

## SECTION 08 51 16

### ALUMINUM WINDOWS

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Aluminum windows.
- B. Baked finish.
- C. Hardware.
- D. Weatherstripping.
- E. Glass and glazing.
- F. Anchoring devices and fasteners.
- G. Electrolytic bituminous isolation coating.
- H. Sealants.

##### **1.02 RELATED SECTIONS**

- A. Glass and glazing are specified in Contract Specifications Section 08 80 00 - Glazing.
- B. Restoration and replacement of existing windows are specified in Contract Specifications Section 08 01 57 - Window Restoration and Replacement.

##### **1.03 MEASUREMENT AND PAYMENT**

- A. General: Aluminum windows will not be measured separately for payment but will be paid for as part of the Contract lump sum price for Architectural Work.

##### **1.04 REFERENCES**

- A. American Architectural Manufacturers Association (AAMA):
  - 1. ANSI/AAMA 101 Voluntary Specifications for Aluminum and Poly (Vinyl Chloride)(PVC) Prime Windows and Sliding Glass Doors
  - 2. AAMA 2604 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels
  - 3. AAMA 1503.1 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
- B. American Society for Testing and Materials (ASTM):

1. ASTM B221 Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
2. ASTM E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
3. ASTM E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
4. ASTM E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

### **1.05 REGULATORY REQUIREMENTS**

- A. In addition to the foregoing referenced standards, the regulatory requirements that govern the work of this Section include the following governing codes:
1. California Code of Regulations (CCR), Title 24, Part 2, California Building Code, Chapter 24, "Glass and Glazing", and Appendix Chapter 13, "Energy Conservation in New Building Construction."
  2. California Code of Regulations (CCR), Title 24, Part 6, California Energy Code, applicable requirements.

### **1.06 QUALITY ASSURANCE**

- A. Test Units:
1. Air, water, and structural test unit sizes and configuration shall conform with requirements of ANSI/AAMA 101.
  2. Thermal test unit sizes shall be 4 feet by 6 feet. Unit shall consist of a single typical vent.
- B. Test Procedures and Performance: Windows shall conform to ANSI/AAMA 101 requirements for the window types specified. In addition, windows shall meet the following performance requirements:
1. Air Infiltration Test:
    - a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E283 at static air pressure difference of 6.24 pounds per square foot.
    - b. Air infiltration shall not exceed 10 cubic feet per minute per foot of perimeter crack length.
  2. Water Resistance Test:

- a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E331 at static air pressure difference of 7.50 pounds per square foot.
  - b. There shall be no uncontrolled water leakage.
3. Uniform Load Structural Test:
- a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E330 at a static air pressure difference of 80 pounds per square foot positive pressure and 80 pounds per square foot negative pressure.
  - b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms, or actuating mechanisms, nor any other damage that would cause the window to be inoperable or otherwise defective.
4. Condensation Resistance Test (CRF):
- a. With window sash and ventilators closed and locked, test unit in accordance with AAMA 1503.1.
  - b. Condensation resistance factor shall be not less than 51.
5. Thermal Transmittance Test (Conductive U-value):
- a. With window sash and ventilators closed and locked, test unit in accordance with AAMA 1503.1.
  - b. Conductive thermal transmittance (U-value) shall be not more than 60 BTU per hour per degree F per square foot.
- C. Drainage: Window design shall enable water entering or occurring within the system to drain to the exterior.

**1.07 SUBMITTALS**

- A. General: Refer to Contract Specification Sections 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.
- B. Shop Drawings: Show materials, sizes and shapes of members, details of fabrication and installation, and finish hardware.
- C. Product Data: Submit window manufacturer's product data, including illustrative photos (catalog cuts) of the windows, operating and locking hardware, and color chart for selection of coating color.

- D. Samples: 3 feet by 4 feet sample of operable unit, of materials, finish and color specified; sample shall include polycarbonate glass, glazing, and hardware.
- E. Test Reports: Test reports from AAMA accredited laboratories certifying specified performance. Furnish with specified certification.
- F. Certification: AAMA Notice of Certification stating that the tested window meets or exceeds referenced criteria for ANSI/AAMA 101 window type specified.

## **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Refer to Contract Specifications Section 01 60 00 - Product Requirements, for general requirements for delivery, storage, and handling procedures.
- B. Do not allow windows or components to come in contact with mud, uncured concrete, materials that with the presence of moisture could cause staining of finish, and other materials that could damage windows or their finish.

## **1.09 WARRANTY**

- A. In addition to the guaranty requirements of the General Conditions, Article GC4.9, Guaranty of Work, furnish warranties specified below in a form acceptable to the Engineer. The warranty shall begin when the Guaranty of Work begins as specified in General Conditions Article GC4.9.
- B. Total Window System:
  - 1. Contractor shall warrant for three years the satisfactory performance of the total window installation, including windows, hardware, glass, glazing, anchorage and setting system, sealing, flashing, and associated items as it relates to air, water, and structural adequacy as specified and as indicated on approved Shop Drawings.
  - 2. Deficiencies due to such elements not meeting specified requirements shall be corrected at Contractor's expense during the warranty period.
- C. Finish Coating: Warrant finish fluoropolymer coating for five years for film integrity, and against color fade and chalking.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS AND FABRICATION**

- A. Window Type: Monumental operable and fixed sash aluminum windows, as indicated, meeting requirements of ANSI/AAMA 101, with baked fluoropolymer finish.

- B. Aluminum: ASTM B221, 6063-T5 alloy and temper, extrusions of sizes indicated and of thickness required to meet specified design and performance requirements.
1. Extrusions:
    - a. Minimum wall thickness shall be 0.125 inches.
    - b. Depth of frame and sash shall be 2 7/16-inches minimum.
  2. Frame Components: Mitered, reinforced with aluminum angle, and welded.
  3. Sash:
    - a. Extrusions shall be tubular.
    - b. Each corner shall be mitered, reinforced with an extruded aluminum corner key, hydraulically crimped, and "cold-welded" with epoxy adhesive.
    - c. Each operable sash shall have two rows of neoprene weatherstripping installed in specially designed dovetail grooves in sash extrusion.
  4. Internal Components: Manufacturer's standard stainless steel or other corrosion-resistant materials compatible with aluminum extrusions.
- C. Baked Fluoropolymer Finish: Full 70 percent polyvinylidene fluoride finish. Only coatings based on fluoropolymer resins meeting requirements of AAMA 2604, will be accepted. Color shall be as selected and approved by the Engineer from manufacturer's standards. All exposed aluminum surfaces shall receive the baked fluoropolymer finish.
- D. Hardware:
1. Operating Handles: Locking handles shall be cam type manufactured from white bronze alloy with a US25D brushed finish. Furnish Allen keyed custodial lock and concealed limit stop.
  2. Operating Arms: Pivot vents shall be extruded aluminum pivot housing with stainless steel pin.
- E. Weatherstripping: Neoprene, for use between frame and vent.
- F. Glass and Glazing: Factory glaze sash with clear float, insulating glass as specified in Contract Specifications Section 08 80 00 - Glazing. Units shall be "wet glazed" with snap-in aluminum extruded glazing bead and PVC bulb on the interior of the glass. Exterior of glass shall be set in a continuous bead of silicone sealant. Provide for expansion and contraction of acoustical glass.
- G. Anchoring Devices and Fasteners: Aluminum or stainless steel when exposed, cadmium- or zinc-plated steel when concealed.

- H. Electrolytic Bituminous Isolation Coating: Asphalt- or Coal-tar pitch-based paint or varnish of heavy or thick consistency, or 1/16-inch thick neoprene or butyl tape.
- I. Sealants: Refer to Contract Specifications Section 07 90 00 - Joint Protection, for requirements.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Where aluminum is installed in contact with dissimilar metals, concrete, or masonry, the aluminum shall be painted with bituminous isolation coating or separated with neoprene or butyl tape.
- B. Clean aluminum surfaces that will come in contact with sealants.

**3.02 INSTALLATION**

- A. Install windows as indicated and in accordance with approved shop drawing, and the window manufacturer's installation instructions and recommendations.
- B. Plumb and align window faces in a single plane for each wall plane, and install windows square and true, adequately anchored to maintain positions permanently when subjected to normal thermal and building movement and specified wind loads.
- C. Calk and seal windows completely around their perimeters with sealant and tape as required.

**3.03 ADJUSTING**

- A. Adjust ventilators and associated hardware to operate smoothly, to provide a tight fit at contact points and weatherstripping, and to meet specified performance requirements. Following adjustment, leave operable units in closed position.
- B. Apply sealants at joints and intersections and at opening perimeters. Wipe off excess material and leave exposed surfaces and joints clean and smooth.
- C. Upon completion of installation, windows shall be inspected, adjusted, and operable units put into proper working order to operate smoothly.
- D. All units shall be weathertight as specified.

**3.04 CLEANING**

- A. Clean exterior and interior faces of windows free of labels, dirt, and other adhering foreign materials, using cleaning materials and methods recommended by the window and glass manufacturers.

**END OF SECTION 08 51 16**