

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Glazed aluminum curtain walls and accessories.
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealants" for joint sealants installed as part of glazed aluminum curtain wall system.
 - 2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for aluminum doors and no-line venting units installed in curtain wall systems, and for aluminum-framed entrances and storefronts.
 - 3. Division 8 Section "General Glazing" for insulated glass assemblies to be installed in glazed aluminum curtain walls.

1.3 SYSTEM DESCRIPTION

- A. General: Provide glazed aluminum curtain wall systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failures include the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Thermally Broken Construction: Provide glazed aluminum curtain wall systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.

1.4 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site in compliance with Division 1 Section "Project Meetings".

1.5 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Refer to Performance Requirements Article in Part 2 of this Section for requirements.
- C. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- D. Product Test Reports: For glazed aluminum curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency evidencing compliance with requirements.
- E. Shop Drawings: For glazed aluminum curtain wall systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work and the following:
 - 1. Layout and installation details, including anchors.
 - 2. Elevations at 1/4 inch = 1 foot, and window unit elevations at 3/4 inch = 1 foot scale.
 - 3. Full-size section details of typical composite members, including reinforcement and stiffeners.
 - 4. Details for flashing and drainage.
 - 5. Location of weep holes.
 - 6. Glazing details.
 - 7. Accessories.
- F. Cutaway Sample: For each type of vertical-to-horizontal framing intersection of systems made from minimum 6 inch lengths of full-size components, and showing details of the following:
 - 1. Joinery.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
 - 6. Structural sealant joints.

- G. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- H. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturers' written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- I. Qualification Data: For Installer.
- J. Source quality-control reports.
- K. Field quality-control reports.
- L. Sample Warranties: For special warranties.
- M. Maintenance Data: For glazed aluminum curtain wall systems to include in maintenance manuals.

1.6 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, registered in the state of the project, to design glazed aluminum curtain wall systems.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain wall systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain wall systems shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failures also include the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus ¼ inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, curtain wall assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, curtain wall assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity for relevant exposure category, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331, with no evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
 2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
 2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
- J. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg. F (using U_{cog}=0.29), as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.
- K. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
1. Sound Transmission Class: Not less than 32 for 1-inch insulated glazing and 36 for laminated glazing.
 2. Outdoor-Indoor Transmission Class: Not less than 27 for 1-inch insulated glazing and 30 for laminated glazing.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg. F, ambient; 180 deg. F, material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg. F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg. F.
 - c. Interior Ambient-Air Temperature: 75 deg F.

1.7 QUALITY ASSURANCE

- A. 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.
1. Engineering Responsibility: Prepare data for glazed aluminum curtain wall systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each component and each type of glazed aluminum curtain wall through one source from a single manufacturer. Manufacturer of curtain wall systems shall be the same as manufacturer of aluminum-framed storefront systems.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance

characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field-testing, or in-service performance.

1. Do not modify intended aesthetic effect, 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 Architect for review.
- D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.9 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace components that fail in materials or workmanship within the specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection.
 - b. Failure of system to meet specified performance requirements including water leakage, air infiltration or condensation.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Adhesive sealant failures.
 - f. Cohesive sealant failures.
 - g. Failure of operating components to function normally.
 - h. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: Two (2) years from date of Substantial Completion.

- C. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Ten (10) years from date of Substantial Completion.

1.10 MOCKUPS

- A. **Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. Mockup to be installed at location indicated on drawing of window frame system type AB.**
 - 1. **Mockup shall be a component of the comprehensive mockup specified in Division 4 Section "Unit Masonry (Assemblies)".**
- B. **Contractor to perform on site water test of finalized mockup window unit in accordance with AAMA 501.1-17 Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.**

ADDENDUM NO. 1

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Basis-of-Design Products are by YKK AP America, Inc. Subject to compliance with requirements, other manufacturers offer products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Kawneer North America.
 - 2. EFCO Corporation.
 - 3. Oldcastle Building Envelope (formerly Vistawall Architectural Products).
- B. Curtain Wall Framing Products:
 - 1. Thermally broken 2-1/2" x 7-1/2" curtain wall – YCW 750 OG.
 - a. Contractor, through the delegated design process, shall engineer all curtainwall framing systems and include internal steel reinforcing as required to meet specified design loads.
- C. Curtain Wall Framing Products:

1. Thermally broken 2-1/2" x 9" curtain wall – YCW 750 OG.
 - a. Contractor, through the delegated design process, shall engineer all curtainwall framing systems and include internal steel reinforcing as required to meet specified design loads.

D. Veneer Wall Framing Products:

1. Thermally broken 2-1/2" x 2 3/8" curtain wall – YCW Veneer Wall
 - a. Contractor, through the delegated design process, shall engineer all curtainwall framing systems and include internal steel reinforcing as required to meet specified design loads.
2. Thermally broken 2-1/2" x 6" curtain wall – YCW 750 OG.
 - a. Contractor, through the delegated design process, shall engineer all curtainwall framing systems and include internal steel reinforcing as required to meet specified design loads. – ADDENDUM NO. 1

2.2 COMPONENTS

- A. Framing Members: Manufacturer's extruded or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Front.
 4. Fabrication Method: Factory or field-fabricated shear block system.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- E. Materials:
 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standard indicated below:
 - a. Sheet and Plate: ASTM B209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
 - c. Extruded Structural Pipe and Tubes: ASTM B429.
 - d. Welding Rods and Bare Electrodes: AWS A5.10.

- e. Structural Profiles: ASTM B308.
 - f. Bars, Rods, and Wire: ASTM B211
- 2. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - 3. Steel Reinforcement:
 - a. Structural Shapes, Plates, and Bars: ASTM A36.
 - b. Cold-Rolled Sheet and Strip: ASTM A1008.
 - c. Hot-Rolled Sheet and Strip: ASTM A1011.

2.3 GLAZING

- A. Glazing and Glazing Sealants: Comply with Division 8 Section "General Glazing."
- B. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- C. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, non-migrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.
- D. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- E. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at manufacturer's option, provide compressible stripping for glazing and weatherstripping such a molded EPDM or neoprene gaskets complying with ASTM D2000 Designation 2C415 to 3BC620, or molded PVC gaskets complying with ASTM D2287, or molded expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.

2.4 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.

- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch 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 A123 or ASTM A153 requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials and of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.5 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. 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.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration with one of the following methods:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- F. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard shear-block system method.

- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 ALUMINUM FINISHES

- 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 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.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 - 1. Color: **Champagne**

2.7 STEEL PRIMING

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. 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.
- C. 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 the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing curtain wall systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
 - 1. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 2. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 3. Seal joints watertight unless otherwise indicated.
- 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 within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- E. Install glazing as specified in Division 8 Section "General Glazing." Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
- F. Install secondary-sealant weatherseal according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.
- G. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
 - 2. Variation from Level: Limit variation from level to 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.
 - 4. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.

- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
- c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

3.4 PROTECTION

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

END OF SECTION 084413