SECTION 08520CPPR -- ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 CRITERIA

A. This section includes aluminum hung, casement, awning and fixed windows.

B. Reference materials shall include American Architectural Manufacturer’s Association (AAMA).

C. Contractor shall submit shop drawings, finish samples, test reports, and warranties.

D. Samples of materials may be requested for submittal without cost to owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, corner section, etc.

E. All hung and projected windows require air infiltration, water resistance, uniform load structural, condensation resistance, and thermal transmittance tests.

F. The contractor shall assume full responsibility and warrant for five (5) years the satisfactory performance of the total window installation which includes that of the windows, hardware, glass, glazing, anchorage and setting system, sealing flashing as it relates to air, water and structural adequacy as called for in the specifications and approved shop drawings.

G. A ten (10) year warranty is required for glass, glazed insulated units and paint finish.

H. RELATED WORK

1. Section 00100  General Conditions for as-built samples
2. Section 08500  Windows

1.2 PERFORMANCE REQUIREMENTS – As a minimum, specify windows that meet the following performance requirements:

A. Performance Level: For each window selected, perform a wind pressure calculation using ANSI/ASCE 7 – “Minimum Design Loads on Buildings and Other Structures”, current edition. Minimum performance grade is 40. Specify a window meeting the appropriate performance category. HC is the minimum performance grade unless there is a specific reason to choose a lower category.

B. Condensation-Resistance Factor: As a minimum, provide aluminum windows tested for thermal performance and condensation resistance
according to AAMA 1503. For windows used in humidified buildings, the
designer shall perform a condensation study before selecting the window
type, to establish the required CRF based on interior and exterior
conditions.

C. Thermal Transmittance: Select aluminum windows with a whole-window
U-value maximum indicated at 15-mph (24-km/h) exterior wind velocity
and winter condition temperatures when tested according to AAMA 1503.
U-Value: 0.65 Btu/sq. ft. x h x deg F.

D. Thermal Movements: Perform an engineering calculation to determine the
expected thermal movement of the windows based on temperature change
range of 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material
surfaces. Select windows, including anchorage, that accommodate
thermal movements without buckling, distortion, opening of joints, failure
of joint sealants, damaging loads and stresses on glazing and connections,
and other detrimental effects.

E. Uniform Structural Load: Select windows that withstand a positive and
negative differential pressure of 1.5 times design pressure in accordance
with ASTM E330. Allow deflection less than 1/175 of the unsupported
spans, when tested in accordance with ASTM E330.

F. Air Infiltration: Select windows that meet AAMA/NWWDA 101/I.S.2
requirements for the product and class specified, when tested in
accordance with ASTM E283 (lab)/E783 (field).

G. Water Penetration Resistance: Windows need to meet both factory and
field criteria:
1. Factory Testing: The factory tests are applied to windows as
individual units before installation. Select windows that pass a 15
minute laboratory test at a pressure differential meeting the
“optional” performance grade established by AAMA/NWWDA
101/I.S.2 for the performance class determined by the design
calculations.
2. Field Test: After installation, the completed window assembly
(including window perimeter flashings, jamb panning, and other
attached elements) must pass a series of two field tests in which the
perimeter elements are also exposed to pressure differentials and
water spray. Perform the first field test in accordance with ASTM
E1105 (Procedure A) for the same performance class as the factory
test, and in no case less than 6.24 psf pressure differential,
followed by a second field test in accordance with ASTM E1105
(Procedure B) consisting of four cycles of 5 minutes at 6.24 psf
and 1 minute at 0 psf.
1.3 SUBMITTALS

A. Product Data: Submittals must 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 by the window fabricator must include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:
   1. Mullion and joinery details, including reinforcement and stiffeners.
   2. Expansion provisions.
   3. Flashing and drainage details.
   5. Glazing details.

C. Require the Contractor to provide calculations by a Rhode Island licensed professional engineer showing the adequacy of the window perimeter anchors, angle supports and attachments, stiffness of the mullions and sash, and showing structural adequacy of components not verified by testing.

1.4 MOCK-UPS

A. Performance Mockups: For special window types, or window assemblies that involve coordination and sequencing of special perimeter panning and flashings, require a sample window to be constructed on-site, far enough in advance of construction that there will be time to adjust the design based on the outcome of the mock-up installation. The mock up should include all the concealed flashings, self-adhered membrane, sealants, and other elements that will be part of the finished assembly. The intent of mock-ups is not only for visual appearance, but to allow the contractor to rehearse the construction sequencing, to solve unanticipated constructability issues, and perform performance tests on the final window assembly, as opposed to the window in isolation.

1.5 WARRANTY

A. Special Warranty: Require the manufacturer's standard warranty, in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Failure to meet performance requirements.
   2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
6. Insulating glass failure.

B. Warranty Period: Two years from date of Substantial Completion.

C. Warranty Period for Metal Finishes: 15 years from date of Substantial Completion.

D. Warranty Period for Glass: 10 years from date of Substantial Completion.

PART 2. PRODUCTS

2.1 MANUFACTURERS

A. Provide windows from the following manufacturers, or approved equals
   1. EFCO
   2. Kawneer
   3. Wausau

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 as follows:
   1. Main frame: Not less than 0.090 inch (2.3-mm) thickness.
   2. Sash: Not less than 0.080 inch (2.0-mm) thickness.
   3. Sill: Not less than 0.125 inch (3.2-mm) thickness.

B. 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.

C. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch (3.2-mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
D. 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.

2.3 FRAME AND SASH CONSTRUCTION

A. Weep System: Each window sash glazing pocket (operable and fixed) and the sill frame must have at least 3 weeps, minimum 3/8 inch dimension, flush with the lowest drainage point of the section to drain all water. Require the manufacturer to coordinate the location of weeps with setting block locations, so that all portions of the section drain freely.

B. Frame and Sash Construction: Offsets of adjacent frame or sash components and metal-to-metal joint separations shall not exceed 1/32 inch. Seal all joints from behind to prevent water penetration into the frame. Frame corners shall be joined with screws and all corners sealed watertight. Face sealing of joints is prohibited. Plastic components shall be shielded from exterior exposure and shall be recommended for exterior use by the plastics manufacturer. All fasteners shall be concealed. Fixed horizontal frame members shall have a sill section with an integral interior stop, i.e. no removable stops at the windowsills, to prevent leakage to the interior.

C. Perimeter Seals and Flashing: To accommodate proper perimeter seals, the window frame must have:
1. Continuous edge returns at least 1 inch deep, continuous and reinforced at all corners, to accept the outer perimeter sealant and backer rod.
2. No joints or overlaps in the system shingled against the flow of water.
3. No penetrations or interruptions in the perimeter seals.

D. Frame perimeter anchorage: Show the permitted locations of window anchors on the window details. Sill anchors shall not penetrate the horizontal leg of the sill flashing.

E. Thermally Improved Construction: Always specify thermally improved windows that contain thermal breaks or “thermally improved” areas of metal reduction. Thermal barriers should be tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505. Use hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
1. Barrier material shall be poured-in-place, two-part polyurethane. A nonstructural thermal barrier is not allowed.
F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, 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.

G. 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.

2.4 WEATHERSTRIPPING AND SEALS

A. Weatherstripping: Operable windows shall have double rows of weatherstripping around the sash. Weatherstripping shall be replaceable without disassembling the sash or frame, or removing the frame from the opening.

B. 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.

C. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.

D. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702. Weather

E. Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material.

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

G. Small-Joint Sealant: For sealants required within fabricated windows, use window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.5 GLAZING – See also Division 8 sections for Glazing.

2.6 Factory Glazing: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/1.S.2. Use sash components that are re-glazable without dismantling sash or ventilator framing.
2.7 Glazing Standards: Make reference to the published recommendations of glass manufacturers and the Glass Association of North America (GANA) "Glazing Manual" unless more stringent standards are warranted.

2.8 All muntins shall be true divided light.

2.9 HARDWARE

2.10 Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon 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. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze or nonmagnetic stainless steel.

2.11 Counterbalancing Mechanism: Comply with AAMA 902.

2.12 Sash Balance: Concealed spring-loaded, block-and-tackle type of size and capacity to hold sash stationary at any open position.

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

2.14 Double-Hung Windows: Provide the following operating hardware:

2.15 Sash Balances: Two per sash handle: Continuous, integral, sash lift baron bottom rail of forward placed operating sash.

2.16 Sash Lock: Cam-action sweep lock and keeper on meeting rail and spring-loaded, snap-type lock on bottom rail of lower sash; two per sash.

2.17 INSECT SCREENS.

A. All operable windows require operable screens that can be easily removed for window cleaning purposes.

B. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on outside of window and provide for each operable exterior sash or ventilator.

D. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

E. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch (1.3-mm) wall thickness.

F. Finish: Match aluminum window members. Aluminum Wire Fabric: 18 by 16 (1.1 by 1.3-mm) mesh of 0.011 inch (0.28-mm) diameter, coated aluminum wire. Wire-Fabric Finish: Charcoal gray, unless there is a specific reason to use another color.

2.5 FINISHES

2.18 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.19 Unless there is a specific reason to do otherwise, use a 3-coat fluoropolymer paint complying with AAMA605.2., or anodized Architectural Class 1 finish, meeting AAMA 607.1 for clear anodized, or 608.1 for color anodized.

2.20 All systems shall have medium factory prefinish at a minimum.

PART 3 - EXECUTION

2.21 FIELD QUALITY CONTROL

2.22 Inspect each window installation during construction to make sure that the flashings, window, sealants, and other elements are present as intended. Perform these inspections early enough that there will still be time to correct any problems identified.

2.23 Engage a qualified testing agency or consultant to perform tests of the completed window installation. When there are unusual configurations that vary by location on the building, select enough windows for testing that there will be a representative sample of all the window types.

END OF SECTION
PART 3.

PART 4.

END OF SECTION