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The Description of the Project
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SPECIFICATION DIVISION 8

END OF CONTENTS TABLE

DIVISION 08 OPENINGS
SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:

1. Division 07 Section: Air Barriers.
2. Division 07 Section: Flashing and Sheet Metal.
3. Division 08 Section “Glazed Aluminum Curtain Walls”.

1.2 SUMMARY

A. Section Includes:

DELETE PRODUCT TYPES NOT REQUIRED FROM THE LIST BELOW.

1. Storefront-type framing system.
2. Exterior entrance doors.
3. Vestibule doors matching entrance doors.
4. Flush Panel FRP Doors

DELETE BELOW IF CURTAIN WALL IS INCLUDED IN PROJECT TO INSURE THAT THE CURTAIN WALL INSTALLER IS THE PRIME CONTRACTOR.

B. Work Provided Under This Section But Specified Under Other Sections:

1. The Work of this Section and applicable portions of the work of the following Sections, that are related to this Section, shall be performed by a Prime contractor providing aluminum storefront products, to establish single source responsibility for aluminum storefront products and associated components.
   a. Division 07 Section “Joint Sealants”.
   b. Division 08 Section “Aluminum Windows”.
   c. Division 08 Section “Door Hardware”.
   d. Division 08 Section “Glazing”.

1.3 SUBMITTALS

A. Product data for each aluminum entrance and storefront system required, including:

1. Manufacturer's standard details and fabrication methods.
2. Data on finishes.
3. Hardware and accessories.
4. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop drawings for each aluminum entrance and storefront system required, including:

1. Layout and installation details, including relationship to adjacent work.
2. Plans at 1/4-inch scale.
3. Elevations at 1/4-inch scale.
4. Detail sections of typical composite members.
5. Anchors and reinforcement.
6. Hardware mounting heights.
7. Provisions for expansion and contraction.
8. Glazing details.
9. Locations of field glazing where permitted.

COORDINATE HARDWARE WITH FINISH HARDWARE SECTION. THRESHOLDS, HINGES, WEATHERSTRIPPING, AND REMOVABLE MULLIONS, ARE USUALLY PROVIDED WITH ALUMINUM FRAMING. OTHER HARDWARE SHOULD BE SPECIFIED IN SECTION 087100 "DOOR HARDWARE".

C. Hardware Schedule: Submit hardware schedule organized into sets for hardware specified in this section. Coordinate hardware with Door Hardware Section to ensure proper function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.

D. Samples for Initial Selection: Indicating factory-applied color finishes.

DELETE "SAMPLES FOR INITIAL SELECTION" PARAGRAPH ABOVE IF COLORS AND OTHER CHARACTERISTICS ARE PRESELECTED AND SPECIFIED OR SCHEDULED. ALWAYS RETAIN FOLLOWING 2 PARAGRAPHS WITH OR WITHOUT ABOVE PARAGRAPH.

E. Samples for Verification: For each type of exposed finish required, in minimum 8-inch lengths.

1. Include 3 or more units in each sample set showing the extreme limits of variations expected in color and texture of finish.

RETAIN PARAGRAPH BELOW TO VERIFY DETAILS OF ASSEMBLY.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

REVISE LIST BELOW TO SUIT PROJECT.

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. Delegated-Design Submittal: Submit analysis data signed and sealed by the qualified Professional Engineer employed by the curtain wall manufacturer who is responsible for their preparation.

1. Show section moduli of wind-load-bearing members and calculations of stresses and deflections. Provide material properties and other information needed for structural analysis including computations.

2. Submit statement by the Professional Engineer attesting that all materials provided under this section, and related Sections, meet specified requirements.

H. Energy Performance Certificates: Forstorefront, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for glazed aluminum storefront.

I. Test Reports: Provide certified test reports from a nationally recognized qualified independent testing laboratory showing that aluminum entrance and storefront systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

J. Field quality-control reports are submitted by Owner's Independent testing Agency.

K. Warranties: Signed original warranty documents from the curtain wall manufacturer indicating the specified terms and conditions for each curtain wall and component.

L. Maintenance Data for Curtain walls to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the specified quality assurance standards and test methods contained in the following documents; latest editions, unless noted otherwise.

1. Applicable standards of the American Architectural Manufacturers Association (AAMA), including but not limited to:
   a. AAMA/WDMA/CSA 101/I.S.2/A440 Voluntary Performance Specification for Windows, Skylights and Glass Doors – A North American Fenestration Standard.
   b. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
   c. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
   d. AAMA 910 Voluntary Life Cycle Specifications and Test Methods for AW Class Architectural Windows and Doors.
   e. AAMA 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
2. Glass Association of North America (GANA) "Glazing Manual."
3. Standards of ASTM International which are referenced in other Articles in this Section.
4. National Fenestration Rating Council (NFRC) Documents and Rating System, including, but not limited to:

a. NFRC 100 Procedure for Determining Fenestration Product U-factors.
b. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
c. NFRC 500-2010 Procedure for Determining Fenestration Product Condensation Resistance Values.

C. Delegated Design: A qualified Professional Engineer registered in Michigan, employed by the storefront manufacturer, shall design storefront assemblies, including aluminum windows where applicable, doors, glazing and all accessories for this project. The storefront assembly shall be manufactured, assembled and installed to withstand the structural load requirements as specified in this Section, the Building Code, and expected loads calculated for the building, based data indicated on the Drawings. Refer to Part 2 Performance Requirements for additional information.

D. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum storefront framing similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.

E. Manufacturer's Preconstruction Testing Agency Qualifications: Qualified according to ISO/IEC 17025 and accredited by ICC-ES for preconstruction testing indicated.

F. Field Testing: The Owner's Testing Laboratory will validate testing of installed storefront in the building walls.

G. Single Source Responsibility: Obtain aluminum entrance and storefront systems from one source and from a single manufacturer.

1.5 MANUFACTURER TESTING

REVISE EXAMPLE TEST METHODS AND SEQUENCE IN SUBPARAGRAPH BELOW TO SUIT PROJECT AND COORDINATE WITH TESTS REQUIRED IN "PERFORMANCE REQUIREMENTS" ARTICLE. CONSULT MANUFACTURERS AND TESTING AGENCIES FOR GUIDANCE ON APPROPRIATE REQUIREMENTS FOR PROJECT.

A. Preconstruction Testing Program: Perform tests specified in "System Performance Requirements" Article on manufacturer's laboratory samples in the following order:

1. Structural-performance preloading at 50 percent of the specified wind-load design pressure when tested according to ASTM E 330.
2. Air infiltration when tested according to ASTM E283.
3. Water penetration under static pressure when tested according to ASTM E 331.
4. Structural performance at design load when tested according to ASTM E 330.
5. Repeat air filtration when tested according to ASTM E 283.
6. Repeat water penetration under static pressure when tested according to ASTM E 331.

7. Structural performance at maximum 150 percent of positive and negative wind-load design pressures when tested according to ASTM E 330.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.

1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

REVISE WARRANTY PER PROJECT AND SPECIFIED MANUFACTURERS. KAWNEER PROVIDES A LIMITED LIFETIME WARRANTY ON ENTRANCE DOORS. FOLLOWING WARRANTY ON FRAMING IS OFFERED BY KAWNEER.

1.7 WARRANTY

A. Provide a complete parts and labor warranty for a minimum of two years from the date of Substantial Completion.

B. Refer to Glazing Section for glass warranties.

C. Fluoropolymer Finish Warranty: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied fluoropolymer finishes within specified warranty period.

COORDINATE COLOR FADING AND CHALKING LIMITS WITH FINISHES RETAINED IN PART 2.

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.

VERIFY AVAILABLE WARRANTIES AND WARRANTY PERIODS FOR FINISHES WITH MANUFACTURERS LISTED IN PART 2 ARTICLES. FLUOROPOLYMER FINISHES ARE ELIGIBLE FOR 10 YEAR WARRANTIES.

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

D. Anodized Finish Warranty: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied anodized finishes within specified warranty period. Any forming or welding must be done prior to finishing.

COORDINATE COLOR FADING AND CHALKING LIMITS WITH FINISHES RETAINED IN PART 2.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta-E Hunter units (square root of the sum of square Delta L, Delta a, and Delta b) as determined by ASTM D 2244.

b. Chalking in excess of a No.8 rating when tested according to ASTM D 4214.
c. Cracking, checking, flaking, or blistering.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

USUALLY RETAIN ALL MANUFACTURERS LISTED IN EACH APPLICABLE CATEGORY BELOW. DELETE INAPPLICABLE CATEGORIES.

A. Entrance Door and Storefront Manufacturers:

1. EFCO Corporation.
2. Kawneer Company, Inc.
3. Oldcastle BuildingEnvelope
4. Tubelite Inc.
5. Wausau Window and Wall Systems.

B. Flush Panel FRP Door Manufacturers:

1. Commercial Door Systems
2. Kawneer Company, Inc.
3. Rebco, Inc.
4. Special-Lite, Inc.

C. Fluoropolymer Coating Manufacturers:

1. PPG Industries.
2. Valspar Corp.
3. Akzo Nobel.

REVISE "SYSTEM PERFORMANCE REQUIREMENTS" ARTICLE BELOW IF ENTRANCES WILL BE INSTALLED IN BUILDING INTERIORS ONLY.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide aluminum entrance and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.

B. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.

1. The system shall be capable of withstanding a metal surface temperature range of 180 deg F (100 deg C) without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.

C. Structural Design: Provide aluminum entrance and storefront systems that comply with structural performance, air infiltration, and water penetration requirements indicated.

VERIFY WIND LOAD FOR CONDITIONS AT UM. WIND LOADS SHOULD BE CALCULATED BY THE STRUCTURAL ENGINEER AND INDICATED ON THE DRAWINGS.

1. Structural Loads: As indicated on Drawings.
2. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330.
   a. Uniform Load: At the static air design load applied in the positive and negative direction in accordance with ASTM E 330, there shall be no deflection in excess of L/175 of the span of any framing member.
   b. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent deformation of main framing members in excess of 0.2 percent of their clear spans shall occur.

D. Energy Performance

1. Air leakage for framing and doors shall be tested and determined in accordance with NFRC 400 and ASTM E 283.
   a. Air Infiltration Storefront Framing System: Air leakage shall not exceed 0.06 CFM per sq. ft. at minimum static-air-pressure difference of 6.24 psf.
   b. Air Infiltration Aluminum Entrance Doors: Air leakage shall not exceed 1.0 CFM per sq. ft. at a static-air-pressure differential of 6.24 psf.
2. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas, as defined in AAMA 501, when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 pounds per square foot.
3. Thermal Transmittance: Provide systems which comply with the following criteria. Test in accordance with NFRC 100.
   a. Framing Systems: Overall U-factor of not more than 0.45 BTU/hr. x sq. ft. x deg. F.
   b. Entrance Doors (glazed): Overall U-factor of not more than 0.80 BTU/hr. x sq. ft. x deg. F.

DELETE PARAGRAPH BELOW IF NO OPAQUE ENTRANCE DOORS.

   c. Entrance Doors (opaque): Overall U-factor of not more than 0.70 BTU/hr. x sq. ft. x deg. F.
   d. Operable Window Glazing and Framing Areas: Overall U-factor of not more than 0.55 BTU/hr. x sq. ft. x deg. F.
4. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

CRF SHOWN IS MINIMUM VALUE BASED ON PRODUCTS MEETING OTHER SPECIFICATION REQUIREMENTS. ESTABLISH CRF BASED ON BUILDING OCCUPANCY FACTORS ACCORDING TO MECHANICAL DESIGN GUIDELINES. VERIFY AVAILABILITY FROM MANUFACTURERS. IF HIGHER CRF IS NEEDED, CONSIDER USING CURTAIN WALL.

5. Condensation Resistance: Provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 56.
6. Air Infiltration:
   a. Not more than 1.0 cfm/sq. ft. for glazed swinging entrance doors.

b. Not more than 0.4 cfm/sq. ft. for all other locations.

7. Labeling: Per ANSI/ASHRAE 90.1-2007, provide a permanent nameplate, installed by the manufacturer, listing the U-factor, SHGC, and air leakage rate. The label may be the NFRC energy performance label or the AAMA performance label.

2.3 MATERIALS

DELETE MATERIALS NOT REQUIRED FOR FABRICATION OR INSTALLATION FROM THIS ARTICLE.

A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire.

USE WHEN REQUIRED. SYSTEMS SHALL BE NO HIGHER THAN 12 FEET.

B. Carbon steel reinforcement of aluminum framing members shall comply with ASTM A 36 for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 for hot rolled sheet and strip.

C. Panel Core Material: Rigid, closed-cell polyurethane insulation.

D. Fasteners: Provide fasteners of nonmagnetic stainless steel, compatible with aluminum components, hardware, anchors and other components.

1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.

E. Concealed Flashing: 0.0187-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.

F. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

1. Concrete and Masonry Inserts: Provide hot-dip galvanized steel inserts complying with ASTM A 123.

2.4 FRAMING SYSTEMS

THE FRAMING SYSTEM IN THE NEXT PARAGRAPH MAY BE USED FOR BOTH STOREFRONT AND ENTRANCE FRAMES. EXTERIOR GLAZING IS MORE COMMON BECAUSE REGLAZING FROM THE INTERIOR IS DIFFICULT AFTER THE BUILDING IS COMPLETED.

A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the exterior on all sides without projecting stops. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.

1. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.
2. Exterior Locations: Provide manufacturer's thermal break construction with two separations consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
3. Interior Locations: Where indicated, provide non-thermal break construction.

FOLLOWING ARE TYPICAL FRAMING DIMENSIONS AND GLAZING DETAIL.

4. System Dimensions - Nominal face width and Depth: 2 inches by 4-1/2 inches.

SELECT GLAZING OPTIONS FROM AVAILABLE FRAMING SYSTEMS.

5. Glass: Center Plane.
6. Glass: Inside Glazed.
7. Glass: Outside.

B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads. Provide units with applied stops; blade stops are not acceptable.

1. Exterior Doors: Manufacturer's standard replaceable compressible weatherstripping molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4 or molded PVC complying with ASTM D 2287.
2. Interior Doors: Provide manufacturer's bulb gasket weatherstripping on stops to prevent metal-to-metal contact.

2.5 GLAZING

A. Glazing: As specified in Glazing section.

2.6 ENTRANCE DOOR SYSTEMS

A. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.

SELECT STILE AND DOOR DESIGN. COORDINATE EXIT DEVICE SELECTION IN FINISH HARDWARE SECTION WITH STILE WIDTH AND DOOR DESIGN.

GENERALLY SPECIFY MEDIUM STILE DOORS UNLESS APPROVED BY DESIGN MANAGER.

1. Door Design: Medium stile; 3-1/2-inch nominal width.

2. Door Design: Wide stile; 5-inch nominal width.

KICK SURFACE BELOW IS A REQUIREMENT OF THE ADA AND MICHIGAN BUILDING CODE. DO NOT REVISE OR DELETE.

3. Kick Surface: Provide an insulated-core, smooth surface, flush aluminum panel, extending the full width of the door, 10 inches high measured from the bottom of the door. Fabricate panel from not less than 0.125-inch thick aluminum sheet and finish to match door framing members.
4. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails.
5. Provide manufacturer's snap-on extruded aluminum glazing stops, preformed gaskets, with exterior stops anchored for nonremoval.

B. FRP Flush Panel Doors

FLUSH PANEL DOORS ARE PREFERRED BY HOUSING FOR MANY APPLICATIONS. MANUFACTURER OF FOLLOWING SPECIFIED MATERIAL IS SPECIAL-LITE.

1. Flush Panel-Type FRP Skin Doors: Provide flush panel-type doors fabricated with tubular or extruded frame members with reinforced mechanical or welded joints; limit frame exposure to 1/2-inch maximum width on door faces. Fill core with foamed-in-place urethane.

DELETE BELOW IF NO FRP FACE SHEETS

a. Face Sheets: Provide 0.120-inch thick fiberglass reinforced polyester (FRP) face sheets with mechanically interlocked with frame members and laminated to framing with waterproof glue.

BELOW IS OPTIONAL FOR ADDED VANDAL RESISTANCE

1) FRP Sheet Surface Texture: Embossed in manufacturer's standard random (stucco) pattern.

SELECT COLOR BELOW: SPECIAL-LITE STANDARD COLORS INCLUDE WHITE, BLACK, LIGHT GRAY, DARK GRAY, BEIGE, BLUE, AND GREEN

2) Face Sheet Color: Dark Bronze.

DELETE THE NEXT PARAGRAPH IF NO LIGHTS ARE INCLUDED IN THE DESIGN.

b. Lights: Provide glazed openings as indicated, with aluminum moldings and stops. Provide nonremovable stops on the exterior.

C. Door sweeps:

1. Exterior Doors: Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

D. Reinforcing: Provide hardware reinforcing as required by the finish hardware scheduled in Division 08 Section “Door Hardware”.

2.7 HARDWARE

A. Provide hardware units as indicated, scheduled, or required for operation of each door as specified in Division 08 Section “Door Hardware”. Include sizes, number, and types recommended by manufacturer for service required; finish to match door.

2.8 FABRICATION

A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work. Provide thermal break construction at exterior locations, and where indicated. Provide non thermal break construction only at interior locations where indicated.

1. Thermal Break Construction: Fabricate storefront framing system with an integrally concealed, low-conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.

B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
3. Preglaze door and frame units to greatest extent possible.

C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.

1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

D. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.

F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.

1. Uniformity of Metal Finish: Abutting extruded aluminum members shall not have an integral color or texture variation greater than half the range indicated in the sample pair submittal.

G. Fasteners: Conceal fasteners wherever possible.

2.9 FINISHES, GENERAL

A. Comply with referenced AAMA Voluntary Specifications for detailed finish requirements.

DELETE BELOW IF NO CURTAIN WALL

TYPICALLY SPECIFY FINISHES IN CURTAIN WALL SECTION.

B. Finish aluminum entrance and storefront to match other adjacent glazed aluminum curtain wall components, when applicable. Refer to Division 08 Section “Glazed Aluminum Curtain Walls” for finish requirements.

DELETE 2 ARTICLES BELOW IF SPECIFIED IN CURTAIN WALL SECTION.

2.10 FLUOROPOLYMER ALUMINUM FINISHES

RETAIN AND EDIT FINISHES IN PARAGRAPHS BELOW TO SUIT PROJECT. FLUOROPOLYMER FINISHES ARE PREFERRED BY THE U OF M.

IF RETAINING MORE THAN ONE, INDICATE LOCATION OF EACH ON DRAWINGS BY TYPE. COORDINATE WITH DESIGNATIONS IN THIS SECTION. ALUMINUM-FRAMING SYSTEMS ARE AVAILABLE WITH DUAL FINISHES, ALLOWING DIFFERENT INTERIOR AND EXTERIOR COLOR FINISHES. REFER TO STOREFRONT FRAMING MANUFACTURER'S DATA FOR ADDITIONAL INFORMATION.

RETAIN ONE OF TWO PARAGRAPHS BELOW; IF BOTH ARE REQUIRED, INDICATE LOCATION OF EACH SYSTEM ON DRAWINGS, IN SCHEDULES, OR BY INSERTS. IF SPECIFIC PRODUCTS ARE REQUIRED, NAME COATING MANUFACTURERS AND PRODUCTS.

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to metal surfaces to comply with coating and resin manufacturers' written instructions.

USUALLY SPECIFY 3-COAT SYSTEM FOR ENTRANCE FRAMING AND DOORS IN AREAS OF HUMAN CONTACT. INCLUDE LESS EXPENSIVE 2-COAT SYSTEM FOR FRAMING ELEMENTS NOT IN CONTACT WITH PEOPLE.

B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

SELECT COLORS AS APPROVED BY THE OWNER.

C. Color and Gloss: Non-metallic solid color, dark bronze; low gloss, as selected by the Owner.

D. Field Touch-up Materials: Fluoropolymer coating produced specifically for field touch-up work by same manufacturer as shop applied coating.

2.11 ANODIC ALUMINUM FINISHES

A. Class I Clear Anodized Finish: Anodic Coating: Class I Architectural, clear film thicker than 0.7 mil) complying with AAMA 611.

RETAIN THE PARAGRAPH ABOVE IF CLEAR FINISH IS REQUIRED, OR THE PARAGRAPH BELOW IF A COLOR ANODIZED FINISH IS DESIRED.

B. Class I Color Anodized Finish: Class I Architectural, film thicker than 0.7 mil with integral color or electrolytically deposited color, complying with AAMA 611.

1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.

1. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

C. Construction Tolerances: Install aluminum entrance and storefront to comply with the following tolerances:

1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
2. Paint dissimilar metals where drainage from them passes over aluminum.
3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with sealant as specified in the Joint Sealants section.

E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

F. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 07 for sealants, fillers, and gaskets.

G. Install thresholds by field scribing around frame members, including door stops, to provide a continuous surface between across the full width of each opening from jamb to jamb.

H. Refer to the Division 08 Section "Glazing" for installation of glass and other panels indicated to be glazed into doors and framing. Preglaze door and frame units to greatest extent possible.

REVIEW WHETHER THE AMOUNT OF STOREFRONT FRAMING REQUIRES FIELD TESTING. DELETE ARTICLE BELOW IF STOREFRONT WORK IS LIMITED TO DOORS.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency for witnessing field testing, determining that the tests are performed correctly and making the final determination whether the storefront framing system has successfully passed the tests.

B. Testing Activities: Testing and inspecting of representative areas of aluminum entrance and storefront system as installation proceeds to determine compliance of installed assemblies with specified requirements. Owner will determine locations and timing of testing.

C. Contractor shall coordinate with Testing Agency and provide the materials, equipment and labor necessary to complete the testing.

EDIT TEST AREAS AS REQUIRED.

D. The following tests will be performed in accordance with the methods and standards specified in the Performance Requirements article in Part Two of this Section:

1. Air Infiltration Tests.
2. Water Penetration Tests.
3. Water Spray Test: Before installation of interior finishes has begun.

E. Storefront framing will be considered defective if it does not pass tests and inspections.

F. If test area fails to meet the specified air infiltration or water penetration requirements, Contractor shall submit description of proposed remedial work for Owner and Architect's information.

1. Remedial work shall be incorporated into the test specimen for retesting.
2. For each area which fails field testing, one additional area of equal size shall be tested for both air infiltration and water penetration.
3. Cost of retesting shall be responsibility of Contractor.

G. Testing agency shall submit copies of test reports to Owner, Architect and Contractor within 48 hours after date of test.

H. The Owner reserves the right to select additional test areas as required, without limitation, subject to correction and remediation as specified herein.

3.4 COMMISSIONING

A. Perform the commissioning activities as outlined in the Division 01 Section “Full Project Commissioning” or “Project Commissioning for Small Projects” and other requirements of the Contract Documents.

3.5 ADJUSTING, CLEANING, PROTECTION

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

B. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

C. Clean glass surfaces after installation, complying with requirements contained in the Glazing Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

D. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefront will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 084113