

SECTION 084110

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Exterior and interior aluminum-framed storefronts.
 - 2. Exterior and interior manual-swing aluminum doors.
 - 3. Operable vents.
 - 4. Custom mullion caps.
- B. Sustainable Design Intent: Refer to Section 018113 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.
- C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 079200 - JOINT SEALANTS for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
 - 2. Section 084410 - GLAZED ALUMINUM CURTAIN WALLS for curtain-wall systems that mechanically retain glazing on four sides.
 - 3. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
 - 4. Section 088000 - GLAZING for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design entrance and storefront system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Dimensional tolerances of building frame and other adjacent construction.
 - 4. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.

- c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units to function properly.
- C. Structural Loads: Wind and seismic loads as indicated on the Structural Drawings, but not less than that required by Code.
- D. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- F. Air Infiltration: Provide doors and storefront which comply with the following. Test unit in accordance with ASTM E 283.
1. Swinging Entrance Doors, ASHRAE Requirement: 1.0 cfm/sf maximum air leakage at a pressure differential of 1.57 psf.
 2. Storefront, ASHRAE Requirement: 0.06 cfm/sf maximum air leakage at a pressure differential of 1.57 psf or higher.
- G. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.
1. Test Pressure: 8 psf.
 2. Performance: No leakage as defined in test method at specified test pressure. No uncontrolled water penetrating system or appearing on normally exposed interior surfaces.
- H. Solar Heat-Gain Coefficient: Provide units with a whole-unit SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.
- I. Thermal Transmittance: Provide window units that have a U-value as required by Code rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft. Submit proof of compliance with submittals as specified.

- J. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 65 for fixed storefront units and not less than 55 for doors when tested according to AAMA 1503.

1.4 SUBMITTALS

- A. Product Data: Include installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated. Indicate special procedures and perimeter conditions requiring special attention.
- B. LEED Submittals:
 - 1. Building Product Disclosure and Optimization, Material Ingredients:
 - a. Option 1, Material Ingredient Reporting: For factory-applied metal finishes, submit Declare product labels.
- C. Shop Drawings: Prepared under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum-framed systems. For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.
 - 3. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 - 4. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
 - 5. Wiring diagrams for power, signal, and control wiring.
 - 6. Activation and safety devices.
 - 7. Include full-size isometric details of each vertical-to-horizontal intersection of storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions
 - d. Glazing
 - e. Flashing and drainage.
 - 8. Include details showing interface with perimeter conditions to depict interface with adjacent thermal, weather, air and vapor barriers, and adjacent flashings.
 - 9. Shop drawings must be signed and stamped by a professional engineer.
- D. Delegated-Design Submittal: For entrance and storefront systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Show structural testing for attachment of the storefront to the existing structure. Contractor should survey slab edge locations and conditions of the embeds to develop the attachment details.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- F. Qualification Data: For Installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.
- H. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that units as glazed for this Project meet or exceed Code requirements for the following:
 - 1. U-value.
 - 2. Solar heat-gain coefficient.
- I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of entrance and storefront systems that are similar to those indicated for this Project in material, design, and extent.
- C. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
- D. Accessible Entrances: Comply with authorities having jurisdiction, local state building code and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
- E. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to storefront system, including, but not limited to, the following:
 - 1. Review structural load limitations.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review required testing, inspection, and certifying procedures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

- A. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Faulty operation of operators, controls, and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Storefront, Thermal Break, 2 inch by 4-1/2 inch and 6 inch profile, where indicated.
 - a. EFCO Corporation, 403X.
 - b. Kawneer North America, 451UT.
 - c. Oldcastle BuildingEnvelope, 3000XT.
 - d. Schüco USA.
 - 2. Doors, Wide Stile:
 - a. EFCO, a Pella Company, D-500.
 - b. Kawneer North America, 500.
 - c. Oldcastle BuildingEnvelope, WS-500.
 - d. Tubelite Inc., Wide.
 - e. YKK AP America Inc., 50D.
 - 3. Doors, Wide Stile, Thermally-Broken:
 - a. EFCO, a Pella Company, D-502.
 - b. Kawneer North America, Insulpour 500T.
 - c. Oldcastle BuildingEnvelope, WS-500TC.
 - d. Tubelite Inc., Wide Thermal Block.
 - e. YKK AP America Inc., 50XT.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Dual thermal-break.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 088000 - GLAZING.

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

- A. Doors: Manufacturer's standard glazed doors, for manual swing operation.
 - 1. Door Construction: Mechanical clip fastening, SIGMA deep penetration plus welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type and EPDM glazing gaskets reinforced with non-stretchable cord.

2.6 DOOR HARDWARE

- A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.
 - 1. Opening-Force Requirements:
 - a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf.
- B. Hardware Sets: Provide as specified in Section 087100 - DOOR HARDWARE.
- C. Pivot Hinges: BHMA A156.4, Grade 1.
- D. Locking Devices, General: Do not require use of key, tool, or special knowledge for operation.
 - 1. Opening-Force Requirements:
 - a. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf (67 N) for not more than 3 seconds.
 - b. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.
- E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- F. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
 - 1. Standard: BHMA A156.3, Grade 1.
- G. Cylinders: As specified in Section 087100 - DOOR HARDWARE.
- H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- I. Operating Trim: BHMA A156.6.
- J. Closers: With accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.
 - 1. Standard: BHMA A156.4, Grade 1.
- K. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- L. Surface-Mounted Holders: BHMA A156.16, Grade 1.

- M. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- N. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
- O. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- P. Silencers: BHMA A156.16, Grade 1.
- Q. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).
 - 1. Standard: BHMA A156.21.
- R. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.7 ACCESSORY MATERIALS

- A. Insulating Materials: As specified in Section 072100 - THERMAL INSULATION.
- B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 - JOINT SEALANTS.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

- E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Doors: Reinforce doors as required for installing hardware.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 - JOINT SEALANTS and to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, without warp or rack.
- F. Install glazing as specified in Section 088000 - GLAZING.
1. Structural-Sealant Glazing:
 - a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
 - b. Install weatherseal sealant according to Section 079200 - JOINT SEALANTS and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrances: Install to produce smooth operation and tight fit at contact points.
1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
 2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.
- 3.3 FIELD QUALITY CONTROL
- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
 2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.
 3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

- A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION