

**SECTION 08 44 13
GLAZED ALUMINUM CURTAIN WALLS**

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Delete any other item or article not applicable in Section and renumber paragraphs.
2. See Physical Security Design Manuals for VA Facilities for Glazed Aluminum Curtain Walls design standards.

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies glazed aluminum curtain wall system.
 1. Thermally isolated, pressure equalized on interior.
 2. Type: // Stick // // Unit // // Unit and Mullion // system to include following:
 - a. // Glass // // Insulated Metal Panels // // Uninsulated Metal Panels // // Glass Spandrel Panels //.
 - b. // Behavioral Health Interior Access Windows //.
 - c. Integral reinforcing.
 - d. Closures, trim, subsills and flashings.
 - e. Column covers.
 - f. Fasteners, anchors, and related reinforcement.

1.2 RELATED WORK:

- A. //Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.//
- B. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- C. Miscellaneous Metal Members: Section 05 50 00, METAL FABRICATIONS.
- D. Firestopping between Curtain Wall and Structure: Section 07 84 00, FIRESTOPPING.
 1. Sheet Metal Flashing and Trim: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- F. //Aluminum and Glass Hinged Entry Doors and Storefront Construction: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS. //
- G. //Revolving Entrance Doors: Section 08 42 33, REVOLVING DOOR ENTRANCES. //
- H. //Aluminum Windows: Section 08 51 13, ALUMINUM WINDOWS. //
- I. //Aluminum Windows: Section 08 51 13.11, SIDE-HINGED ALUMINUM WINDOWS. //

J. //Metal Framed Skylights: Section 08 63 00, METAL-FRAMED SKYLIGHTS.//

K. Glazing: Section 08 80 00, GLAZING.

L. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.

M. Louvers and Wall Vents: Section 08 90 00, LOUVERS AND VENTS.

1.3 QUALITY ASSURANCE:

A. Qualifications:

1. Approval by Contracting Officer Representative (COR) is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:

- a. Manufacturers Qualifications: Manufacturer with five (5) years continuous documented experience in // design, // // fabrication, // and // installation // of glazed aluminum curtain wall systems of similar type and for projects of equivalent size.
- b. Installer: Manufacturer approved in writing who has continuously installed glazed aluminum curtain walls systems of similar type and for projects of equivalent size for previous five (5) years.
- c. Manufacturer is to provide technical field representation at project site, as a minimum, at start of project, during middle, towards end of project, and during field testing of field mockup panel.
- d. //Manufacturers Professional Engineer Qualifications: A Professional Engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of glazed aluminum curtain walls that are similar to those indicated for this Project in material, design, and extent.//
- e. Testing Laboratory: Contractor is to retain AAMA accredited commercial testing laboratory to perform tests specified. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to perform testing specified in this section.
- f. Product Options: Information on construction documents establishes requirements for aesthetic effects and performance characteristics of glazed aluminum curtain wall system. Aesthetic effects are indicated by dimensions, arrangements,

alignment, and profiles of components and assemblies as they relate to sightlines, one another, and adjoining construction. Performance characteristics are indicated by criteria subject to verification by one (1) or more methods including preconstruction testing, field testing, or in-service performance.

- 1) Do not modify intended aesthetic effects. If modifications are proposed, submit comprehensive explanatory data for review.

g. Qualification of Welders:

- 1) Welding is to be performed by certified welders qualified in accordance with AWS D1.2/D1.2M, using procedures, materials, and equipment of the type required for this work.

SPEC WRITER NOTES:

1. Delete requirements for mockup if not warranted by project size or portions of Article not deemed necessary.
2. Indicate location size and configuration of mockup panel on architectural contract drawings.
3. Verify necessity and obtain approval from COR before requiring that a mockup be provided.

B. // Mockup: //

1. //Construct, at job site, full size typical wall unit which incorporates horizontal and vertical joints, framing, window units, panels, glazing, sealants, and other accessories as detailed and specified. Mock-up wall unit location, size and design are to be as indicated on construction documents. Orient mockup to be facing full sun when constructed. //
2. // Performance Test //

 - a. //Conduct performance test of mockup after approval of visual aspects has been obtained. Testing is to be performed on mockup according to requirements in "Field Quality Control" Article. //
 - b. //Refer to Performance Requirements and Field Quality Control Articles, this section, for testing requirements. //

3. // Approved Mock-up //

 - a. // After completion and approval of performance test results of job site mockup, as directed by COR, approved mock-up panel

is to be used as minimum standard of comparison for entire curtain wall system.//

SPEC WRITER NOTE: Delete this Article if project size does not warrant a pre-installation conference.

C. // Pre-Installation Conference //

1. //Prior to starting installation of glazed curtain wall system schedule conference with COR to demonstrate the following:
 - a. Clear understanding of construction documents.
 - b. Onsite inspection and acceptance of structural and pertinent structural details relating to curtain wall system.
 - c. Coordination of work of various trades involved. Conference is to be attended by Contractor; personnel directly responsible for installation of curtain wall system, flashing and sheet metal work, firestopping system and curtain wall manufacturer and their technical field representatives. Conflicts are to be resolved and confirmed in writing. //

1.4 SUBMITTALS:

SPEC WRITER NOTE:

1. Certain occupancies (behavioral health, psychiatric, dependence rehabilitation) require special provisions for glazed vision areas. These are specified in detail in specification Section 08 51 13.11 and must be referenced here when applicable.

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. //Sustainable Design Submittals, as described below:
 1. //Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.// //
- C. Manufacturer's Literature and Product Data:
 1. Manufacturer's standard details and fabrication methods.
 2. Data on finishing, components, and accessories.
 3. Instructions: Submit descriptive literature, detail specifications, performance test data and instructions for installation, and adjustments.
 4. Recommendations for maintenance and cleaning of exterior surfaces.
- D. Shop Drawings:

1. Show elevations of glazed curtain wall system at 1:48 (1/4 inch) scale, metal gages, details of construction, methods of anchorage, flashing and coping details, glazing details, firestopping assemblies at edge of slabs and details of installation. Show interfaces and relationships to work of other trades and continuity with adjacent thermal, weather, air and vapor barriers.
 2. Submit for curtain wall system, accessories //, and mock-up // . Tentative approval of drawings is to be received before fabrication of mock-up. Final approval of drawings is to be deferred pending approval of mock-up and accessories.
 3. //Operating Windows // // or behavioral health interior access windows for vision glass areas. //
 - a. //Specified in Section 08 51 13, ALUMINUM WINDOWS. //
 - b. //Side-hinged type specified in Section 08 51 13.11, SIDE-HINGED ALUMINUM WINDOWS. //
 4. Operation and Maintenance Manuals
 - a. Submit cleaning and maintenance instructions.
- E. Samples:
1. Submit pairs of samples of each specified color and finish on 305 mm (12-inch) long section by width of each tubular, or extruded shape section or 305 mm by 305 mm (12-inch by 12-inch) wide sections of sheet shapes.
 2. Submit corner section of framing members showing fasteners, panels, glazing methods, glazing materials, and weather-stripping. Submit one (1) sample minimum 305 mm by 305 mm (12 inches by 12 inches). In lieu of submitting separate samples for corner section, intermediate section, and panel, one (1) composite sample incorporating all components and features listed may be submitted.
 3. Where normal color variations are anticipated, include two (2) or more units of each sample indicating extreme limits of color variations.
- F. Glass:
1. Specified in Section 08 80 00, GLAZING.
- G. Quality Assurance Submittals:
1. Design Data:
 - a. Submit structural and thermal calculations for complete wall assembly. Structural calculations and design shop drawings signed and sealed by a Professional Engineer (PE).

2. Factory Test Reports:

a. Test Reports: Submit certified test reports, for each of following listed tests, from a qualified independent testing laboratory showing that glazed aluminum curtain wall system assembly has been tested in accordance with specified test procedures and complies with performance characteristics as indicated by manufacturer's testing procedures. Submit factory tests required except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested within last year, under conditions specified herein, resulting test reports may be submitted in lieu of listed testing. Submit appropriate testing reports for specific tests indicated below:

- 1) Deflection and structural tests.
- 2) Water penetration tests.
- 3) Air infiltration tests.
- 4) Delamination tests.
- 5) Thermal conductance tests.
- 6) //Sound transmission loss test. //
- 7) // Behavioral Health Windows: Test for (2000 ft-lb.) simulated human impact in accordance with AAMA 501.8. //

H. Manufacturer's Certificates:

1. Submit Certificates of Compliance, with specification requirements, for the following:
 - a. Metal extrusions.
 - b. Metal accessories.
 - c. Statement(s) that aluminum has been given specified thickness of anodizing or organic coating finish.
 - d. Statement(s) indicating manufacturers and installers conform with qualifications as specified.
 - e. Submit list (minimum of five (5)) of equivalent project size installations for both manufacturer and installer.

I. Manufacturer's Field Reports:

1. Submit field reports of manufacturer's field representative observations of curtain wall installation indicating observations made during inspection at beginning of project, during middle of installation and at conclusion of project.

J. Welders: Submit welders qualifications as specified.

K. Testing Laboratory: Submit Testing Laboratory qualifications.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Refer to AAMA CW 10 for care and handling of architectural aluminum from shop to site.
- B. Prior to packaging for shipment from factory, mark wall components to correspond with shop and erection drawings and their placement location and erection sequence.
- C. Prior to shipment from factory, place knocked-down lineal curtain wall members in cardboard containers and cover finished surfaces of members with protective covering of adhesive paper, waterproof tape, or strippable plastic. Do not cover metal surfaces that will be in contact with sealants after installation.
- D. Inspect materials delivered to site for damage; unload and store with ventilation, free from heavy dust, not subject to combustion products or sources of water, and to permit easy access for inspection and handling. Sealing and caulking compounds, including handling, is to be in accordance with requirements of Section 07 92 00, JOINT SEALANTS.

1.6 PROJECT CONDITIONS:

- A. Field Measurements: Where glazed aluminum curtain wall systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
 - 501.8-14.....Test Method for Determination of Resistance of Human Impact of Window Systems Intended for Use in Psychiatric Applications
 - MCWM-1-89.....Metal Curtain Wall Manual
 - CW 10-12.....Care and Handling of Architectural Aluminum from Shop to Site
 - CW 11-85.....Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing
 - CW 13-85.....Structural Sealant Glazing Systems (A Design Guide)

- TIR A11-04.....Maximum Allowable Deflection of Framing Systems
for Building Cladding Components of Design Wind
Loads
- 501-05.....Methods of Test for Exterior Walls
- 503-08.....Field Testing of Metal Storefronts, Curtain
walls and Sloped Glazing Systems
- 2605-13.....High Performance Organic Coatings on
Architectural Extrusions and Panels
- C. American Society of Civil Engineers (ASCE):
- ASCE 7-10.....Minimum Design Loads for Buildings and Other
Structures
- D. ASTM International (ASTM):
- A36/A36M-12.....Structural Steel
- A123/A123M-13.....Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products
- A193/A193M-14a.....Alloy-Steel and Stainless Steel Bolting
Materials for High Temperature Service
- A307-14.....Carbon Steel Bolts and Studs, 60,000 PSI
Tensile Strength
- B209-14.....Aluminum and Aluminum Alloy Sheet and Plate
- B209M-14.....Aluminum and Aluminum Alloy Sheet and Plate
(Metric)
- B211-12.....Aluminum and Aluminum Alloy Bar, Rod, Wire
- B211M-12.....Aluminum and Aluminum Alloy Bar, Rod, Wire
(Metric)
- B221-14.....Aluminum and Aluminum Alloy Extruded Bars,
Rods, Wire, Shapes and Tubes
- B221M-13.....Aluminum and Aluminum Alloy Extruded Bars,
Rods, Wire, Shapes and Tubes (Metric)
- B316/B316M-10.....Aluminum and Aluminum Alloy Rivet and Cold-
Heading, Wire, and Rods
- C578-14a.....Rigid Cellular Polystyrene Thermal Insulation
- C612-14.....Mineral Fiber Block and Board Thermal
Insulation
- C920-14a.....Elastomeric Joint Sealants
- C794-10.....Standard Test Method for Adhesion-In-Peel of
Elastomeric Joint Sealants.
- C1193-13.....Guide for Use of Joint Sealants

- C1363-11.....Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
- C1521-13.....Practice for Evaluating Adhesion of Installed Weatherproofing
- D1037-12.....Evaluating the Properties of Wood-Base Fibers and Particle Panel Materials
- E84-14.....Surface Burning Characteristics of Building Materials
- E330/E330M-14.....Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- E331-00(R2009).....Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference
- E413-10.....Classification for Rating Sound Insulation
- E783-02(R2010).....Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
- E1105-00(R2008).....Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors By Uniform or Cyclic Static Air Pressure Differences
- E. American Welding Society, Inc. (AWS):
D1.2/D.1.2M-06(R2014)..Structural Welding Code-Aluminum
- F. Military Specifications (MIL):
MIL-C-18480.....(Rev. B) Coating Compound, Bituminous Solvent, Coal Tar Base
- G. National Association of Architectural Metal Manufacturers (NAAMM):
500 Series (2006).....Metal Finishes Manual
- H. Steel Structures Painting Council (SSPC)
Paint 25-97 (2004).....Red Iron Oxide Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)
- I. U.S. Veterans Administration:
Physical Security Design Manual for VA Facilities (VAPSDG); Life Safety Protected
Physical Security Design Manual for VA Facilities (VAPSDG); Mission Critical Facilities

Architectural Design Manual for VA Facilities (VASDM)

J. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products

1.8 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their glazed aluminum curtain wall system for a minimum of five (5) // // years from date of installation and final acceptance by the Government.
Submit manufacturer warranty.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION:

- A. Design Requirements:
 - 1. Curtain Wall System: // Tubular aluminum sections // // Tubular aluminum sections with thermal break condition // // self-supporting // // supplementary support // framing, factory prefinished, vision glass, // glass // // insulated metal panel // // spandrel infill, // // and louvers // ; related flashings, anchorage and attachment devices.
 - 2. System Assembly: // Site assembled. // // Shop unitized assembly. //
 - 3. Maximum wall framing member deflection, in a direction normal to plane of wall: 1/175 of its clear span or 20 mm (3/4 inch), whichever is less, when designed in accordance with requirements of AAMA TIR A11 and tested in accordance with ASTM E330/E330M.
 - 4. Maximum wall framing member deflection when a // plastered // // gypsum wallboard // surface is affected: 1/360 of span.
 - 5. Maximum Framing Member Permanent Deformation: 0.2 percent of its clear span when tested in accordance with ASTM E330/E330M for a minimum test period of 10 seconds at 1.5 times design wind pressures indicated as part of structural drawing wind load requirements.
- B. No glass breakage, or damage to fasteners, hardware or accessories is permitted due to deformation design requirements indicated.
 - a. Provide system complete with framing, mullions, trim, fasteners, anchors, accessories, concealed auxiliary members, and

attachment devices for securing wall to structure as specified or indicated. Unless noted otherwise, comply with AAMA MCWM-1.

- b. Obtain all components of curtain wall system, including framing // spandrel panels // // venting windows // // entrances // from single manufacturer.
 - c. Fully coordinate system accessories directly incorporated and adjacent to contiguous related work and ensure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified. Coordinate continuity with adjacent thermal, weather, air and vapor barriers.
 - d. Provide system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from -18 degrees C to 49 degrees C (0 degrees F to 120 degrees F).
 - e. Provide wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified.
- C. Calculations: Submit professionally prepared calculations to indicate how design requirements for structural loading, thermal, and other performance criteria have been satisfied.

2.2 PERFORMANCE REQUIREMENTS:

- A. Delegated Design: Engage a qualified Professional Engineer, to design glazed aluminum curtain walls.
- B. Conform with system performance requirements specified.
- C. Provide curtain wall components tested in accordance with requirements below and meeting performance requirements specified:

SPEC WRITER NOTE: Edit seismic code and wind loads requirements required by project location.

- 1. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall // as calculated in accordance with code.// // as calculated in accordance with ASCE 7. // to a design pressure of // // kPa, (// // lb./sq. ft.) // as measured in accordance with ASTM E330/E330M. //

2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with // // code. Provide with the following tolerances.
 - a. Phase I: 3 stroke cycles using .005 x the story height - no damage or failure.
 - b. Phase II: 3 stroke cycles using .010 x the story height - no damage or failure.
3. Water Penetration:
 - a. No water penetration is to occur when wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of inward acting design wind pressure as indicated on structural drawings, but not less than 479 Pa (10 psf).
 - b. Make provision in wall construction for adequate drainage to outside of water leakage or condensation that occurs within outer face of wall. Leave drainage and weep openings in members and wall open during test.
4. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783.
 - a. Static-Air-Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
 - b. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq. ft.) of surface maximum.

SPEC WRITER NOTE: Indicate design of entire system to withstand wind and concentrated loads as indicated on structural drawings.

5. Deflections Test: ASTM E330/E330M, Procedure B:
 - a. No member is to deflect in a direction parallel to plane of wall, when carrying its full design load, more than an amount which will reduce edge cover or glass bite below 75 percent of design dimension. No member after deflection under full design load, is to have a clearance between itself and top of panel, glass, sash, or other part immediately below it less than 3 mm (1/8 inch); clearance between member and an operable window or door is to be minimum 1.5 mm (1/16 inch).
 - b. //Window Within Curtain Wall Tests:
 - 1) Windows are to meet the requirements specified in Section 08 51 13, ALUMINUM WINDOWS // or // Section 08 51 13.11,

SIDE-HINGED ALUMINUM WINDOWS //, except where requirements of this section differ, this section is to govern.

2) Windows are to meet same requirements for deflection and structural adequacy as specified for framing members when tested in accordance with ASTM E330/E330M except permanent deformation is not to exceed 0.4 percent; there is to be no glass breakage, and no permanent damage to fasteners, anchors, hardware, or operating devices.

3) Windows are to have no water penetration when tested in accordance with requirements of ASTM E331. //

6. Delamination Test:

a. Adhesively bonded metal-faced // // panels are to show no evidence of delamination, warpage or other deterioration or damage when subjected to the six "Accelerated Aging Cycles" specified in ASTM D1037.

7. //Thermal Conductance Tests: ASTM C1363.

a. The thermal transmittance of opaque panels are not to exceed a U-value, Btu/hr./sq. ft./ degree F, as required and indicated on construction documents for exterior wall system, when tested in accordance with ASTM C1363. Average calculated thermal transmittance of complete wall assembly including panels, windows, and all other components are not to exceed a U-value of // //

8. // Sound Attenuation Through Wall System (Exterior to Interior):

a. STC // 50 // // // , measured in accordance with ASTM E413. //

SPEC WRITER NOTE: Determine the Facility Type as listed in the Physical Security Design Manual for VA Facilities, Mission Critical or Life Safety Protected Facilities.

9. // Physical Security Life Safety Protected Facilities:

a. Provide glazed aluminum curtain walls designed to meet or exceed the design and construction standards as provided in the Physical Security Design Manual for VA Facilities: Life Safety Protected.

1) Blast Resistance: Design level threat (W1) located at the standoff distance, but not greater than GP1. //

10. // Physical Security Mission Critical Facilities:

- a. Provide glazed aluminum curtain walls designed to meet or exceed the design and construction standards as provided in the Physical Security Design Manual for VA Facilities: Mission Critical Facilities.
 - 1) Blast Resistance: Design level vehicle threat (W2) located at the standoff distance, but not greater than GP2. //
- 11. // Behavioral Health Interior Access Windows: Provide interior access windows designed to meet the 2711 Newton meters (Nm) (2000 ft-lb.) simulated human impact test in accordance with AAMA 501.8-14. //

2.3 MATERIALS:

- A. Extruded Aluminum Framing Members: ASTM B221M (B221); 6063-T5 extruded aluminum for non-structural components or 6063-T6 extruded aluminum for structural members; temper and alloy as recommended by manufacturer.
- B. Sheet Aluminum: ASTM B209M (B209); 6065-T5 temper and alloy as recommended by manufacturer.
 - 1. Formed flashing and closures: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
 - 2. Extruded sill members: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
- C. Steel Sections: ASTM A36/A36M.
- D. Primer: TS TT-P-645; red, for shop application and field touch-up.
- E. Fasteners:
 - 1. For Exterior Cap Retainers: ASTM A193/A193M B8 300 series, stainless steel screws.
 - 2. For Framework Connections: ASTM B211M (B211) 2024-T4 aluminum, ASTM A193/A193M B8 300 series, stainless steel, and ASTM B316 aluminum rivets, as required by connection.
 - 3. For Anchoring Glazed Aluminum Curtain Wall to Support Structure: ASTM A307 zinc plated steel fasteners.
- F. Shims: Metal or plastic.
- G. Joint Sealants and Accessories:
 - 1. In accordance with requirements specified in Section 07 92 00, JOINT SEALANTS.
 - 2. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.

3. Non-structural Flush Glazed Joints and Weather Seal Joints:
Silicone sealants applied in accordance with manufacturer's recommendations.
 4. //Sealants used inside the weatherproofing system are to have a VOC content of //250// // // g/L or less when calculated according to 40 CFR 59, (EPA Method 24).//
 5. //Structural silicone sealant performance requirements: ASTM C920.
 - a. Hardness: Type A, 30 durometer.
 - b. Ultimate Tensile Strength: 1172 kPa (170 psi).
 - c. Tensile at 150% Elongation (of original bench mark distance):
55 kPa (80 psi).
 - d. Joint Movement Capability after 14 Day Cure: +/- 50%.
 - e. Peel Strength Aluminum, After 21 Day Cure: 599 g/mm
(34 pounds per inch). //
 6. //Structural silicone is not be used to support dead weight of vertical glass or panels. //
 7. Comply with recommendations of sealant manufacturer for specific sealant selections.
 8. Provide only sealants that have been tested per ASTM C794 to exhibit adequate adhesion to samples of glass and metal equivalent to those required for project.
 9. Exposed Metal to Metal Joints: Silicone sealant selected from manufacturer's standard colors.
- H. Glazing Materials:
1. As specified under Section 08 80 00, GLAZING.
 2. Glazing Gaskets:
 - a. Exterior: Continuous EPDM gaskets at each glass and spandrel panel.
 - b. Interior: Continuous, closed cell PVC foam sealant tape, sealed at corners.
 3. Glass Sizes and Clearances:
 - a. Accommodate up to // 25 mm (1 inch) // // //glazing.
 - b. Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip glass to remove flares or to reduce oversized dimensions. All cutting is to occur in factory.

4. Glass Setting Materials:

- a. Provide head bead and drive wedge required for glass installation to suit curtain wall system in accordance with manufacture's recommendations.

I. //Louvers:

1. As specified under Section 08 90 00, LOUVERS AND VENTS.//

J. //Louver Screening:

1. As specified under Section 08 90 00, LOUVERS AND VENTS.

K. //Column Covers Exterior and Interior Surfaces: // // mm

- (// // inch) thick prefinished aluminum, // // full contact pressure bonded to // // ensuring flat surface, // // finish as selected. // to match curtain wall mullion sections. // //

L. Firestopping: Refer to Section 07 84 00, FIRESTOPPING for requirements.

2.4 FABRICATION:

- A. Curtain wall components are to be of materials and thickness indicated in construction documents. Details indicated are representative of required design and profiles. Maintain sightlines. Unless specifically indicated or specified otherwise, methods of fabrication and assembly are to be at discretion of curtain wall manufacturer. Perform fitting and assembling of components in shop to maximum extent practicable. Anchorage devices are to permit adjustment in three directions. No exposed fasteners are permitted.
- B. Joints: Joints exceeding +1.5 mm (+1/16") are to be mechanically fastened.
- C. Ventilation and Drainage: Direct water leakage to exterior by means of concealed drainage system and weeps. Flashings and other materials used internally are to be nonstaining, noncorrosive, and nonbleeding.
- D. Protection and Treatment of Metals:
1. Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving shop.
 2. Provide protection against galvanic action wherever dissimilar metals are in contact, except in case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint conforming to MIL-C-18480 or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.

- E. Metal sills and Closures: Fabricate accessories, spandrel panels, trim closures of sizes and shapes indicated from similar materials and finish as specified for wall system.
- F. //Concealed Interior Mullion Reinforcing: ASTM A36/A36M steel shapes as required for strength and mullion size limitations, hot dip galvanized after fabrication in accordance with ASTM A123/A123M. //
- G. //Metal Spandrel Panels: Manufacturer's standard laminated aluminum-faced panels of thickness indicated, flat with no deviations in plane exceeding 1.5 mm in 610 mm (1/16 inch in 24 inches) or 3 mm (1/8 inch) over entire panel. Provide with edge flanges:
1. Face Sheets: 0.6 mm (0.024-inch) minimum thickness finished to match system framing.
 - a. Texture: // Smooth // // Embossed // .
 2. Concealed Back Sheets: Aluminum or galvanized steel in manufacturer's standard thickness.

SPEC WRITER NOTES:

1. Select proper stabilizer-sheet type if required for project.
2. Cement board stabilizer sheets in 3 mm (0.125 inch) and 4 mm (0.157) inch thicknesses are also available. Cement board not susceptible to moisture but is very brittle and possibly more expensive.
3. Contact panel manufacturer for design assistance before inserting cement board requirements.
4. Delete items not applicable for use and renumber paragraphs.

H. //Stabilizer Sheets:

1. //3 mm (1/8 inch) thick tempered hardboard. //
2. //13 mm (1/2 inch) thick gypsum board. //

SPEC WRITER NOTES:

1. Select stabilizer-sheet type below if fire resistant panels are required for project. Verify requirements of Authorities Having Jurisdiction.
2. Delete items not applicable for use and renumber paragraphs.

3. //Gypsum board at inner face and hardboard at outer face as required to provide surface burning characteristics when tested according to ASTM E84 as follows:

SPEC WRITER NOTES:

1. Provide actual values required for panel ratings required for project. Verify requirements with Authorities Having Jurisdiction.
2. Delete items not applicable for use and renumber paragraphs.

- a. Flame Spread: // //.
- b. Smoke Developed: // //.

SPEC WRITER NOTES:

1. Select proper core type required for project based on R-Value required for wall system or design type requirements. R-Values indicated are examples only.
2. Authorities Having Jurisdiction may restrict insulation materials based on fire performance characteristics. Verify requirements with Authorities Having Jurisdiction.
3. Delete items not applicable for use and renumber paragraphs.

I. //Panel Core Material:

1. //Rigid, closed-cell, polyisocyanurate thermal insulation: R-Value:
// R11 // // R19 // . //
2. //Extruded-polystyrene thermal insulation complying with ASTM C578, Type IV requirements: R-Value: // R11 // // R19 // // R // . //
3. //Rigid, glass-fiberboard thermal insulation complying with ASTM C612 requirements and with 96-kg/cu. m (6-lb./cu. ft.) nominal density and R-Value: // R11 // // R19 // // R //.
4. //Edge Configuration: // Sealed. // // Vented to the exterior.// //

2.5 METAL FINISHES:

- A. In accordance with NAAMM AMP500 series.
- B. //Anodized Aluminum: //
 1. //AA-C22A41 Chemically etched medium matte, with clear anodic coating, Class 1 Architectural, 0.7-mil thick (min.). //
 2. //AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class 1 Architectural, 0.7-mil thick finish. Dyes will not be accepted. //
 - a. // Light // // Medium // // Dark // bronze.
 - b. // Black. //
- C. //High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.//

1. // Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than // 50 // // 70 // percent PVDF resin by weight in color coat. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES. //
2. // Three // // Four // -coat fluoropolymer finish complying with AAMA 2605 and containing not less than // 50 // // 70 // percent PVDF resin by weight in both color coat and clear topcoat. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES. //

SPEC WRITER NOTE:

1. Select one of following paragraphs for primer type required. Select a primer compatible with finish material.
2. For high performance finish, careful selection of primer is required.
3. Consult with manufacturer for recommendation of proper primer to be used.

- D. //Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide. // // . //
- E. //Touch-Up Primer for galvanized Steel Surfaces: SSPC Paint 20 zinc rich. // // . //
- F. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to // 610 gm/sq. m (2.0 oz./sq. ft. // // // gm/ sq. m (// // oz./sq. ft.). Primed with iron oxide paint.
- G. Apply one (1) coat // coats // of bituminous paint to concealed aluminum // and steel // surfaces one (1) // // coat(s) in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION**3.1 EXAMINATION:**

- A. Prior to installation of glazed curtain wall system, arrange for representative(s) of manufacturer to examine structure and substrate to determine that they are properly prepared, and ready to receive glazed curtain wall work included herein.
- B. Verifying Conditions and Adjacent Surfaces: After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in building frame.

3.2 PREPARATION:

- A. Take field dimensions and examine condition of substrates, supports, and other conditions under which work of this section is to be performed to verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Contact between aluminum and dissimilar metals are to receive a protective coating of bituminous paint for prevention of electrolytic action and corrosion.

3.3 INSTALLATION:

- A. Install and erect glazed curtain wall system and all components in accordance with written directions of curtain wall manufacturer. Match profiles, sizes, and spacing indicated on approved shop drawings.
- B. Bench Marks and Reference Points: Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of marks, stop erection work in that area until discrepancies have been corrected.
- C. Ensure that drainage system operates properly in accord with AAMA 501 procedures.
- D. Do not proceed with structural silicone work when metal temperature is below 0 degrees C (32 degrees F).
- E. Isolate between aluminum and dissimilar metals with protective coating or plastic strip to prevent electrolytic corrosion.
- F. Install glazed aluminum curtain wall system so as to maintain a virtually flat face cap, with no visible bowing.
- G. Install entire system so that fasteners are not visible.
- H. Tolerances:
 - 1. Maximum variation from plane or location shown on approved shop drawings: 3 mm per 3657 mm (1/8 inch per 12 feet) of length up to not more than 13 mm (1/2 inch) in any total length.
 - 2. Maximum offset from true alignment between two (2) identical members abutting end to end in line: 0.8 mm (1/32 inch).
 - 3. Sealant Space Between Curtain Wall Mullion and Adjacent Construction: Maximum of 19 mm (3/4 inch) and minimum of 6 mm (1/4 inch).

SPEC WRITER NOTE: Delete following paragraph on windows if not part of curtain wall system.

I. //Windows:

1. Refer to // Section 08 51 13, ALUMINUM WINDOWS // and/or // Section 08 51 13.11, SIDE-HINGED ALUMINUM WINDOWS // for window requirements.
2. //Install windows in accordance with details indicated and approved shop drawing detail drawings. //
3. //Seal exterior metal to metal joints between members of windows, frames, mullions, and mullion covers in accordance with requirements of Section 07 92 00, JOINT SEALANTS. Remove excess sealant. //
4. //After installing and glazing windows, adjust ventilators and hardware to operate smoothly and to be weathertight when ventilators are closed and locked. Lubricate hardware and moving parts. //
5. //Install to make weathertight contact with frames when ventilators are closed and locked. Do not cause binding of sash or prevent closing and locking of ventilator. //
 - a. //Provide for ventilating sections of all windows to ensure a weather-tight seal meeting infiltration tests specified. Use easily replaceable factory-applied weather-stripping of manufacturer's stock type. // //

SPEC WRITER NOTE: Delete following paragraphs if sealant installation is not part of curtain wall work.

J. //Joint Sealants:

1. Joint Sealants: Are to be in accordance with requirements of Section 07 92 00, JOINT SEALANTS.
2. Surfaces to be primed and sealed are to be clean, dry to touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions are to conform to approved detail drawings with a tolerance of plus 3 mm (1/8 inch). Do not apply compound unless ambient temperature is between 5 and 35 degrees C (40 and 90 degrees F). Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings are to be of type that leave no residue on metals.

3. Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound is to be uniformly smooth and free of wrinkles and, unless indicated otherwise, is to be tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four (4) hours, but at no time is this amount exceed 19 liters (5 gallons).
4. Apply primer to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after sealant work is completed.
5. Tightly pack backing in bottom of joints which are over 13 mm (1/2 inch) in depth with specified backing material to depth indicated in construction documents. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.
6. Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.
7. Remove compound smears from surfaces of materials adjacent to sealed joints as work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with solvent approved by sealant and curtain wall manufacturers. Upon completion of sealing, remove remaining smears, stains, and other soiling, and leave work in clean neat condition.//

K. Glass:

1. Refer to Section 0880 00, GLAZING, and drawings for glass types. Install in accordance with manufacturer's recommendations as modified herein.
2. Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.
3. Clean sealing surfaces at perimeter of glass and sealing surfaces of rebates and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets.

4. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer and by curtain wall manufacturer.
5. Provide sashes designed for outside glazing.
6. Provide continuous snap in glazing beads to suit glass as specified.
7. Insulating and tempered glass, and glass of other types that exceed 2540 mm (100 united inches) in size: Provide void space at head and jamb to allow glass to expand or move without exuding sealant. Provide perimeter frames and ventilator sections with glazing rebates for unobstructed glazing surface 19 mm (3/4 inch) in height. Glazing rebate surfaces must be sloped to shed water.
8. Provide adequate means to weep incidental water and condensation away from sealed edges of insulated glass units and out of wall system. Provide weeping of lock-strip gaskets in accordance with recommendation of glass manufacturer.

L. Metal Copings:

1. Refer to Section 07 60 00, FLASHING AND SHEET METAL for requirements of metal copings when they are not a part of glazed curtain wall system work.
2. Coordinate curtain wall installation with metal coping detail on construction documents. Provide watertight seal to meet criteria set forth in this section regarding air and water penetration.

SPEC WRITER NOTE: Delete the following article if no operating components such as windows and doors are part of curtain wall assembly.

3.4 //ADJUSTING:

- A. //Adjust // windows // // doors // // revolving doors // to provide a tight fit at contact points and operate easily. //
- B. //Adjust weather-stripping to make even contact with surfaces. //
- C. //Adjust operating hardware and moving parts. // //

3.5 CLEANING:

- A. Install curtain wall frame and associated metal to avoid soiling or smudging finish.
- B. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.
- C. Remove excess glazing and sealant compounds, dirt, and other substances.

- D. Follow recommendations of manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.
- E. Replace cracked, broken, and defective glass with new glass at no additional cost to Government. Just prior to final acceptance of curtain wall system clean glass surfaces on both sides, remove labels, paint spots, compounds, and other defacements, and clean metal fixed panels. Remove and replace components that cannot be cleaned successfully.

3.6 FIELD QUALITY CONTROL:

- A. Testing Agency: Engage an AAMA accredited commercial qualified independent testing and inspecting agency to perform field quality-control tests specified, and to prepare test reports: Submit information regarding testing laboratory's facilities and qualifications of technical personnel to COR for approval.
- B. Conduct field check test for water leakage on designated wall areas after erection to comply with AAMA MCWM-1. Conduct test on two (2) wall areas, two (2) bays wide by two (2) stories high where directed. Conduct test and take necessary remedial action as directed by COR.
- C. Test Specimen:
 - 1. Test specimen is to include curtain wall assembly and construction. Test chamber is to be affixed to exterior side of test specimen and test is to be conducted using positive static air pressure.
 - 2. Test specimens are to be selected by COR after curtain wall system has been installed in accordance with construction documents.
- D. Sealant Adhesion Tests: Test installed sealant, in presence of sealant manufacturer's field representative, in a minimum of two (2) areas and as follows:
 - 1. //Test structural silicone sealant according to field adhesion test method described in AAMA CW 13.//
 - 2. Test weatherseal sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
- E. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783 and to values indicated below, whichever is more stringent.
 - 1. Field air leakage testing is not required for continuous curtain wall systems.

2. Static-Air-Pressure Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
 3. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq. ft.) of surface maximum.
- F. Water Penetration: Test glazed aluminum curtain wall system for compliance with requirements according to AAMA 503, which requires testing according to ASTM E1105.
1. Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 479 Pa (10 psf). No uncontrolled water is to be present.
- G. Retesting:
1. Should system fail field test, system may be modified or repaired, and retested.
 2. Should system fail second field test, system may be additionally modified or repaired, and retested.
 3. All modifications and repairs made to tested areas are to be recorded, and same modifications and repairs made to all system and adjacent construction on project.
 4. Should second test fail, COR may require testing of additional areas of the curtain wall.
- H. Rejection:
1. Failure of any of specimens to meet test requirements of third test is cause for rejection of wall system and adjacent construction on project.

SPEC WRITER NOTE:

The following Article may not be required if no operating components such as window and door units are included in curtain wall system.

3.7 //DEMONSTRATION, TESTING, AND ACCEPTANCE:

- A. //Instruct Government's personnel in proper operation and maintenance of // windows // // revolving entrance door equipment // or // horizontal sliding entrance door equipment //. Train personnel in procedures to follow in event of operational failures or malfunctions. //
- B. //Acceptance: At completion of project, and as a condition of acceptance, // revolving entrance door equipment // or // horizontal sliding entrance door equipment // and systems are to be operated for a period of fifteen (15) consecutive calendar days without breakdown. //

3.8 PROTECTION:

- A. After installation, protect windows, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods are to be in accordance with recommendations of product manufacturers or of respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or respective trade association.

- - - END - - -