

SECTION 08920
GLAZED ALUMINUM CURTAIN WALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following: Glazed aluminum curtain wall.
- B. Primary components of the glazed window wall system include:
 - 1. Aluminum curtain wall framing system.
 - 2. Fixed aluminum window system.
 - 3. Insulated spandrel panels.
 - 4. Custom fabricated copings.
 - 5. Custom fabricated aluminum panels.
 - 6. Flexible flashing: Self adhering sheet membrane underlayment
 - 7. Glass.
 - 8. Glazing gaskets.
 - 9. Anchors, shims, fasteners, inserts, accessories, and support brackets.
- C. Related Sections:
 - 1. Division 8 Section "Exterior Wall Systems - General", for requirements for exterior wall components.

1.3 SYSTEM DESCRIPTION

- A. The contractor is responsible for the engineering and design of all components and materials, as well as the installation of the Aluminum Curtain Wall System.
- B. The glazed aluminum curtain wall system shall be designed to interface with the structure.
- C. Aluminum system: Major components consist of aluminum vertical exterior mullions, horizontal rails, aluminum spandrel panels, custom aluminum cladding and trim members, and glazed spandrel and vision glass.
- D. Provide glazed aluminum curtain wall system that has the following capabilities based on testing manufacturer's standard units in assemblies similar to those indicated for this Project:
 - 1. Withstands loads and thermal and structural movement requirements indicated without failure. Failure includes the following:
 - a. Air infiltration and water penetration exceeding specified limits.
 - b. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
 - 2. Glazing is physically and thermally isolated from framing members.
 - 3. System is reglazable from the interior, except spandrel glazing or panels are reglazable from the exterior.

1.4 SYSTEM PERFORMANCE

- A. Wind Load Design Pressure: Provide glazed aluminum curtain wall system, including anchorage, capable of withstanding wind load design pressure of 40 psf acting inward and outward, normal to the plane of the wall.
 - 1. Deflection of framing members in a direction normal to wall plane is limited to the following:
 - a. Spans up to 14': L/175.
 - b. Spans greater than 14': L/240 + 1/4 inch.

- c. Spans for individual glass lights: L/175 or 3/4" whichever is less.
 2. Structural Test Performance: Provide glazed aluminum curtain wall system that does not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Structural Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration for Deflection Testing: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
- B. Dead Loads: Provide glazed aluminum curtain wall system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of fixed panels, glazing, or other fixed part immediately below. Provide a minimum 1/16-inch (1.59-mm) clearance between members and operable windows and doors.
- C. Live Loads: Provide glazed aluminum curtain wall system, including anchorage, that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- D. Air Infiltration: Provide glazed aluminum curtain wall system with permanent resistance to air leakage through system of not more than 0.10 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft.
- E. Water Penetration: Provide glazed aluminum curtain wall system that does not evidence water leakage when tested according to ASTM E 331 as follows.
 1. Pressure Glazed Curtainwall: Minimum differential pressure of 10 lbf/sq. ft.
- F. Thermal Movements: Provide glazed aluminum curtain wall system, including anchorage, that accommodates thermal movements of system and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.
 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- G. Structural Support Movement: Provide glazed aluminum curtain wall system that accommodates structural movements including, but not limited to, sway, twist, column shortening, long-term creep, and deflection.
- H. Condensation Resistance: Provide glazed aluminum curtain wall system with condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.1.
- I. Average Thermal Conductance: Provide glazed aluminum curtain wall system with an average U-value of not more than 0.65 Btu/sq. ft. x h x deg F (3.75 W/sq. m x K) when tested according to AAMA 1503.1.
- J. Dimensional Tolerances: Provide glazed aluminum curtain wall system, including anchorage, that accommodates dimensional tolerances of building frame and other adjacent construction.

1.5 SUBMITTALS

- A. Product Data for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings showing fabrication and installation of glazed aluminum curtain wall system including plans, elevations, sections, details of components, and attachments to other units of Work.
 1. For installed products indicated to comply with design loadings, include structural analysis data signed and sealed by the qualified structural engineer responsible for their preparation.

- C. Samples for verification of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- D. Product test reports from a qualified independent testing agency evidencing compliance of glazed aluminum curtain wall system with requirements based on comprehensive testing of manufacturer's current system.
- E. Field test reports from a qualified independent inspecting and testing agency indicating and interpreting test results relative to compliance with performance requirements of glazed aluminum curtain wall system.

1.6 QUALITY ASSURANCE

- A. **Engineer Qualifications:** A structural engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of glazed aluminum curtain wall systems that are similar to those indicated for this Project in material, design, and extent.
- B. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing glazed aluminum curtain wall systems similar to those required for this Project and who is acceptable to manufacturer.
- C. **Source Limitations:** Obtain each type of glazed aluminum curtain wall system from one source and by a single manufacturer.
- D. **Product Options:** Drawings indicate size, profiles, and dimensional requirements of glazed aluminum curtain wall system and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to CM for review.
- E. **Testing:** Provide laboratory mock-up of glazed curtain wall for testing, unless manufacturer's curtain wall system has been previously tested within 4 years, and testing procedures and results are acceptable to the CM, at the CM's sole discretion.
- F. **Welding Standards:** Comply with applicable provisions of AWS D1.2, "Structural Welding Code-Aluminum."
 - 1. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.
- G. **Mockups:** Prior to installing glazed aluminum curtain wall system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by CM.
 - 2. Notify CM 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain CM's approval of mockups before start of Work.
 - 5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 WARRANTY

- A. Special Warranty: Submit a written warranty executed by the curtainwall manufacturer agreeing to repair or replace components of a glazed aluminum curtain wall system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including, but not limited to, excessive deflection.
 - 2. Noise or vibration caused by thermal movements.
 - 3. Failure of system to meet performance requirements.
 - 4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 5. Failure of operating components to function normally.
 - 6. Water leakage.
 - 7. Glazing breakage.
- B. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal:
 - 1. EFCO Corporation.
 - 2. Kawneer Company, Inc.
 - 3. Vistawall Architectural Products.
 - 4. Wausau Metals Corporation.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
- B. Aluminum Extrusions Thickness: not less than 0.125 inch for main frame members, including horizontals and mullions and 0.062 inch thick for glazing and snap on cover members.

2.3 STEEL REINFORCEMENT

- A. Structural Steel Shapes, Plates, and Bars: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500, Grade B, minimum.
- C. Electrodes for Welding: Comply with AWS Code.
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- E. Minimum thickness: Steel reinforcement and steel supports shall be not less than required for loads, but not less than 3/16".

- F. Surface Preparation for Painting: Clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows: SP-6 "Commercial Blast Cleaning."
- G. Steel Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 6-10 mils total thickness. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Concealed Surfaces: Subject to compliance with requirements, provide one of the following:
 - a. Series 65 High-Build Epoxoline; Tnemec, Inc. 2.0-3.0 mil dft
 - b. Carboline 888; Carboline Inc. 2.0-3.0 mil dft
- H. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; in hardness recommended by manufacturer.
- I. Framing system gaskets and joint fillers as recommended by manufacturer for joint type.
- J. Sealants and joint fillers for joints within glazed aluminum curtain wall system as specified in Division 7 Section "Joint Sealants."
- K. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.4 ALUMINUM TRIM

- A. Sheet Aluminum Coping and Trim Members: Fabricate from single thickness sheet with concealed stiffeners as necessary to meet performance requirements. Select sheets for surface flatness, smoothness, and freedom from blemishes.
 - 1. Aluminum coping, trim, and closures shall be watertight to prevent water from entering into internal space and shall be designed to divert water entering into the system to the exterior by gutters, flashing and weeps.
 - 2. Provide concealed splice plates to splice joints between members. Fabricate units in as long lengths as possible; locate joints where indicated on drawings.
 - 3. Thickness: not less than 0.125 inch for main coping and trim members.

2.5 CUSTOM ALUMINUM CLADDING PANELS

- A. Sheet Aluminum Cladding Panels: Fabricate from single thickness aluminum sheet with concealed plywood backer panels and waterproof underlayment. Select sheets for surface flatness, smoothness, and freedom from blemishes.
 - 1. Aluminum cladding panels shall be watertight to prevent water from entering into internal space and shall be designed to divert water entering into the system to the exterior by gutters, flashing and weeps.
 - 2. Provide concealed splice plates to splice joints between members. Fabricate units in as long lengths as possible; locate joints where indicated on drawings.
 - 3. Thickness: Sheet metal not less than 0.125 inch for main cladding members.
- B. Concealed Plywood: Exposure 1 sheathing, span rating to suit application, and thickness as indicated but not less than 1/2 inch.
 - 1. Preservative Treatment by Pressure Process: AWPA C9 (plywood)

2.6 COMPONENTS

- A. Brackets and Reinforcements: Provide manufacturer's standard high-strength aluminum brackets and reinforcements. Provide nonstaining, nonferrous shims for aligning system components.

- B. Insulated Spandrel Panels: Manufacturer's standard laminated aluminum-faced panels of thickness indicated, flat with no deviations in plane exceeding 1/16 inch in 24 inches or 1/8 inch over entire panel.
 - 1. Face Sheets: 0.024-inch minimum thickness finished to match system framing.
 - a. Texture: Smooth.
 - 2. Concealed Back Sheets: Aluminum or galvanized steel in manufacturer's standard thickness.
 - 3. Stabilizer Sheets: 1/8-inch- thick tempered hardboard.
 - 4. Core: 3/4-inch honeycomb-type cells perpendicular to panel faces made of 90-lb kraft paper with 11 percent phenolic-resin content.
 - 5. Edge Configuration: Sealed.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Finish exposed portions to match glazed aluminum curtain wall.
 - 1. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.
 - 2. Where fasteners anchor into aluminum less than 0.125 inch (3.2 mm) thick, provide reinforcement to receive fastener threads.
- D. Anchors: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.
- E. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, of type selected by manufacturer for compatibility with system.

2.7 FABRICATION

- A. Fabricate glazed aluminum curtain wall system according to Shop Drawings. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- E. Thermally Improved Construction: Fabricate aluminum framing 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 three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
- F. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- G. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
- H. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by

manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- I. Frame Units: Factory assemble frame units according to Shop Drawings to greatest extent possible. Rigidly secure non-movement joints. Seal joints watertight, unless otherwise indicated. Assemble components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
 1. Install glazing according to Shop Drawings. Comply with requirements of Division 8 Section "Glazing".

2.8 ALUMINUM FINISH

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half 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.
- B. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes. Finish designations beginning "AA" are those of the Aluminum Association.
- C. High Performance Organic Coating: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
 1. Fluorocarbon 2-Coat Coating System: Manufacturer's standard 2-coat thermo-cured system, composed of specially formulated inhibitive primer and fluorocarbon color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; comply with AAMA 2605.
 2. Color and Gloss: Color to match Architect's sample.

2.9 STEEL PRIMING

- A. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- B. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of glazed aluminum curtain wall system. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to CM have been made.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight, unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.
- D. Install framing members plumb and true in alignment with established lines and grades.
- E. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.
 - 1. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- G. Install glazing according to Shop Drawings. Comply with requirements of Division 8 Section "Glazing,".
- H. Install sealant according to Shop Drawings. Comply with requirements of Division 7 Section "Joint Sealants".
- I. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm); where a reveal or protruding element separates aligned surfaces by less than 2 inches (50.8 mm), limit offset to 1/2 inch (12.7 mm).
 - 4. Location: Limit variation from plane or location shown on Shop Drawings to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform testing indicated.
- B. Water Spray Field Check: After completing the installation of aluminum curtain wall system, test system for water penetration according to AAMA 501.2 in a 2-bay area directed by CM.
- C. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure glazed aluminum curtain wall system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08920