SECTION 084413 - GLAZED ALUMINUM STOREFRONT and CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDED - Section includes the following:

A. Conventionally Glazed Aluminum Curtain Walls installed as outside glazed, center tongue, shear blocked systems assemblies.(Basis of design): Kawneer Series 1600 or approved equal).

B. Conventionally Glazed Storefront Window System (Basis of design): Kawneer Trifab VG 415T or approved equal)

C. Sunshades designed as an integral part of the Outside Glazed Curtain Wall system and the storefront system.

D. Entrance doors as noted in the documents shall be designed as an integral part of the Curtain Wall system (Design Basis: Kawneer Wide Stile Entrance door or approved equal.)

E. Projected concealed vents shall be designed as an integral part of the Glazed Curtain Wall system.

F. Related Sections:

1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
2. Division 08 Section “Glazing”
3. Division 08 Section “Door Hardware”

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by preconstruction testing of manufacturer's standard glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes 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.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: 26 psf @ non-corner zones & 31 psf @ corner zones.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) 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 amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).

3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lb/sq. ft.

G. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft

1. Maximum Water Leakage: According to AAMA 501.1 under dynamic pressure equal to. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

H. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F , material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
3. Test Performance: 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.

I. Energy Performance:

1. Average Thermal Conductance: Provide glazed aluminum curtain wall systems with average U-factor of not more than 0.59 Btu/sq. ft. x h x deg f when tested according to AAMA 1503.
2. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
3. Condensation Resistance: Fixed glazing and framing areas shall have a condensation resistance of not less than 65 when tested according to AAMA 1503.

1.4 SUBMITTALS:

A. Substitutions: See section 016000 –Product Requirements and as follows:
   1. Sunshade –
      a. A proposal drawing showing full sizes details of all sunshade and curtain wall components including all anchors, sunshade supports, and building attachments.
      b. Engineering calculations documenting compliance with performance requirements.
   2. Entrance doors –
      a. A sample of door (size and configuration) as per requirements of the Architect.
      b. Test reports documenting compliance with performance requirements
   3. Projected Concealed Vents –
      a. A sample window, 36” (914 mm) x 24” (610 mm) single unit, as per requirements of the Architect.
      b. Test reports documenting compliance with performance requirements

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.

   3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.

      a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. 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.

H. Qualification Data: For qualified Installer.

I. Welding certificates.

J. Energy Performance Certificates:

K. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

L. Field quality-control reports.

M. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

N. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Installer Qualifications: Manufacturer reserves the right to review the installers past history with their curtain wall product and make a recommendation to the architect regarding the installers qualifications.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review 10 days prior to bid date.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

F. Energy Performance Standards: Comply with AAMA for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide AAMA-certified glazed aluminum curtain walls.

G. Pre-installation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: 2 years from date of Substantial Completion.

B. 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide all work related products by one single source manufacturer of the following:

B. Basis-of-Design Product for Aluminum and Glass Curtainwall: Subject to compliance with requirements, provide 1600 series - 2 ½" x 6" (Steel reinforcement by manufacturer as noted areas and as required for structural loads) as manufactured by Kawneer. Provide the named product or an approved equal product by one of the following:

1. Wausau Windows and Walls.
2. EFCO Corporation.

C. Basis-of-Design Product for Aluminum and Glass Storefront Windows: Subject to compliance with requirements, provide Trifab VG 415T System (Steel reinforcement by manufacturer as noted areas and as required for structural loads) with insect screens at operable panels and Roto Operators as manufactured by Kawneer. Provide the named product or an approved equal product by one of the following:

1. Wausau Windows and Walls.
2. EFCO Corporation.

D. Basis-of-Design Product for Sunshades: Subject to compliance with requirements, provide "Versoleil" System with airfoil profile blades and rectangular profile front fascia as manufactured by Kawneer. Provide 30" depth assemblies at Storefront Windows. Provide the named product or an approved equal product by one of the following:

1. Wausau Windows and Walls.
2. EFCO Corporation.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: 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.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 611.
3. Hot-Rolled Sheet and Strip: ASTM A 570/A570 M.

C. Exterior sunshade device:
1. Aluminum: Extruded aluminum shall be 6063-T6 alloy and temper.
2. Dissimilar Metals: All dissimilar metals must be properly insulated to prevent galvanic action
3. Fasteners: All exposed fasteners shall be aluminum, stainless steel, or zinc plate steel.

4. Anchors: Perimeter and floor line anchors shall be aluminum or steel. All steel anchors shall be properly insulated from the aluminum.

D. Wide Stile Entrance Door:
1. Aluminum: Extruded aluminum shall be 6063-T6 alloy and temper
2. Fasteners: All exposed fasteners shall be aluminum or stainless steel.

E. Projected Concealed Vents:
1. Aluminum: Extruded aluminum shall be 6063-T6 alloy and tempered
2. Hardware: RotoOperator (Kawneer – Basis of Design)

2.3 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally isolated.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding 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.
3. Use exposed fasteners with countersunk Phillips screw heads finished to match framing system.

D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) 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/A 123M or ASTM A 153/A 153M requirements.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing Sealants: Manufacturer's standard sealants.

2.4 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. 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 exterior.
6. Fasteners, anchors and connection devices that are concealed from view to greatest extent possible.
7. Provisions for field replacement of glazing from exterior.

D. Fabricate components that, when assembled, have the following characteristics:

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. Curtain-Wall Framing: Fabricate components for assembly using shear blocks.

F. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight unless otherwise indicated.
3. Install glazing to comply with requirements in Division 08 Section "Glazing."

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

H. Exterior sun control devices:
1. General:
   a. All aluminum horizontal extrusions (blades) shall have a minimum wall thickness of .063” (1.5 mm) to .125” (3 mm).
   b. Sunshade “arms” and mullion clips shall be extrusions with a nominal wall thickness of .25” (6 mm).

2. Sunshade Device
    a. Horizontal components (blades) shall be mechanically fastened by means of extruded aluminum screw splines.

I. Wide Stile Entrance Door:
1. General:
    a. Major portions of the door sections shall have a .125”(3 mm) wall thickness. Glazing stop sections shall have a .050” (1.2mm) wall thickness.
    b. Entrance doors:
        1. Door stiles shall be no less than 5” (127 mm) wide (not including glass stops).
        2. Door stiles and rails shall have a hairline joints at corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be of deep penetration and filet welded.
        3. Weather stripping shall be wool pile and shall be installed in one stile of pairs of doors and in jambs stiles of center pivoted doors.
    c. Door stops shall include a bulb weather-strip that complies with ASTM E 2203 specification.
    d. Glazing:
        1. All units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and a gasket that complies with ASTM E 2203 specification.
2. Screens:
    a. Screen frames shall be extruded
    b. Screen mounting holes in the window frame shall be factory drilled
    c. Screen mesh shall be aluminum or fiberglass
3. Glazing:
    a. All units shall be glazed with the manufacturer’s standard sealant process provided the glass is held in place by a removable, extruded aluminum, glazing bead. The glazing bead must be isolated from the glazing material by a gasket.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Interior and Exterior of window: Clear Anodized

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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. 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 components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Exterior Sun Control Devices:
1. Use only skilled tradesmen with work done in accordance with approved shop drawings and established specifications, and erect all curtain wall components to all building bench marks and column center lines.
2. Plumb and align curtain wall faces in a single plane for each wall plane, and erect curtain wall materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, building movement, and specified wind loads.
3. Adjust windows in curtain wall for proper operation after installation.
4. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material; leave all exposed surfaces and joints clean and smooth.

H. Wide stile entrance door:
1. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.
2. Plumb and align entrance door faces in a single plane for each wall plane and erect doors and materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.
3. Adjust doors for proper operation after installation.
4. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

I. Projected Concealed Vents:

1. Use only skilled tradesmen with work done in accordance with approved shop drawings and specifications.
2. Plumb and align window faces in a single plane for each wall plane and erect doors and materials square and true. Adequately anchor to maintain positions permanently when subjected to normal thermal movement, specified building movement, and specified wind loads.
3. Adjust vents for proper operation after installation.
4. Furnish and apply sealants to provide a weather tight installation at all joints and intersections and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) 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 (12.7 to 25.4 mm) 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

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084413