SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum windows of the following types:
   1. Included under this Section of the Work are window types as indicated.
      a. Outward Projecting windows
      b. Fixed windows

B. Related Sections:
   1. Section 079200 - Joint Sealants: For caulking between aluminum frames and adjacent materials.
   2. Section 088000 - Glazing: For glazing requirements.

1.2 DEFINITIONS

A. AW: Architectural.

B. Performance grade number, included as part of the AAMA/WDMA 101/I.S.2/NAFS product designation code, is actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.

C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.

D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

E. Projection Windows: Units with ventilators that project outward from the plane of the window frame. They are top hinged and swing up from the sill.

F. Fixed Windows: Inoperable and consist of a glazed frame installed into an opening.

1.3 SYSTEM DESCRIPTION

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 test size indicated below:

1. Minimum size required by AAMA/WDMA 101/I.S.2/NAFS.

B. AAMA/WDMA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.

1. Performance Class: AW.
2. Performance Grade: 60, minimum.

C. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2 — Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
   a. Basic Wind Speed: 90 mph
   b. Importance Factor: 1.15
   c. Exposure Category: B
2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

D. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52, where windows are indicated to be "thermally improved."

E. Sound Transmission Class: Provide glazed windows rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

F. Thermal Transmittance: Provide aluminum windows with whole-window U-value maximum indicated at 15 mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-value .56.

G. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient

and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 degrees F, ambient 180 degrees F. material surfaces.

1.4 SUBMITTALS

A. Shop Drawings: For each type of window required. Include information not fully detailed in manufacturer's standard product data and the following:
   1. Layout and installation details, including anchors.
   2. Elevations of continuous work at 1/8-inch scale and typical window unit elevations at 3/4-inch scale.
   3. Full size section details of typical composite members, including reinforcement.
   4. Hardware including operators.
   5. Glazing details.
   6. Screens and screen operation.
   7. Accessories.

B. Samples for Initial Selection: For units with factory applied color finishes and louver blinds.

C. Quality Assurance/Control Submittals
   1. Product Data: For each type of window required, including:
      a. Construction details and fabrication methods.
      b. Profiles and dimensions of individual components.
      c. Data on hardware, accessories, and finishes.
      d. Recommendations for maintenance and cleaning of exterior surfaces.
   2. Certification: Provide certification by a recognized independent testing laboratory or agency to perform tests specified. Provide certified test results showing that each type, grade, and size of window unit complies with performance requirements indicated.
   3. Qualification Data: Letter from window manufacturer/supplier approving installer.

D. Additional Submittals
   1. Credit MR 4.1; Recycled Content: Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   2. Credit MR 5.1; Local/Regional Materials
      a. Indicate location of manufacturing facility; indicate

distance between
manufacturing facility and the potential site.

b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.

3. Credit EQ 4.1; VOC Data; Adhesives: Submit manufacturer's product data for adhesives. Indicate VOC limits of the product.

E. Closeout Submittals
1. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.
2. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this project.
1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for aluminum windows, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in
assemblies similar to those indicated for this Project.

B. Regulatory Requirements
1. Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.
2. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights, and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

C. Mock-ups: The first window installed shall serve to verify installation requirements and shall be approved by NE before remainder of windows is installed. Mock-up is for review of installation requirements only.
1. Mock-up shall be of typical window unit as selected by NE.
2. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Waste Management: As specified in Section 017419 — Construction Waste Management and as follows:
   1. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to
      manufacturer for recycling into new product.
   2. Separate corrugated cardboard in accordance with Waste Management Plan and place in designated areas for recycling.
   3. Fold up metal banding, flatten, and place in designated area for recycling.

1.7 PROJECT CONDITIONS

A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.
   1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit of window units.

1.8 WARRANTY

A. Aluminum Window Warranty: Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Failures include but are not limited to:
   1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
   2. Faulty operation of sash, access panel, venetian blinds, screens, hardware, and glazing.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Water leakage, air infiltration, or condensation.

B. Warranty Period: 10 years after the date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is made by the Contractor under requirements of the Contract Documents.

D. 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: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Aluminum windows shall be casement, flush exterior face, inside glazing type units as manufactured by one of the following manufacturers. Fixed and casement types are required. Provide units with a minimum 3-1/4 inch jamb width. Refer to Drawings for locations of each type.

B. Products of the following manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, size, configuration, function, and arrangement required:
   1. 6800 Series; Graham Architectural Products, York, PA
   2. Series 810-I; EFCO Corporation, Monett, MO
   3. Series 3250; Wausau Metals Corp., Wausau, WI
   4. Series 14P; Modu-line, Wausau, WI
   5. Series 3525; Manko Window Systems, Manhattan, KS

2.2 MATERIALS, GENERAL

A. Main frame and sash sections shall have a minimum aluminum wall thickness of .125 inch extruded from 6063-T5 or T6 alloy with a tensile strength of 22,000 psi in all structural areas. Each aluminum member shall be extruded as a single section, filled with a polyurethane insulator as described herein, then the aluminum bridge removed after finishing to establish interior and exterior sections.
   1. In lieu of .125 wall thickness window design may incorporate multi-chamber hollow construction in both the sash and frame utilizing euro-groove technology.

B. Fasteners: Shall be aluminum, nonmagnetic stainless steel or other material that is noncorrosive and compatible with the aluminum window members, trim, hardware, and other components of the window units. Cadmium-plated steel fasteners are not permitted.
   1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Trim: Anchors, clips, sills, jambs, and other accessories shall be of configuration indicated on the Drawings, and exposed surfaces shall match finish of window units.

1. Provide trim of sufficient strength to withstanding design pressure indicated.
    a. Manufacturer shall provide installation materials including steel strap anchor, snap trim clip, or receptor system with subsill as indicated for a complete installation. Attachment through window frame into blocking is not an approved installation method.
2. Anchors, Clips and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
    a. Cadmium plated steel anchors, clips, and assemblies are not permitted.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Caulk Stop: Continuous channel shaped vinyl extrusion provided by window manufacturer.

F. Compression Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.
    1. Weather stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2/NAFS.

G. 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.

H. Screens: Shall be provided at operable vents. Screens shall be 18 by 16 mesh of .013 inch diameter aluminum wire, complying with FS RR-4-365 Type VII, and shall have an extruded tubular aluminum frame for inside mounting. Provide fully hinged wickets.

2.3 GLAZING

A. Glass and Glazing Materials: Refer to Section 08800 — Glazing for glass units and glazing requirements applicable to glaz-

ing aluminum window units.

B. Safety Glazing: Windows shall be glazed with tempered glass where subject to human impact. Guidelines of the applicable state and local code authorities and the consumer product safety commission CPSC 16 CFR 1201 shall be followed.

1. Provide tempered glass at the following locations:
   a. Glazing adjacent to a door and within the same wall plane as the door whose nearest vertical edge is within 12 inches of the door in a closed position and whose bottom edge is less than 60 inches above the floor or walking surface, unless an intervening interior permanent wall is between the door and the glazing.
   b. Glazing in means of egress windows.
   c. Glazing as required by applicable State and Local Code Authorities.
   d. At all locations with applied muntins.

2.4 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum or stainless steel complying with AAMA 907, or other corrosion resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide a finish to compliment the frame, provide solid bronze, nonmagnetic stainless steel, extruded, cast or wrought aluminum or die-cast zinc with special coating.

B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash
in direction indicated and operated from the inside only.

1 Combination lever handle and cam action lock with concealed pawl and keeper; two per ventilator over 36 inches.

C. Hinges: Concealed, five knuckle, three leaf butt hinges, fabricated of extruded aluminum of 6063-T5 or T6 alloy with nylon brushings and stainless steel pins.

D. Sill Panning Trim: Shall be of configuration indicated on Drawings and shall match finish of window unit. Design trim to comply with performance requirements indicated and to drain to the exterior.

E. Shims: Provide U-shaped plastic shims for installation of windows in openings.

2.5 FIXED WINDOWS

A. Frames: Frame members shall be mechanically joined. Thickness of material shall not be less than .125 inch. Frames shall be factory glazed and shall be same configuration as frames for operable units.
   1. All window units shall be factory glazed.

2.6 ACCESSORIES

A. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

B. Factory Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Section 08800 - Glazing and with AAMA/NWWDA 101/I.S.2/NAFS.

2.7 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWWDA 101/I.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are re-glazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
   1. Provide thermal break construction that has been in use for not less than 3 years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.

2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

2.8 FINISH

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40Rlx (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color 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 manufacturer's written instructions.
1. Color and Gloss: As selected by Architect from coating manufacturer's full range.

E. Powder-Coat Finish(Manufacturer's Option): Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder-coat finish.
Comply with resin manufacturer's written instructions for application, baking, and minimum dry
film thickness.
1. Color and Gloss: As selected by Architect from coating manufacturer's full range.

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 barriers, 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. Metal Surfaces: Dry, clean, free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturers written instructions for installing windows, hardware, accessories, and other components; Drawings; and shop drawings. Install in accordance with one of the following methods:

1. Metal strap anchor.
2. Snap trim and clip.
3. Receptor system with subsill.

B. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide
proper support and anchor securely in place.

1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under paragraph "Dissimilar Materials" in the Appendix to AAMA 101.

C. Set sill members and other members in a bed of compound or with joint fillers or gaskets to provide weathertight construction. Refer to Section 07920 - Joint Sealants for compounds, fllers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashing and other components of the work.

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

3.3 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
Lubricate hardware and moving parts.

3.4 PROTECTION AND CLEANING

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturers written recommendations.

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

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

END OF SECTION