

## SECTION 08 4113

### ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Work of this Section consists of the following:
  - 1. Exterior aluminum-framed storefronts.
  - 2. Exterior manual-swing aluminum doors.
  - 3. Window wall system.
  - 4. Brake-shaped trim adjacent to storefront openings.
- B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:
  - 1. General provisions of the Contract, including General and Supplementary Conditions, and Division 01 General Requirements Specification Sections.
  - 2. Section 05 5000 - METAL FABRICATIONS.
  - 3. Section 07 2100 - THERMAL INSULATION.
  - 4. Section 07 6200 - SHEET METAL FLASHING AND TRIM.
  - 5. Section 07 9200 - JOINT SEALANTS.
  - 6. Section 08 7100 - DOOR HARDWARE.
  - 7. Section 08 8000 - GLAZING.
- C. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

##### 1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
- B. Delegated-Design Submittal: Wind load and seismic design for aluminum-framed systems documenting compliance with design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of aluminum-framed systems.
  - 2. Include design calculations.
- C. Coordinated Submittal: Submittals for aluminum storefront systems shall be coordinated with and submitted together with the submittal for glazing products to be installed in the aluminum storefront. See Section 08 8000 - GLAZING for additional requirements.
- D. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.

3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12 inch lengths of full-size components and showing details of the following:
  1. Joinery.
  2. Anchorage.
  3. Expansion provisions.
  4. Glazing.
  5. Flashing and drainage.
- G. Welding certificates.
- H. Qualification Data: For Installer and testing agency.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.
- J. Field quality-control test and inspection reports.
  1. Submit manufacturer's test report results.
- K. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- L. Warranties: Special warranties specified in this Section.

### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
  1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E699 for testing indicated.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
  1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with ICC/ANSI A117.1.

- E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."
- F. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Field testing shall be performed on mockups according to requirements in Part 3 "Field Quality Control" Article.
- G. Preinstallation Conference: Convene at Project site with Contractor, Architect and installer to review mockup and review work prior to installation.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Handle packages with care to avoid damaging contents. Do not drop packages from any height.
  - 1. Acceptance at Site: Inspect shipped materials on delivery to ensure compliance with the Contract Documents, reject damaged goods and accept properly ordered, protected and undamaged goods.
    - a. Mark products with Shop Drawing location reference, unless already properly marked.
- C. Store materials off ground and protect from exposure to detrimental weather conditions, other construction activities, Stack materials neatly and evenly and avoid crushing packages.

#### 1.5 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by thermal movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Adhesive or cohesive sealant failures.
    - e. Water leakage through fixed glazing and framing areas.
    - f. Failure of operating components to function properly.
  - 2. Warranty Period: Two (2) years from date of Substantial Completion.
- B. 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: Five (5) years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure,

the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:
  - a. Deflection exceeding specified limits.
  - b. Thermal stresses transferred to building structure.
  - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
  - d. Glazing-to-glazing contact.
  - e. Noise or vibration created by wind and thermal and structural movements.
  - f. Loosening or weakening of fasteners, attachments, and other components.
  - g. Sealant failure.
  - h. Failure of operating units to function properly.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
  - a. Wind load calculations shall include component and cladding pressures, per ASCE 7-05 Method 1.
2. Seismic Loads: As indicated in the Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches 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 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.

D. Deflection Compensation: Provide compensation channels and clearance at head of aluminum storefront systems sized to accommodate vertical movement of the overhead structure of at least 1/2 inch up or down (+/- 1/2 inch) relative to the base of the storefront.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

- G. 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.
  - 2. Test Performance: 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. Test High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Test Low Exterior Ambient-Air Temperature: 0 deg F.
    - c. Test Interior Ambient-Air Temperature: 75 deg F.
- H. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas 0.04 cfm per sq ft of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
- J. Average Thermal Conductance: Provide U-factors in compliance with the energy calculations in the "Metal Framed Fixed / Operable Fenestration Schedule" in the Energy Code drawings.

## 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. EFCO Corporation.
  - 2. Kawneer North America, an Arconic company.
  - 3. Oldcastle BuildingEnvelope™.
  - 4. U.S. Aluminum; a brand of C.R. Laurence.
  - 5. YKK AP America Inc.

## 2.3 MATERIALS

- A. Aluminum Framing and Components:
  - 1. Material Standard: ASTM B221; 6063-T6 alloy and temper
  - 2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
  - 3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.
- 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 A36 / A36M.
  - 2. Cold-Rolled Sheet and Strip: ASTM A1008 / A1008M.
  - 3. Hot-Rolled Sheet and Strip: ASTM A1011 / A1011M.

## 2.4 STOREFRONT FRAMING SYSTEM

- A. Basis-of-Design Products: Subject to compliance with requirements, provide the following:
  - 1. Window Wall: Kawneer, "Trifab 601T".
  - 2. Storefront: Kawneer Trifab 451T, 2 in x 4-1/2 in profile.
- B. Kawneer IsoLock™ Thermal Break with a nominal 1/4" (6.4 mm) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.
- E. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action
- F. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- G. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

## 2.5 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: Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding 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 or Roberts screw heads, finished to match framing system, fabricated from stainless steel.
- D. Internal Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding 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.
- E. Sill Flashing: Manufacturer's extruded aluminum flashing designed to drain water to exterior. Finish to match aluminum frames. Provide end dams extending up outside of jambs designed to

capture water draining inside and behind jambs and direct it out the sill flashing weeps. Seal end dams to sill flashing.

- F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.
- G. Compensation Channels: On jambs and heads of all units
  - 1. Confirm system accommodates displacements indicated in seismic criteria in the structural notes on the Drawings.

## 2.6 GLAZING SYSTEMS

- A. Glazing: As specified in Section 08 8000 - 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.
  - 1. Infill: 1 inch
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

## 2.7 DOORS

- A. Doors: Manufacturer's standard heavy-duty glazed doors, for manual swing operation.
  - 1. Door Construction: 2 inch overall thickness, with minimum 3/16 inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
    - a. Thermal Construction: High-performance poured and debridged type plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
  - 2. Door Design: Medium style, 3-1/2 inch nominal width.
    - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
    - b. Door stiles and rails shall have hairline joints at corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be of deep penetration and fillet welded.
    - c. Weather stripping shall be wool pile and shall be installed in one stile of door pairs and in jamb stiles of center pivoted doors.
  - 3. Door stops shall include a bulb weather-strip that complies with ASTM E2203 specification.
  - 4. Glazing
    - a. All units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and a gasket that complies with ASTM E2203 specification.
  - 5. Door Frame
    - a. Depth of frame shall not be less than 4-1/2 inches.
    - b. Face dimension shall not be less than 2 inches.
    - c. Welded corner construction shall be utilized throughout.
    - d. System design shall be such that raw edges will not be visible at joints.

## 2.8 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. References to BHMA Standards: Provide products complying with standards referenced in this Article and with requirements for description, quality, type, and function listed in the Door Hardware Schedule.
  - C. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles; fabricated to full height of door and frame.
  - D. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
  - E. Weather Stripping: Manufacturer's standard replaceable components.
    1. Compression Type: Made of ASTM D2000, molded neoprene.
  - F. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
  - G. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
    1. Standard: BHMA A156.21.
    2. ADA compliant.
  - H. Balance of Door Hardware: As specified in Section 08 7100 - DOOR HARDWARE.
- 2.9 ACCESSORY MATERIALS
- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 9200 - JOINT SEALANTS.
  - B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.
- 2.10 FABRICATION
- A. General:
    1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
    2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
    3. Prepare components to receive anchor devices. Fabricate anchors.
    4. Arrange fasteners and attachments to conceal from view.
    5. Coordinate electrical and low-voltage requirements and routing for access control systems.
    6. Coordinate hardware preparation requirements as specified in Section 08 7100 - FINISH HARDWARE.
  - B. Storefront Framing: Fabricate components for stick assembly system.
  - C. 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.
- D. 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.
- E. Brake Shapes: Finished to match adjacent frames. Shapes as indicated on Drawings.
- F. Hardware Installation: Cut, drill, and tap for hardware before applying finishes.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.11 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. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
1. Colors and Gloss: Custom, as selected by Architect from manufacturer's full range.

## PART 3 EXECUTION

### 3.1 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.

### 3.2 EXAMINATION

- A. Carefully examine areas with Installer present, for compliance with requirements affecting Work performance.
1. Verification of Conditions: Verify that field measurements, surfaces, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to

- receive Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 PREPARATION

#### A. Field Measurements:

1. Verify actual dimension of openings by field measurement prior to fabrication.
2. Record measurements on Shop Drawings.
3. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

### 3.4 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 non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration between dissimilar metals.
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 07 9200 - 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 08 8000 - GLAZING.

#### 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. Install perimeter joint sealants as specified in Section 07 9200 - JOINT SEALANTS, and to produce weathertight installation.

#### I. 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.

### 3.5 FIELD QUALITY CONTROL

- A. All windows and doors shall be pre-tested by the manufacturer to design conditions. The associated test records shall be submitted.
- 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. Water Penetration Resistance Field Testing:
    - a. At least one (1) window of each operational type will be tested to the Waterproofing Consultants' Specified Field Test Pressure in accordance with ASTM E 1105-08 (the Standard). For storefront assemblies, Procedure A (Uniform) test will be used for a single cycle not less than 20 minutes in duration. The initial test will be inclusive of both installation interface and window product. In the case of failure (defined in the standard), the representative sample will be expanded to five (5) specimens in order to obtain statistical confidence in remedial repairs if needed. In the case of failure, the responsible party will be held financially liable for the cost of retesting, and any related wall assembly or cladding deconstruction needed to obtain passing results. This test specification supersedes AAMA Voluntary Specification for Field Testing. The test reports will be reviewed and approved by a registered Professional Building Envelope Engineer.
      - 1). Test Pressures:
        - a). 6.0 psf for windows
        - b). 6.0 psf for swing doors
  - 2. Air Leakage Field Testing:
    - a. Storefront Aluminum Frames- Areas shall be tested in accordance with ASTM E 783 for air infiltration 1.5 times the rate specified for laboratory testing under the "Performance Requirements" article, but not more than .09 cfm/sq.ft in a fixed wall section is permissible. Testing will be under uniform static pressure difference of 6.24 psf. In the case of an operable vent, refer to the next section for applicable leakage rates and pressure differentials. Where feasible, the storefront specimen size shall be one area 100 ft sq minimum, and include all joinery and components listed in AAMA 503-03.3.5.5. Exterior swing entries are not included in this test specification.
    - b. In the case of failure, the responsible party will be held financially liable for the cost of retesting, and any related wall assembly or cladding deconstruction needed to obtain passing results.
- 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.

### 3.6 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.
2. Comply with ADA requirements as required for opening and closing force.

**END OF SECTION**