 0.015-inch- (0.38-mm-) thick, aluminum-sheet backing.
- E. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
- F. Markerboard Color: #100 White.
- G. Basis of Design Product: LCS 3 Markerboard by Claridge, or equivalent.
- H. Unit Markerboards: Basis of Design is Claridge 800 Series with 5/8" Face Trim, or equal.
 - 1. Accessories: Full length marker tray and map rail with two map hooks.
 - 2. Frame Style: 5/8" face, mitered corners, clear satin anodized aluminum finish.
 - 3. Sizes: As indicated on Drawings. Refer to Tackboard and Whiteboard Schedule.

2.5 SLIDING MARKERBOARDS WITH TRACK SYSTEM AND HANGING HARDWARE

- A. Sliding Whiteboards (DB-1 and DB-2): Steel markerboards with glossy surface fabricated from 18 gauge cold rolled steel with double-formed 90 degree edges on all four sides, and glossy white surface for dry erase markers. Frameless markerboard shall have multiple horizontal steel channeled stiffeners adhered to markerboard back surface, designed to be attached to sliding track system.
 - 1. Basis of Design Product: Diversiboard MB by Track Technology Systems Inc. or equal.
 - 2. Sizes: As indicated on Drawings. Refer to Tackboard and Whiteboard Schedule
 - 3. Provide music lines on the whiteboards in the music room.
- B. Sliding Whiteboard Hardware: Provide sliding track mount, dual-track system, including tracks and rollers, carriages, connectors and rails that attach white boards, and a

mechanical brake; provide additional track sections and custom roller lengths as required for complete assembly.

1. Basis of Design Product: Diversitrack by Track Technology Systems Inc. or equal.
2. Track Length: As indicated on Drawings. Refer to Tackboard and Whiteboard Schedule.

2.6 MAGNETIC BOARDS

- A. Custom fabricate magnetic boards from DF stile/rail maple end panels with perforated metal infill in the frame. Back shall be finished and flush to the wood frame. Size 30"w x 46"h.

1. Basis of Design Product: Model #EP4630 by Hale Manufacturing, or equal product by Media Technologies.

2.7 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch- (1.57-mm-) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by the Architect from manufacturer's standard structural support accessories to suit conditions indicated.

- B. Mounting Accessories: Provide angle clip hangers and mounting adhesive supplied by manufacturer.

- C. Flag Holders: Provide a flag holder accessory for each classroom.

2.8 FABRICATION

- A. Assembly: Provide factory-assembled tackboards and markerboard units in single units without joints.

2.9 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

- C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
 - 1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
 - 2. Surfaces to receive tackboards and magnetic boards shall be dry and free of substances that would impair the bond between tackboards or magnetic boards and substrate
 - 3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights as indicated on drawings; comply with manufacturer's installation instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed
- B. Clean units in accordance with the manufacturer's instructions. Break in markerboards only as recommended by the manufacturer.

END OF SECTION 101000