SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes fixed framed windows for exterior locations.
B. Related Sections include the following:
   1. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
   2. Division 08 Section "Glazing" for additional glazing requirements for aluminum windows.
   3. Division 08 Section "Glazed Aluminum Curtain Walls" for incorporating aluminum windows into glazed curtain walls and for coordinating finish among aluminum fenestration units.

1.3 DEFINITIONS
A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
   1. AW: Architectural.
B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-05:
   1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.
C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
D. Minimum Test Size: Smallest size permitted for performance class (gateway test size) or as specified elsewhere in this section, whichever is more stringent. Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class. Downsized test reports will not be considered acceptable.
1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Fixed Windows: 60” x 99”.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units of the minimum test size specified herein that pass AAMA/WDMA/CSA 101/I.S.2/A440-05, Uniform Load Structural and Uniform Load Deflection Tests:

1. Uniform Load Structural Test: 150 psf (positive and negative).
2. Uniform Load Deflection Test: 100 psf (positive and negative).

C. [Windborne-Debris Resistance: Provide glazed windows capable of resisting large missile impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.] <Note to Specifier: Windborne debris resistance requires the use of Lexan MR10 or Laminated Glass (.090” PVB Interlayer) at the exterior lite.>

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
5. Glazing details.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar samples of hardware and accessories involving color selection.

D. Maintenance Data: For finishes to be included in maintenance manuals.
E. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Product Qualifications: In order to confirm that the proposed product(s) conform to the material and performance requirements contained in these specifications, bidders shall include the following with their bid. Failure to comply with these requirements shall cause the bid to automatically be rejected.

1. Bidder’s Acknowledgement: Bidders shall include a letter in their bid stating the manufacturer and series (model) number of the product upon which its bid has been based. Changes in product (manufacturer or series) will not be permitted after the bid.

2. Product Test Reports: Bidders submitting bids based on products other than the Basis of Design product listed in Paragraph 2.1 must also include with their bid comprehensive test reports not more than four years old prepared by a qualified testing agency for each window type being used on the project. Test reports based on the use of downsized test units will not be accepted.

3. Product Details: Bidders submitting bids based on products other than the Basis of Design product listed in Paragraph 2.1 must also include with their bid full size product details showing all frame and sash details, dimensions, thermal break construction, wall thicknesses and joinery. Details must accurately reflect all glazing and hardware options specified herein.

B. Product Requirements: For maximum performance, windows for this project must meet both the testing requirements as contained herein and the minimum material requirements specified. Windows that carry the applicable AAMA rating but do not meet the material thicknesses, depths, etc. shall not be acceptable for use on this project.

C. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

D. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

E. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Do not modify size and dimensional requirements.

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.

1. Provide AAMA-certified aluminum windows.

G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

H. Preinstallation Conference: If requested, conduct conference at project site to review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.7 PROJECT CONDITIONS

A. Field Measurements: For retrofit installations, verify aluminum window openings 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 opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, or air infiltration.
c. Deterioration of metals or other materials beyond that which is normal.
d. Failure of insulating glass.

2. Warranty Period:

a. Window: [Two] [Three] [Five] [Ten] years from date of Substantial Completion.
b. [Insulated Glazing: 10 years from date of Substantial Completion.]
c. [Painted Metal Finishes:]
   1) [Five years from date of Substantial Completion for AAMA 2603 Baked Enamel Finishes.]
   2) [Ten years from date of Substantial Completion for AAMA 2604 High Performance Finishes.]
   3) [Twenty years from date of Substantial Completion for AAMA 2605 Superior Performance Finishes.]
      [Twenty-five years from date of Substantial Completion for AAMA 2605 Superior Performance Finishes applied by a member of the PPG Certified Applicator Program.]

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The basis of design for these specifications is the Series 3900i Fixed as manufactured by Architectural Window Manufacturing Corporation, Rutherford, New Jersey.

B. Equivalents: Subject to compliance with all material and performance requirements outlined in these specifications, “or equal” products by other manufacturers will be considered for use subject to review by the Architect. The Architect’s decision regarding equivalency is final.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and nominally 0.125-inch thickness.

B. Frame Depth: 2 ¾” [3 ½”] minimum.

C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
   1. All fasteners must be concealed except where unavoidable for application of hardware.
   2. For application of hardware, where required, use non-magnetic stainless steel phillips machine screws.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.


1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

G. Replaceable Weather Seals: Comply with AAMA 701/702.

H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 WINDOW

A. Window Type: Fixed

B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-05.

1. Performance Class and Grade: AW100.

C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a minimum CRF of 60.

D. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested using pyrolitic Low-E glass according to AAMA 1503.

1. U-Factor: 0.42 Btu/sq. ft. x h x deg F or less.

E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-05, Air Infiltration Test.

1. Maximum Rate: 0.10 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).
F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.

1. Test Pressure: 20 percent of positive design pressure, but not less than 15 lbf/sq. ft..

G. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.

2.4 [INSULATED] <DUAL> GLAZING

A. Construction: All windows (except those receiving insulated panels) shall be factory glazed with [hermetically sealed 1 1/8” insulating glass units with a dual seal of polyisobutylene and silicone and a desicant filled aluminum spacer.] <dual glazing> [Insulated] <Exterior lite of> glass must be set into a continuous bed of silicone sealant and held in place with removable extruded aluminum snap-in beads. [Wrap around (marine) glazing which requires the removal and disassembling of the frame for re-glazing will not be acceptable. Units must be IGCC certified for a CBA rating level.] < Interior glazing shall be wrap around (marine) glazed into a removable access panel. Access panels shall be hollow extruded sections with minimum wall thickness of 0.062 inches and shall be miter cut and assembled with stainless steel screws for ease of repair. Tamper resistant security fastenings shall be installed at the bottom of each panel to securely attach panels to sash. For safety purposes, access panels shall be encased within channels at the top and bottom to prevent the panel from falling out even if the security fastening is removed.>

1. Exterior Glazing:
   b. Tint: [Clear] [Bronze] [Grey] [Green]
   c. Type: [Annealed Glass] [Heat Strengthened Glass] [Tempered Glass] [Laminated Glass (.030” PVB Interlayer)] [Laminated Glass (.060” PVB Interlayer)] [Laminated Glass (.090” PVB Interlayer)] <Lexan® MR10 (or equal)>

2. Interior Glazing:
   b. Tint: [Clear] [Obscure]
   c. Type: [Annealed Glass] [Heat Strengthened Glass] [Tempered Glass] [Laminated Glass (.030” PVB Interlayer)] [Laminated Glass (.060” PVB Interlayer)] [Laminated Glass (.090” PVB Interlayer)] <Lexan® MR10 (or equal)>
   d. [Coating: [Pyrolitic Low-E (#3 Surface)] [PPG Solarban 60 Low-E (or equal) (#3 Surface)] [Other (Insert requirements or contact AWM for assistance)]]

B. Opaque Insulated Panels:
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Series 3900i
Fixed – 2 3/4”

1. Overall thickness: 1 1/8”
2. Exterior Face: [**Kynar paint on smooth .032” aluminum.**] [**Porcelain enamel on 28 gauge [smooth] [textured] steel.**] [**Porcelain enamel on 26 gauge stucco embossed aluminum.**] - color to be selected from manufacturer’s standard.
3. Interior Face: [**Kynar paint on smooth .032” aluminum.**] [**Porcelain enamel on 28 gauge [smooth] [textured] steel.**] [**Porcelain enamel on 26 gauge stucco embossed aluminum.**] - color to be selected from manufacturer’s standard.
6. Core: [**Polyisocyanurate.**] [**Polystyrene.**]

2.5 HARDWARE

A. General: Not applicable.

2.6 INSECT SCREENS

A. General: Not applicable.

2.7 ACCESSORIES

A. Rescue Labels: Not applicable.

2.8 FABRICATION

A. Fixed windows must have equal sightlines to any operable ventilators.
B. Fixed windows must have an integral exterior bevel.
C. Window sightlines cannot exceed those indicated on drawings in order to maintain the intended historic integrity.
D. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
E. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
F. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed thermal barriers will not be acceptable), low-conductance thermal
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Series 3900i
Fixed – 2 ¾”

barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.

2. No thermal short circuits shall occur between the exterior and interior.

3. The thermal barrier shall be INSULBAR® or equal, and shall consist of two glass reinforced polyamide nylon 6/6 struts mechanically crimped in raceways extruded in the exterior and interior extrusions.

4. Poured and debridged urethane thermal barriers shall not be permitted.

G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

I. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch thick extruded aluminum. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

J. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440-05.

K. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

L. Muntins: Where shown on drawings, muntins shall be [3/4” x 7/8” beveled extruded aluminum applied to the exterior of 1 1/8” deep insulating glass (roll formed muntins shall not be acceptable)] [roll formed aluminum between the lites of 1 1/8” insulated glass].

2.9 FINISHES, GENERAL

A. 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. Exterior of Window:

1. [Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.]

2. [Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.]

3. [Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.]
   a. Color: [Champagne] [Medium bronze] [Dark bronze] [Black].

4. [Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.]
   b. Color: As selected by Architect from manufacturer’s standard colors. (Note: Exterior color may be different from interior color.)

5. [High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.]
   a. Fluoropolymer Two-Coat System: Manufacturer’s standard two-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50% polyvinylfluoride resin by weight; complying with AAMA 2604.
   b. Color: As selected by Architect from manufacturer’s standard colors. (Note: Exterior color may be different from interior color.)

6. [Superior-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare,
pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer’s written instructions.

a. Fluoropolymer [Two-Coat] [Three-Coat] System: Manufacturer’s standard [two-coat] [three-coat] thermocured system consisting of specially formulated inhibitive primer [and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.] [, fluoropolymer color coat, and clear fluoropolymer top coat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.]
b. Color: As selected by Architect from manufacturer’s standard colors. (Note: Exterior color may be different from interior color.)

D. Interior of Window:

1. [Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.]
2. [Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.]
3. [Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.]
a. Color: [Champagne] [Medium bronze] [Dark bronze] [Black].

b. Color: As selected by Architect from manufacturer’s standard colors. (Note: Exterior color may be different from interior color.)
5. [High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
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Fixed – 2 ¾”

a. Fluoropolymer Two-Coat System: Manufacturer’s standard two-coat thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50% polyvinylfluoride resin by weight; complying with AAMA 2604.
b. Color: As selected by Architect from manufacturer’s standard colors. (Note: Exterior color may be different from interior color.)

6. Superior-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer’s written instructions.

a. Fluoropolymer [Two-Coat] [Three-Coat] System: Manufacturer’s standard [two-coat] [three-coat] thermocured system consisting of specially formulated inhibitive primer [and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.] [fluoropolymer color coat, and clear fluoropolymer top coat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.]
b. Color: As selected by Architect from manufacturer’s standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodbile surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FACTORY TESTING

A. One window for each seventy-five manufactured shall be randomly selected by the Owner and Architect to be tested at the manufacturer’s facility for air and water infiltration in order to confirm compliance of the project’s windows with the performance requirements contained in these specifications. Bidders are to include the cost of transportation, food, and lodging for four representatives of the Owner and/or Architect to witness these tests.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Manufacturer shall clean all glass and aluminum prior to shipment.

B. Protection of newly installed windows and/or final cleaning of glass and aluminum to remove any accumulations that may have occurred during the construction period is to be the responsibility of the General Contractor or Owner.

C. Comply with manufacturer’s written recommendations for final cleaning and maintenance.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system.

END OF SECTION 085113