

June 27, 2025 -- ADDENDUM NO. 03 West Virginia University Parkersburg Main Building & Caperton Center Upgrades

TO ALL BIDDERS:

The following items revise or clarify the Bidding Documents dated June 02, 2025. Acknowledge receipt of this Addendum at the appropriate locations indicated in the Bidding Documents. Failure to do so may cause the Bid to be rejected or disqualified.

LIST OF ADDENDUM ITEMS:

1.0 PROJECT MANUAL

- 1.1 Add Spec Section 072726 Fluid Applied Membrane Air Barriers
- **1.2** Revised Spec Section 077200 Roof Accessories
- **1.3** Revised Spec Section 084413 Glazed Aluminum Curtain Wall
- **1.4** Revised Spec Section 088000 Glazing
- **1.5** Refer to Section 024119 for Selective Demolition as a whole and Specifically Article 3.3 for protection of existing construction.
- **1.6** Please provide material specifications for: Gypsum sheathing and Metal hat channel gauge. <u>Answer -</u> Sheathing: Glass-mat-faced gypsum sheathing; ASTM C1177; 5/8 inch
- 1.7 11. Spec section 075323 references the base, intermediate and upper layers of insulation shall be 2". Drawings show 2 layers of 3". Please specify if the insulation is to be 2" or 3". <u>Answer -</u> Provide roof insulation in multiple layers with joints staggered minimum of 6 inches from joints of preceding layer. Provide R value of 30 minimum.

2.0 DRAWINGS

- 2.1 Match existing finishes for wall and ceiling see demolition notes on Drawings A1.01
- 2.2 Window treatments are attached directly to the aluminum window wall. Reinstall existing? Demo? Answer - Remove window treatments. If University refuses them, legally dispose of them off Owner's property.
- 2.3 Radiant heat units are attached directly to the aluminum window wall. Can these units be reinstalled for the new window system? <u>Answer -</u> Provide an angle support attached to the floor structure to support the radiant heating units.
- 2.4 Please clarify exactly what areas of the building are to have the caulking restoration work detailed on A1.01 performed. The entire building? Only certain sides? Upper areas? Lower areas? <u>Answer</u> <u>–</u> Entire Building stated as the area of work on Drawing A1.01

END OF ADDENDUM NO. 03

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. High-build air barriers, vapor retarding.
 - 2. High-build air barriers, vapor permeable.
 - 3. Medium-build air barriers, vapor retarding.
 - 4. Medium-build air barriers, vapor permeable.
 - 5. Low-build air barriers, vapor retarding.
 - 6. Low-build air barriers, vapor permeable.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
 - 2. Section 072500 "Weather Barriers" for weather barriers, including [building paper] [flexible flashing] [and] [building wraps with air-barrier properties].

1.2 DEFINITIONS

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

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site] < Insert location>.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

- 1. High-build air barriers, vapor retarding.
- 2. High-build air barriers, vapor permeable.
- 3. Medium-build air barriers, vapor retarding.
- 4. Medium-build air barriers, vapor permeable.
- 5. Low-build air barriers, vapor retarding.
- 6. Low-build air barriers, vapor permeable.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.[Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.]
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer to be licensed by ABAA in accordance with ABAA's Quality Assurance Program and to employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution[and for preconstruction testing].
 - 1. Build integrated mockups of exterior wall assembly [as indicated on Drawings] [, 150 sq. ft.] <Insert requirement>, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane[, building corner condition,] [and] [foundation wall intersection].

- c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
- 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: [Owner will engage] [Engage] a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies must comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 - 1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage in accordance with [ASTM E1186, chamber pressurization or depressurization with smoke tracers] [ASTM E1186, chamber depressurization with detection liquids] <Insert requirement>.
 - 2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate in accordance with [ASTM E783] [or] [ASTM E2357].
 - 3. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate in accordance with ASTM D4541.
 - 4. Notify Architect [seven] <Insert number> days in advance of the dates and times when mockups will be tested.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing 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.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain primary air-barrier materials and air-barrier accessories from single manufacturer.

FLUID-APPLIED MEMBRANE AIR BARRIERS

MAIN BUILDING & CAPERTON UPGRADES

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier[and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration]. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations[, tie-ins to installed waterproofing], and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum [0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft.] <Insert value>, when tested in accordance with ASTM E2357.
- C. Air Permeance: Maximum [0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft.] <Insert value> pressure difference; ASTM E2178.
- D. Ultimate Elongation: Minimum [200] [250] [350] [500] <Insert number> percent; ASTM D412, Die C.
- E. Adhesion to Substrate: Minimum [16 lbf/sq. in.] [30 lbf/sq. in.] <Insert value> when tested in accordance with ASTM D4541.
- F. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- G. UV Resistance: Can be exposed to sunlight for [30] [60] [90] [180] [240] [360] <Insert number> days in accordance with manufacturer's written instructions.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier, Modified Bituminous Type: Modified bituminous membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. <a>

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- B. High-Build, Vapor-Retarding Air Barrier, Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. <<u>Couble click here to find, evaluate, and insert list of manufacturers and products</u>
- C. Vapor Permeance: Maximum [0.1 perm] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.4 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier, Modified Bituminous Type: Modified Bituminous membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

- 1. <a> <a>
- B. High-Build, Vapor-Permeable Air Barrier, Synthetic Polymer Type: Synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.
 - 1. <a>

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- C. Vapor Permeance: Minimum [5 perms] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.5 MEDIUM-BUILD AIR BARRIERS, VAPOR RETARDING

- A. Medium-Build, Vapor-Retarding Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 16 to 34 mils over smooth, void-free substrates.
 - 1. <a> <a>
 - 2. Vapor Permeance: Maximum [0.1 perm] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.6 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 16 to 34 mils over smooth, void-free substrates.
 - 1. <a>

 Source of the second second
 - 2. Vapor Permeance: Minimum [5 perms] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.7 LOW-BUILD AIR BARRIERS, VAPOR RETARDING

- A. Low-Build, Vapor-Retarding Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 6 to 15 mils over smooth, void-free substrates.
 - 1. <a>

 Source of the second second
 - 2. Vapor Permeance: Maximum [0.1 perm] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.8 LOW-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. Low-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 6 to 15 mils over smooth, void-free substrates.
 - 1. <a> <a>

2. Vapor Permeance: Minimum [5 perms] <Insert value>; ASTM E96/E96M, [Procedure A, Desiccant Method] [Procedure B, Water Method].

2.9 ACCESSORY MATERIALS

- A. Provide primers, transition strips, termination strips, joint reinforcing fabric and 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] [solvent-borne] primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, [0.0187 inch] [0.0250 inch] <Insert dimension> thick, and Series 300 stainless steel fasteners.
- D. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 - 1. <a> <a>

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 substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 3. Verify that substrates are visibly dry and free of moisture.[Test concrete substrates for capillary moisture by plastic sheet method in accordance with ASTM D4263.]
 - 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, fill, and seal substrate and joints and cracks in substrate in accordance with manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for airbarrier 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 material.
- 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 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 in accordance with manufacturer's written instructions and details.

3.3 INSTALLATION OF ACCESSORIES

- A. Install accessory materials in accordance with 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 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] [preformed silicone extrusion] so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
 - 1. Transition Strip: Roll firmly to enhance adhesion.
 - 2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. 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 beyond repaired areas in strip direction.

3.4 INSTALLATION OF PRIMARY AIR-BARRIER MATERIAL

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier in accordance with 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 Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils] [not less than 40 mils] [not less than 45 mils] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats].

- 2. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats].
- C. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding, Medium-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements] [not less than 16 mils] [not less than 34 mils] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats]. Apply additional material as needed to achieve void- and pinhole-free surface.
 - 2. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats]. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
- D. Low-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
 - Vapor-Retarding, Low-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements] [not less than 15 mils] [not less than 6 mils] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats]. Apply additional material as needed to achieve void- and pinhole-free surface.
 - 2. Vapor-Permeable, Low-Build Air Barrier: Total dry film thickness [as recommended in writing by manufacturer to comply with performance requirements] <Insert dimension>, applied in [one coat] [two equal coats] [one or more equal coats]. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.
- E. Do not cover air barrier until it has been tested and inspected by testing agency.
- F. 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. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: [Owner will engage] [Engage] a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. [Inspections may include the following:]

- 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
- 2. Air-barrier dry film thickness.
- 3. Continuous structural support of air-barrier system has been provided.
- 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
- 5. Site conditions for application temperature and dryness of substrates have been maintained.
- 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
- 7. Surfaces have been primed, if applicable.
- 8. 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.
- 9. Termination mastic has been applied on cut edges.
- 10. Strips and transition strips have been firmly adhered to substrate.
- 11. Compatible materials have been used.
- 12. Transitions at changes in direction and structural support at gaps have been provided.
- 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
- 14. All penetrations have been sealed.
- D. Tests: As determined by testing agency from among the following tests:
 - 1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage in accordance with [ASTM E1186, chamber pressurization or depressurization with smoke tracers] [ASTM E1186, chamber depressurization using detection liquids] <Insert requirement>.
 - 2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate in accordance with [ASTM E783] [or] [ASTM E2357].
 - 3. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in accordance with ASTM D4541 for each [600 sq. ft.] <Insert value> of installed air barrier or part thereof.
- E. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, in accordance with manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than

recommended, remove and replace air barrier or install additional, full-thickness, airbarrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.

- 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof curbs if not provided by equipment manufacturer.
 - 2. Equipment supports if not provided by equipment manufacturer.

3. Roof hatches.

- 4. Non-penetrating railing system
- 5. Pipe and duct supports.
- 6. Pipe portals.
- 7. Preformed flashing sleeves.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roofhatch curbs.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
 - 4. Section 077100 "Roof Specialties" for manufactured gutters and downspouts.
 - 5. Section 233423 "HVAC Power Ventilators" for power roof-mounted ventilators.
 - 6. Section 237413 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

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

1.6 CLOSEOUT SUBMITTALS

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

1.7 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 ROOF CURBS

- A. Roof Curbs: Insulated internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides and integrally formed deck-mounting flange at perimeter bottom.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.
- D. Material: Aluminum-zinc alloy-coated steel sheet, 0.079 inch thick.
 - 1. Finish: Two-coat fluoropolymer.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:

- 1. Curb Profile: Manufacturer's standard compatible with roofing system.
- 2. Fabricate curbs to minimum height of 12 inches above finished roofing surface unless otherwise indicated.
- 3. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
- 4. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
- 5. Insulation: Factory insulated with 1-1/2-inch thick glass-fiber board insulation.
- 6. Liner: Same material as curb, of manufacturer's standard thickness and finish.
- 7. Nailer: Factory-installed wood nailer along top flange of curb, continuous around curb perimeter.
- 8. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
- 9. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
- 10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Rail-type metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, and integrally formed structure-mounting flange at bottom.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported
- D. Material: Aluminum-zinc alloy-coated steel sheet, 0.064 thick.
 - 1. Finish: Two-coat fluoropolymer.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Material: Aluminum sheet, 0.125 inch thick.
 - 1. Finish: Two-coat fluoropolymer
 - 2. Color: As selected by Architect from manufacturer's full range.
- F. Material: Stainless steel sheet, 0.0781 inch thick.
 - 1. Finish: Manufacturer's standard.

G. Construction:

- 1. Curb Profile: Manufacturer's standard compatible with roofing system.
- 2. Insulation: Factory insulated with 1-1/2-inch thick glass-fiber board insulation.
- 3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
- 4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches wide on top flange of equipment supports continuous around support perimeter.
- 5. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
- 6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
- 7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
- 8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
- 9. Fabricate equipment supports to minimum height of 12 inches above roofing surface unless otherwise indicated.
- 10. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.4 ROOF HATCHES

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double -walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides and integrally formed deck-mounting flange at perimeter bottom.
- B. Type and Size: Single-leaf lid, 36 by 36 inches.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Zinc-coated (galvanized) steel sheet.
 - 1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 - 2. Finish: Two-coat fluoropolymer.
 - 3. Color: Match Architect's sample.

E. Hatch Material: Aluminum sheet.

- 1. Thickness: Manufacturer's standard thickness for hatch size indicated.
- 2. Finish: Two-coat fluoropolymer.
- 3. Color: As selected by Architect from manufacturer's full range.
- F. Construction:

- **1. Insulation: 1-inch thick, glass-fiber board.**
 - a. R-Value: 4.3 according to ASTM C1363.
- 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
- 3. Hatch Lid: Glazed, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
- 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
- 5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
- 6. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.
- G. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 1. Provide two-point latch on lids larger than 84 inches.
- H. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 - 1. Height: 42 inches above finished roof deck.
 - 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 - 3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 - 4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 - 5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 - 6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 9. Fabricate joints exposed to weather to be watertight.
 - 10. Fasteners: Manufacturer's standard, finished to match railing system.
 - 11. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.
- I. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roofaccess ladder.
 - 1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.

2. Height: 42 inches above finished roof deck.

- 3. Material: Stainless steel or Aluminum]
- 4. Post: 1-5/8-inch- diameter pipe.

5. Finish: Manufacturer's standard baked enamel or powder coat.

a. Color: As selected by Architect from manufacturer's full range.

2.5 NON-PENETRATING RAILING SYSTEM

- A. Roof Edge Protection: Provide Safety Rail Company freestanding pedestrian egress barrier system on roof, including pipe railings, uprights, bases, accessories and fittings.
 - a. Roof Edge Protection: Provide Safety Rail freestanding pedestrian egress barrier system on roof, including pipe railings, uprights, bases, accessories and fittings.
 - b. System top and mid rail provided in accordance with OSHA Standards 29 CFR 1910.29 (b)(1-14).
 - c. Structural Load: 200 lb (90.7 kg), minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.
 - d. Height: 42 inches (1067 mm), minimum.
 - e. Railings: 1-5/8 inch (41 mm) O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.
 - f. Mounting Bases: 104 lbs (47.2 kg) Class 30 gray iron material cast with four receiver posts. Provide rubber pads on bottom of bases.
 - g. Receiver Posts: Provided with a positive locking system into receiver holes that allow rails to be mounted in any direction. Receiver posts shall have drain holes.
 - h. Securing Pins: 1010 carbon steel, zinc plated and yellow chromate dipped. Pins shall consist of collared pin and latch that connects to lynch pin.
 - i. Accessories:
 - 1) Toe Board Brackets.
 - 2) Roof Pads: Provide additional EPDM Roof Pad under each base to protect roof membrane.
 - j. Factory finished powder coat paint.
 - 1) Color: Specified by Architect.

2.6 PIPE AND DUCT SUPPORTS

A. Adjustable-Height Structure-Mounted Pipe Supports: Extruded-aluminum tube, filled with urethane insulation; 2 inches in diameter; accommodating up to 7-inch- diameter pipe or conduit, with provision for pipe retainer; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, stainless steel roller and retainer, and extruded-aluminum carrier assemblies; as required for quantity of pipe runs and sizes.

2.7 PIPE PORTALS

- A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless steel snaplock swivel clamps.
- B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless steel snaplock swivel clamps.

2.8 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.
 - 1. Metal: Aluminum sheet, 0.063 inch thick.
 - 2. Diameter: As required for specified pipe sizes on Drawings
 - 3. Finish: Manufacturer's standard.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 - 1. Metal: Aluminum sheet, 0.063 inch thick.
 - 2. Height: 13 inches.
 - 3. Diameter: As required for specified pipe sizes on Drawings.
 - 4. Finish: Manufacturer's standard.

2.9 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.
 - 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 - 3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, AZ50 coated.

- 1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
- 2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
- 3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil
- 4. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
- 5. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
- 6. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- C. Aluminum Extrusions and Tubes: ASTM B221 manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- D. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- E. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.
- F. Steel Tube: ASTM A500/A500M, round tube.
- G. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.
- H. Steel Pipe: ASTM A53/A53M, galvanized.

2.10 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.

- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Underlayment:
 - 1. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 - 2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D4397.
 - 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.
 - 4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slipresisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
- F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
- G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- H. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- J. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

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

E. Roof-Hatch Installation:

- 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
- 2. Attach safety railing system to roof-hatch curb.
- 3. Attach ladder-assist post according to manufacturer's written instructions.

F. Do not begin installation until substrates have been properly prepared.

- G. Non-penetrating railing system:
 - 1. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
 - 2. Clean surfaces thoroughly prior to installation.
 - 3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 - 4. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
 - 5. Protect installed products until completion of project.
 - 6. Touch-up, repair or replace damaged products before Substantial Completion.
- H. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
 - 1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- I. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.
- J. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

ROOF ACCESSORIES

SECTION 084413 - GLAZED ALUMINUM WINDOW-CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazed aluminum window curtain wall.

1.02 RELATED REQUIREMENTS

- A. Section 051200 Structural Steel Framing.
- B. Section 078400 Firestopping.
- C. Section 079200 Joint Sealants.
- D. Section 088000 Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA 501.2 Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.
- B. AAMA 501.4 Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift; 2018.
- C. AAMA 503 Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.
- D. AAMA 609 & 610 Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- E. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum; 2020.
- F. AAMA CW-10 Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- G. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- J. ASTM E330/E330M Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

- K. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).
- L. ASTM E783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).
- M. ASTM E1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components comprising exterior enclosure.
- B. Preinstallation Meeting: Conduct preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 013300 Submittal Procedures for submittal procedures.
- B. Product Data: Provide component dimensions, internal drainage details, and descriptions of anchorage, fasteners, structural sealant, and glazing.
- C. Shop Drawings: Indicate system dimensions, internal drainage, framed opening requirements and tolerances, expansion and contraction joints, and affected adjacent work.
- D. Samples: Submit two samples, 6 by 6 inches, illustrating finished aluminum surface and glazing.
- E. Certificate: Certify products of this section meet or exceed specified requirements.
- F. Design Data: Structural characteristics, physical characteristics, wind load calculations, dimensional limitations, and load calculations at attachment points to building structure.
- G. Test Reports: Submit results of full-size mock-up testing for previously tested exterior wall assembly.
- H. Designer's qualification statement.
- I. Installer's qualification statement.
- J. Specimen warranty.
- K. Executed warranty.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design curtain wall and structural support framing components under direct supervision of professional structural engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 Construction Waste Management and Disposal for packaging waste requirements.
- B. Handle products of this section in accordance with AAMA CW-10.
- C. Deliver materials to project site in manufacturer's original packaging with seals unbroken and contents identified.
- D. Protect materials from harmful environmental elements, construction dust, direct sunlight, and other detrimental conditions.

1.08 FIELD CONDITIONS

 A. Do not install sealants at ambient temperature below 40 degrees F. Maintain temperature above 40 degrees F during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 2-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacing units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Extended Correction Period: Correct defective work within 5-year period commencing on substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- Basis of Design: Series <u>YCW 750 OG</u> YWW 45 T MegaTherm® Aluminum Window Wall System manufactured by YKK AP <u>America Inc</u>.
- B. Or other manufacturers that can meet performance specifications:
 - 1. Tubelite Inc.

GLAZED ALUMINUM **WINDOW** <u>CURTAIN</u> WALLS

2. Kawneer <u>Company Inc.</u>

C. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.02 GLAZED ALUMINUM CURTAIN WALL

- A. Description: Factory-fabricated, factory-finished aluminum framing members with flashings, anchorage, and attachment devices.
 - 1. Eliminate noise caused by wind and thermal movement, prevent vibration harmonics, and prevent stack effect in internal spaces.
 - 2. Internal Drainage: Provide weep network to drain migrating moisture, water entering joints, and condensation in glazing channel to exterior.
 - 3. Outside glazed, with pressure plate and mullion cover.
 - 4. Maintain continuous air barrier and vapor retarder seal throughout assembly, in line with glazing pane and heel bead of glazing compound.
 - 5. Movement: Accommodate the following movement without component damage or seal deterioration:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by 170 degrees F temperature cycling over 12-hour period.
 - c. Curtain wall movement relative to perimeter framing.
 - d. Structural support framing deflection under permanent and dynamic loads.
 - e. Shortening of structural concrete columns.
 - f. Creep of structural concrete members.
 - g. Interstory drift of _____ inches.
 - h. Mid-span slab edge deflection as determined by delegated design. of _____ inches.
- B. Delegated Design:
 - 1. Engage a qualified professional engineer to design glazed aluminum curtain walls.
- C. Performance Requirements:
 - Wind Loads: Provide components capable of withstanding loads without damage or permanent set when tested in accordance with ASTM E330/E330M, using 1.5 times the design wind loads and 10-second maximum load duration.
 - a. Member Deflection: Limit member deflection to L/175, with full recovery of glazing materials.

2. Water Penetration Resistance: No uncontrolled water on interior face when tested in accordance with ASTM E331 at pressure differential of 15 psf.

2.03 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Construction Method: Factory-unitized system.
 - 2. Glazing Method: Factory-glazed system.
 - 3. Provide thermally broken members.

4. <u>Aluminum Framing Depth: 7.5 inches.</u>

- 5. Cross-Section: As indicated on drawings.
- 6. Structurally Reinforced Members: Provide internal reinforcement from structural steel member.
- 7. Finish: Class I Natural Anodized Color anodized.
 - a. Color: As selected by Architect from manufacturer's standard line.

8. **Products: Kawneer**

- B. Swing Doors: Glazed aluminum with interlocking corners to conceal rail edges.
 - 1. Basis of Design: YKK 50HL
 - 1-2. Configuration and Size: As indicated on drawings Wide stile.
 - 2.3. Top Rail: 2-1/2 5 inches wide.
 - 3.<u>4.</u> Vertical Stiles: 1-15/16 5 inch wide.
 - 4. Midrail Size: 7-5/16 inch.
 - 5. Bottom Rail: 10 inches wide.
 - 6. Glazing Thickness: 1 inch.
 - 7. Glazing Stops: Square.
 - 8. Finish: Match storefront curtain wall.
 - 9. Weatherstripping: Wool pile, continuous and replaceable; provide on interior and exterior doors.
- C. Glazing: See Section 088000.
- D. Glazing Gaskets: EPDM, compatible with adjacent materials; comply with ASTM C864.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 and ASTM B221M, alloy 6063-T6.

2.05 FINISHES

- A. Factory finish exposed surfaces.
- B. Class I Natural Anodized Finish: Clear anodic coating, comply with AAMA 611 AA-M12C22A41, minimum 0.7 mil, 0.0007 inch thick.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 ACCESSORIES

- A. Structural Supporting Anchors. : See Section 051200.
- B. Fasteners: Stainless steel; type recommended by curtain wall manufacturer.
- C. Exposed Flashings: Aluminum sheet, 20-gauge, 0.032-inch minimum thickness; finish to match framing members.
- D. Concealed Flashings: Stainless steel, 26-gauge, 0.0187-inch minimum thickness.
- E. Thermal Separator: Extruded, elastomeric material compatible with silicone sealants.
- F. Firestopping: See Section 078400.
- G. Sealants: See Section 079200.
- H. Glazing Accessories: See Section 088000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and attachments to other work.
- B. Verify curtain wall openings and adjoining vapor retarder and weather barrier seal materials are ready to receive work of this section.
- C. Verify installation and location of anchorage devices.

3.02 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.
- B. Attach to structure in manner permitting adjustment to accommodate construction tolerances and other irregularities.
- C. Permanently fasten system to building structure with alignment attachments and shims.
- D. Joints and Corners: Flush and weatherproof, accurately fitted and secured, with fasteners and attachments concealed from view; prepared to receive anchors and hardware; reinforced as required for imposed loads.

GLAZED ALUMINUM **WINDOW** <u>CURTAIN</u> WALLS

- E. Fasteners and Attachments: Concealed; reinforced as required for imposed loads.
- F. Where fasteners penetrate sill flashings, make watertight by sealing fastener heads to sill flashing.
- G. Align assembly plumb and level, free of warp or twist. Maintain dimensional tolerances and align with adjacent work.
- H. Thermally isolate system where components penetrate or disrupt insulation.
- I. Install flashing. Turn up ends and edges; seal to adjacent work to form watertight dam.
- J. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- K. Install glass using wet glazing method.
 - 1. See Section 088000.
- L. Sealants: Install in accordance with manufacturer's instructions.
- M. Seal framing to water-resistive barriers in adjacent construction. See Section 072500.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements for additional requirements.
- B. Test for water leakage in accordance with AAMA 501.2. Test shall not evidence water penetration.
 - 1. Perform minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- C. Test for water and air penetration accordance with AAMA 503.
 - 1. Perform minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of work.
 - 3. Test for water penetration in accordance with ASTM E1105 at minimum test pressure of 8 psf.
 - a. Allowable Rate of Water Penetration for 15-Minute Test: Maximum 0.5 ounce of water not drained to exterior or collected on surface of horizontal framing member.
 - 4. Test for air leakage in accordance with ASTM E783 at uniform static air pressure difference of 1.57 psf.

3.04 CLEANING

- A. See Section 017000 Execution and Closeout Requirements for additional requirements.
- B. Remove protective material from prefinished aluminum surfaces.
- C. Wash surfaces with solution of mild detergent in warm water. Remove dirt from corners.
- D. Upon completion of installation, clean aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION 084413

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for doors and **window** <u>curtain</u> walls.
 - 2. Glazing sealants and accessories.
- B. Related Sections:
 - 1. Section 084113 <u>Glazed Aluminum Curtain Walls</u> for aluminum frames and doors.
 - 2. Section 081113 Hollow Metal Doors and Frames for Hollow Metal doors and interior window frames.

1.3 DEFINITIONS

- A. Doors: Aluminum, hollow metal and wood assemblies.
- B. Exterior: Installation located within the exterior wall of the building.
- C. Frames: Aluminum curtain wallstorefront, aluminum entrance and hollow metal assemblies.
- D. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- E. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- F. Glass/Glazing: Terms are interchangeable and have same meaning.
- G. IBC: International Building Code.
- H. Interspace: Space between lites of an insulating glass unit.
- I. Interior: Installation located within the interior walls of the building.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches square.
 - 1. Tinted glass.
 - 2. Coated glass.
 - 3. Laminated glass.
 - 4. Insulating glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations as indicated.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of glass products.
- B. Product Certificates: For glass.
- A. Product Test Reports: For each type of fire-rated glass and security glass, tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of

insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

- 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
- 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
- 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Permanently mark glazing with certification label. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with specified requirements, and is not less than the thickness indicated or required, whichever is greater.
 - 1. Minimum Glass Thickness for Exterior Lites: ¹/₄ inch.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heatstrengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heatstrengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Class 1 (clear) or Class 2 (tinted) as applicable to product; Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Low E Coating: For insulating glass units, glass manufacturer's standard second-surface sputter coating.

E. Opacifier: Equal to Vitro Opaci-Coat-300; Color selected by Architect.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.5 INSULATING GLASS

- A. Insulating Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Spacer: Manufacturer's standard spacer material and construction.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.
 - 4. Color Appearance: Steel blue gray.
 - 5. Minimum Lite Thickness: 1/4 inch.
 - 6. Unit Width: 1-inch.
 - 7. Winter Nighttime U-Factor: **0.27 0.28** maximum.

8. Summer Daytime U-Factor: 0.295 maximum.

- 9. Visible Light Transmittance: 51 <u>46</u> percent minimum.
- 10. Solar Heat Gain Coefficient: **0.31**–**0.23** maximum.
- 11. Shading Coefficient: 0.36 maximum.
- 12. Include security glazing lites where <u>required by building code</u> indicated.
- B. Products: Subject to compliance with specified requirements, provide one of the following:
 - 1. Solarban <u>70</u> Z50 Optiblue+Clear; **PPG Industries, Ine** <u>Vitro Architectural Glass</u>.
 - 2. Architect-approved equivalent.

2.6 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
 - 4. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 5. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 6. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 GLASS SCHEDULE

- A. Insulated Glazing (Vision) -Use at exterior window.
 - Double Glazed Tint+Clear Solar Control Insulating Glass Unit [Solarban® 70XL * 6mm (2) Air 1/2" (12.7mm) | Clear 6mm] Conformance: ASTM E 2190
 - a. Outdoor Lite: Tinted Float Glass; Blue
 - b. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.
 - c. Glass Thickness: 6mm (1/4")
 - d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.
 - e. Coating: Solarban® 70**XL** on Surface # 2
 - f. Heat-Treatment: Heat-strengthened, ASTM C 1048, Kind HS, Tempered; ASTM C 1048, Kind FT; where tempered glass is mandated for safety or other purposes by code.
 - g. Interspace Content: Air 1/2" (12.7mm)
 - h. Indoor Lite: Clear float glass
 - i. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.
 - j. Heat-Treatment: Heat-strengthened, ASTM C 1048, Kind HS, Tempered; ASTM C 1048, Kind FT; where tempered glass is mandated for safety or other purposes by code.
 - k. Glass Thickness: 6mm (1/4")
 - 1. Performance Requirements: Refer to paragraph 2.5.A
 - 1) Visible Light Transmittance: 64 percent minimum.
 - 2) Winter Nighttime U-Factor: 0.28 (Btu/hr*ft2*°F) maximum.
 - 3) Summer daytime U-Factor: 0.26 (Btu/hr*ft2*°F) maximum.
 - 4) Shading Coefficient: 0.32 maximum.
 - 5) Solar Heat Gain Coefficient: 0.27 maximum.
 - 6) Outdoor Visible Light Reflectance: 12 percent maximum.

B. Insulated Spandrel Glazing.

- Double Glazed Tint+Clear Spandrel Glass Unit [Solarban® 70 * 6mm (2) Air 1/2" (12.7mm) | Clear 6mm] Conformance: ASTM E 2190
 - a. Outdoor Lite: Tinted Float Glass, Blue, Heat-strengthened
 - b. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.
 - c. Glass Thickness: 6mm (1/4")
 - d. <u>Coating: Solarban® 70 on Surface # 2</u>
 - e. Interspace Content: Air 1/2" (12.7mm)
 - f. Indoor Lite: Clear float glass, Heat-strengthened
 - g. Opacifier: Ceramic-frit on Surface #4
 - h. <u>Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.</u>
 - i. <u>Glass Thickness: 6mm (1/4")</u>

END OF SECTION 088000



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DESCRIPTION OF WORK: REMOVE KNEE WALL TO PAVEMENT. REINSTALL BRICK BELOW HEIGHT OF EXISTING UPPER PAVEMENT. CONSTRUCT NEW WALL CAP TO ACT AS CURB FOR PAVEMENT ABOVE. INSTALL TWO PIPE GUARDRAIL TO REPLACE KNEE WALL.

1



(B1) RAMP WALL ELEVATION

2

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C4 NEW CONCRETE WALL CAP 1 1/2" = 1'-0"

4

