SECTION 08 41 13

ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Exterior and interior manual swing entrance doors and door frame assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: Technical data including construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit plans, elevations, sections, full size details, and attachments to other work for aluminum framed entrances and storefronts.
   1. Coordinate all submittals with other related items specified in other Sections.
   2. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   3. Include full size isometric details of each type of vertical to horizontal intersection of aluminum framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
      f. Integration of all accessories and connected assemblies.
   4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
   5. Include point to point wiring diagrams showing the following:
      a. Power requirements for each electrically operated door hardware.
      b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Fabrication Sample: Of each vertical to horizontal intersection of assemblies, made from 12 inch (300 mm) lengths of full size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   3. Expansion provisions.
   4. Glazing.

5. Flashing and drainage.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Delegated Design Submittal: Submit supporting documentation evidencing compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Coordinate shop drawings and required glazing, including all glazing thicknesses, with the Performance Requirements of Section 08 80 00 Glazing. All Glazing thicknesses shall be sized under delegated design to suit all applications.

1.3 INFORMATIONAL SUBMITTALS

A. Preconstruction Testing Submittals:

1. Testing Program: Developed specifically for materials and systems to be utilized in the Project.
2. Test Reports: Prepared by a qualified testing agency for each test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: Submit supporting data for Installer and field testing agency.

C. Energy Performance Certificates: Submit certification for aluminum framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC certified energy performance values for each aluminum framed entrance and storefront.

D. Product Test Reports: Submit test data for tests performed by a qualified testing agency.

E. Quality Control Program: Developed specifically for materials to be utilized in the Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality control reports.

F. Source quality control reports.

G. Field quality control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Submit data for aluminum framed entrances and storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: Submit data for structural sealant glazed storefront to include in maintenance manuals, including ASTM C 1401 recommendations for post installation phase quality control program.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Entity having minimum 5 years documented experience that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by the International Accreditation Service or the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's written approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
    a. Comply with all requirements of Section 01 33 00 Submittal Procedures regarding any proposed variations.
    b. Any substitutions proposed shall be governed by the requirements of Section 01 25 00 Substitution Procedures prior to any submittals.

D. Structural Sealant Glazing: Where required, comply with ASTM C 1401 for design and installation of storefront systems.

E. Source Limitations: Obtain components of aluminum framed entrance and storefront system, curtain wall assemblies, [exterior sun control louvers] and related items including framing spandrel panels and accessories from a single manufacturer.

F. Mockups: Build mockups to verify selections and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings or as identified by the Architect during contract administration.
2. Testing shall be performed on mockups according to requirements.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.
5. Rejected mockups assemblies shall be reconfigured or reassembled to address all issues identified by the Architect.

G. Preinstallation Conference: Conduct conference at site.

1.6 WARRANTY

A. Storefront Assembly Warranty: Written warranty signed by manufacturer and installer where manufacturer and installer agree to repair or replace components of aluminum

framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals and materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.
2. Warranty Period: Five years from date of Substantial Completion.

B. High Performance Organic Finish Warranty: Written warranty signed by manufacturer in which manufacture agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

C. Anodized `Finish Warranty: Written warranty signed by Manufacturer in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory applied finishes within specified warranty period.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design aluminum framed storefronts, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Comply with performance requirements specified, determined by testing of aluminum framed entrances and storefronts representing those indicated without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:
   1. Wind Loads: Indicated on Drawings.
   2. Other Design Loads: Indicated on Drawings.
      a. Wind Loads: Design and size components of aluminum framed entrances and storefronts to withstand loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with SEI/ASCE 7 to establish wind pressure based on the following criteria:
         1) Ultimate Design Wind Speed (Vult): Derived from loads as indicated on the Drawings.
         2) Nominal Design Wind Speed (Vasd): as indicated on the Drawings.
         3) Occupancy Category: II.
         4) Exposure Category: B.
         5) Internal Pressure Coefficient (GCPI): ±0.18.
      b. Seismic Loads: Indicated on Drawings.
      c. Other Design Loads: Indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
      a. Operable Units: Provide a minimum 1/16 inch (1.6 mm) clearance between framing members and operable units.
   3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
      a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330/E 330M:
   1. When tested at positive and negative wind load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration:
   1. Fixed Framing and Glass Area:
      a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static air pressure differential of 1.57 lbf/sq. ft. (75 Pa) and 6.24 lbf/sq. ft. (300 Pa).
   2. Entrance Doors:

a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static air pressure differential of 1.57 lbf/sq. ft. (75 Pa).
b. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static air pressure differential of 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive windload design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Seismic Performance: Aluminum framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and local codes.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.

J. Energy Performance Exterior Units (Kawneer 451T Basis of Design): Certify and label energy performance according to NFRC:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.26 determined according to NFRC 200.
3. Condensation Resistance Ultra Thermal 451UT units: When tested to AAMA Specification 1503, the CRF shall not be less than 68 frame.

K. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332.
1. Outdoor-Indoor Transmission Class: Minimum 26.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.
1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
a. High Exterior Ambient Air Temperature: That which produces an exterior metal surface temperature of 180 degrees F (82 degrees C).

b. Low Exterior Ambient Air Temperature: 0 degrees F (minus 18 degrees C).
c. Interior Ambient Air Temperature: 75 degrees F (24 degrees C).

M. Structural Sealant Joints:
1. Designed to carry gravity loads of glazing.

N. Structural Sealant: ASTM C 1184. Capable of withstanding tensile and shear stresses imposed by structural sealant glazed, aluminum framed entrances and storefronts without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant to substrate bond strength exceeds sealant's internal strength.

2.2 STOREFRONT SYSTEMS

A. Basis of Design: Subject to compliance with requirements, provide Trifab™ VersaGlaze™ 451UT (Ultra Thermal) and 451 (Non-Thermal) Framing Systems by Kawneer.
1. Subject to compliance with requirements, products by one of the following may be acceptable if found to be equal and approved by the Architect:
a. Arcadia, Inc.
b. Oldcastle Building Envelope.
c. United States Aluminum a brand of C.R. Laurence.
d. Wausau Window and Wall Systems; Apogee Wausau Group, Inc.
e. YKK AP America Inc.

B. Framing Members: Extruded or formed aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Exterior Framing Construction: Thermally broken.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: Center.
5. Finish:
a. Exterior Applications: High performance organic finish.
1) Color: Match Architect’s sample.
b. Interior Applications: Clear anodic finish.
6. Fabrication Method: Field fabricated stick system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.

d. Structural Profiles: ASTM B 308/B 308M.

8. Steel Reinforcement: Required by manufacturer to comply with performance requirements, zinc rich, corrosion resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot Rolled Sheet and Strip: ASTM A 1011/A 1011M.
   d. Primer: Zinc rich, corrosion resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

C. Backer Plates: Continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: High strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Insulated Spandrel Panels: Laminated, metal faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.
   1. Overall Panel Thickness: 1 inch (25.4 mm) unless otherwise indicated on the Drawings.
   2. Exterior Skin: Aluminum.
      a. Thickness: Standard for finish and texture indicated.
      b. Finish: Match framing system.
      c. Texture: Smooth.
      d. Backing Sheet: 1/8 inch (3.2 mm) thick tempered hardboard.
   3. Interior Skin: Aluminum.
      a. Thickness: Standard for finish and texture indicated.
      b. Finish: Matching storefront framing.
      c. Texture: Smooth.
      d. Backing Sheet: 1/8 inch (3.2 mm) thick tempered hardboard.
   4. Thermal Insulation Core: Rigid, closed cell, polyisocyanurate board.
   5. Surface Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame Spread Index: 25 or less.
      b. Smoke Developed Index: 450 or less.

2.3 ENTRANCE DOOR SYSTEMS

A. Entrance Doors Exterior Applications: Glazed entrance doors for manual swing or automatic operation.

1. Door Construction: 2-1/4 inches overall thickness with minimum 0.125 inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    a. Thermal Construction: High performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Square, snap on, extruded aluminum stops and preformed gaskets.
    a. Provide nonremovable glazing stops on outside of door.
4. Basis of Design 250T / 350T / 500T Insulpour Thermal Entrance by Kawneer.

B. Entrance Doors Interior Applications: Glazed entrance doors for manual swing or automatic operation.

1. Door Construction: 1-3/4 inch (44.5 mm) overall thickness, with minimum 0.125 inch thick, extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    a. Thermal Construction: High performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Square, snap on, extruded aluminum stops and preformed gaskets.
    a. Provide nonremovable glazing stops on outside of door.
4. Basis of Design 190 / 350 / 500 Standard Entrances by Kawneer.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified is specified in Section 08 71 00.

B. Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door, to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening Force Requirements:
    a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
    b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

C. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of entrance door hardware are indicated. Products are identified by using entrance door hardware designations:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Continuous Gear Hinges: BHMA A156.26.

E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

F. Manual Flush Bolts: BHMA A156.16, Grade 1.

G. Automatic and Self Latching Flush Bolts: BHMA A156.3, Grade 1.

H. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

I. Cylinders: BHMA A156.5, Grade 1.

1. Keying: Master key system to comply with Owner’s requirements. Permanently inscribe each key with a visual key control number and include notation to be furnished by Owner.

J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

K. Operating Trim: BHMA A156.6.

L. Removable Mullions: BHMA A156.3 extruded aluminum.

1. When used with panic exit devices, provide keyed removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

M. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

N. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

O. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

P. Weather Stripping: Replaceable components.

1. Compression Type: Made of ASTM D 2000 molded neoprene or ASTM D 2287 molded PVC.

2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon fabric or aluminum strip backing.

Q. Weather Sweeps: Exterior door bottom sweep with concealed fasteners on mounting strip.

R. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).

S. Finger Guards: Collapsible neoprene or PVC gasket anchored to frame hinge jamb at center pivoted doors.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00.

B. Glazing Gaskets: Sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Section 08 80 00.

D. Structural Glazing Sealants: ASTM C 1184 chemically curing silicone formulation compatible with system components with which it comes in contact; specifically formulated and tested for use as structural sealant and approved by structural sealant manufacturer for use in storefront system indicated.

1. Color: As selected by Architect.

E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural sealant, weatherseal sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: As selected by Architect.

2.6 ACCESSORIES

A. Automatic Door Operators: Refer to Section 08 71 13.

B. Fasteners and Accessories: Corrosion resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

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

C. Anchors: Three way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

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

D. Concealed Flashing: Dead soft, 0.018 inch (0.457 mm) thick stainless steel, complying with ASTM A 240/A 240M, of type recommended by manufacturer.

E. Bituminous Paint: Cold applied asphalt mastic paint containing no asbestos, formulated for 30 mil (0.762 mm) thickness per coat.

F. Rigid PVC Filler.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
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. Structural Sealant Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using shear block system.

G. Entrance Door Frames: Reinforce as necessary to support loads imposed by door operation and for installing entrance door hardware.
1. At interior and exterior doors, provide compression weather stripping at fixed stops.

H. Entrance Doors: Reinforce doors as necessary for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations according to approved Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Superior Performance Organic Finish, Three Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
2. Color and Gloss: Selected by Architect.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality control procedures complying with ASTM C 1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Proceed with installation after correcting unsatisfactory conditions.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions.

1. Do not install damaged components.
2. Fit joints to produce hairline joints free of burrs and distortion.
3. Rigidly secure nonmovement joints.

4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
5. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed specified in Section 07 92 00 to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weatherstripping contact and hardware movement to produce proper operation.

F. Install glazing specified in Section 08 80 00.

G. Install weatherseal sealant according to Section 07 92 00 and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field Installed Entrance Door Hardware: Install surface mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum framed entrances and storefronts to comply with the maximum tolerances:
1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

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

B. Field Quality Control Testing: Perform the following test on representative areas of aluminum framed entrances and storefronts.

1. Water Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
   a. Perform a minimum of three tests in areas as directed by Architect.
   b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static air pressure differential of 1.57 lbf/sq. ft. (75 Pa).
   a. Perform a minimum of three tests in areas as directed by Architect.
   b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
3. Water Penetration: ASTM E 1105 at a minimum uniform static air pressure differential of 0.67 times the static air pressure differential specified for laboratory testing, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

C. Structural Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of two areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING, CLEANING AND PROTECTION

A. Adjust operating door panels, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing door units. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory glazed glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect storefront surfaces from contact with contaminating substances resulting from construction operations.

1. Monitor storefront surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, mortar, alkaline deposits, stains, or contaminants. If contaminating substances do contact storefront surfaces, remove contaminants immediately according to manufacturer's written recommendations.

3.7 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION