

SECTION 089100 - GLAZED ALUMINUM ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed frame aluminum window and storefront assemblies.
2. Aluminum and glass entrance doors and frames; exterior and interior.
3. Anchors, hardware and accessories, including trim pieces as shown on drawings.

B. Related Sections:

1. Joint sealers: Division 7.
2. Glass and glazing: Elsewhere in Division 8.
3. Door hardware: Elsewhere in Division 8.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Aluminum Association (AA).
2. National Association of Architectural Metal Manufacturers (NAAMM).
3. Architectural Aluminum Manufacturers Association (AAMA).
4. American Welding Society (AWS).
5. American National Standards Institute (ANSI).

- B. Manufacturer Qualifications: Aluminum assemblies and all necessary and required component parts specified herein shall be the product of a manufacturer who can furnish supporting evidence of manufacturing experience in design, fabrication, erection of aluminum assemblies, and of having been regularly engaged in such design, fabrications and erection for a period of not less than 10 years. Such experience shall have been in connection with custom fabrication similar to requirements of this project. Qualifications of manufacturer shall be subject to the review and acceptance of the Architect.

- C. Engineering Design: Structural engineering shall be performed by a professional engineer licensed in the State of New Jersey and employed by the system manufacturer.

D. Performance Requirements:

1. Except when applicable codes make other provisions, or as otherwise noted herein, the loads shall act in combinations that provide the most unfavorable conditions. The performance requirements shall include, but not necessarily be limited to, the following items:
 - a. Provision for Thermal Movement: The work shall be designed to provide for such expansion and contraction of component materials, as will be caused by a surface temperature ranging from -20 degrees F. to 180 degrees F., without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects. The amount of such movement that is accommodated in the Contractor's design shall be identified on shop drawings and shall be accompanied by thermal calculations substantiating that adequate accommodation has been provided.
 - b. Fixed frame aluminum assemblies with "thermal break" design shall meet the following criteria when tested in accordance with AAMA 1503.1 and ASTM C 236:
 1. CRF (frame only) not less than 70.
 2. U value not more than 0.65.
 - c. For fixed frames, when tested in accordance with ASTM E 283, air infiltration shall not exceed 0.06 CFM per sq. ft. of fixed area at 6.24 psf pressure differential.
 - d. For fixed frames, when tested in accordance with ASTM E 331, there shall be no water penetration at a test pressure of 15.0 psf pressure differential with a water rate of 5 gallons/hr. sq. ft.
 - e. Structural Performance for Fixed Frames: Design, engineer, fabricate and install the glazed aluminum curtain wall system to withstand the effects of a wind load of 30 psf acting inward and outward, normal to the plane of the wall, when tested in accordance with ASTM E 330, with no material failures or permanent deformation of structural members.
 1. Structural test pressure shall be equal to 150 percent of the inward and outward acting design wind pressures.
 2. Deflections: The fixed frame shall be capable of withstanding building movements including wind loading and of performing within the following limitations:
 - a. Deflection of framing members perpendicular to the plane of the wall shall not exceed $L/175$ of its clear span.
 - b. Deflection of members parallel to the plane of the wall, when carrying its full dead load, shall not exceed an amount that will reduce glass bite by less than 75 percent of the design dimension and shall not reduce edge clearance between itself and the panel, glass, or other fixed member immediately below to less than an inch.
 - f. Doors shall conform to HGD-HC40.

1. Air Infiltration: Air infiltration shall be tested in accordance with ASTM E 283, at a pressure differential of 1.567 psf. A single 3'-0" x 7'-0" entrance door and frame shall not exceed 0.50 cfm per lineal foot of perimeter crack. A pair of 7'-0" x 7'-0" entrance doors and frame shall not exceed 1.0 cfm per lineal foot of perimeter crack.
 - g. The system shall perform to these criteria under a wind load of 30 psf or greater if required by the prevailing Building Code.
 - h. Aluminum assemblies shall be fabricated and installed to resist seismic forces per prevailing Codes and Ordinances.
2. Structural Design Loads: The allowable stresses for aluminum assembly elements shall conform to the minimum standards published in the Aluminum Association's "Aluminum Structures", latest edition, and other applicable codes or regulations. The minimum design loads herein specified shall comply with the following requirements, including, but not necessarily limited to, those as established by the ANSI A58.1 and applicable Building Code, and other applicable building codes and regulations.
3. Anchorage and Structural Support Framing:
 - a. The anchor assemblies and components, and support framing, including related connections and/or fasteners, for and related to the aluminum assemblies shall be designed, furnished and/or installed as required for full compliance with the specified performance criteria. The items indicated and/or noted on the drawings are schematic and do not necessarily indicate the exact and/or required scope, type, shape or profile. Additional anchorage and structural support framing shall be added or complemented as required.
 - b. Design anchorage and support framing to accommodate thermal and building movements without any harmful effect on the assemblies including glass and glazing and sealant applications. Design anchorage (bracing, inserts, clips, bolts, etc.) for 1.5 x wind load requirements.
 - c. Design, select and furnish all devices for the support of the framing systems and their components, which will be required to be embedded into or attached to other work; provide this information to the appropriate trades.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications for materials and fabrication, installation instructions and recommendations, and maintenance and reglazing instructions.
- B. Shop Drawings: Submit drawings showing elevations, dimensions, member profiles, details of composite members, details of interface with other building construction, reinforcement, expansion provisions, method and location of attachment to structural system, and glazing materials and methods.
 1. Prepare drawings at 1/2 inch to 1 foot, for elevations, and 3 inches to 1 foot, for details.

2. Indicated the following:
 - a. Section moduli of wind-load-bearing members.
 - b. Calculations of maximum stresses and deflection under design loadings.
 - c. Calculations showing design of structural anchors.
 - d. Calculations of structural reactions at points of attachment to the structural system.
 - e. Field measurements.
3. Shop drawings shall have the seal of the manufacturer's engineer (see para. 1.2 C) and a written statement by that engineer that the system conforms to the structural performance requirements specified.

C. Samples: Submit samples of the following:

1. Extruded frame member, 12 inches long, in selected color.
2. Fasteners and anchors, full size, each type.

D. Certification: Submit certification indicating that assemblies meet Performance Requirements specified herein.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver aluminum assemblies and all necessary and required components to the job site in as large pre-assembled sections as practical, and transport handle and store in such a manner as to preclude damage of any nature.
- B. Deliver other materials to the site, ready for use, in the manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Remove delivered materials which are disfigured, cracked, chipped, or scratched, or otherwise not suitable for installation from the job site and replace with new materials. Delivered materials shall be identical to approved samples in every respect with regard to color, finish and approved shop drawings.
- C. Store materials under cover in a dry and clean location, off the ground.
- D. Exercise special care when handling, shipping and erecting factory-finished aluminum to avoid abrasion or other damage to the finished surfaces. Stacking and storing of the members - in the shop, in transit, and at the job site - shall be done using softeners and timbers to keep individual members free from contact with the ground, and with each other; and shall be protected from soiling by adjacent fabrication or construction operations.

1.5 JOB CONDITIONS

- A. Environmental Requirements:

1. Install materials within the temperature and humidity criteria recommended by the manufacturer of each material.
2. Do not install materials on surfaces which contain frost, condensation, dirt, grime or other foreign materials encountered which may hinder or create circumstances which will prevent the material(s) from properly being installed, and once installed from functioning for use intended.

1.6 WARRANTY

- A. Provide written warranty agreeing to repair or replace work which fails in materials or workmanship within 5 years from date of substantial completion.
 1. Failure includes failure to perform as specified, glass breakage in excess of expected accidental breakage, and deterioration of finish or construction in excess of that to be expected under normal weathering.
 2. Failure includes failure of insulating glass seals and formation of internal condensation in insulating units.
 3. Include in written warranty a detailed description of all components covered under "System Description" herein.
 4. Warranty shall be signed by manufacturer, installer, and Contractor.
 5. This warranty is in addition to, and not a limitation of, all other rights the Owner may have against the Contractor under the contract documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements of the contract documents, provide products/system manufactured by one of the following, or approved equal:
 1. Oldcastle Building Envelope (basis for project design).
 2. EFCO.
 3. Traco.
- B. Basis for Project Design:
 1. Exterior windows, storefront: Old Castle FG-3000 (2" x 4-1/2" frame).
 2. Interior storefront: Old Castle FG-2000 (1-3/4" x 4-1/2" frame).
 3. Aluminum doors: Old Castle Standard Medium Stile (1-3/4" frame).

2.2 MATERIALS

- A. Aluminum Members: Alloy and temper recommended by manufacturer for the strength required, for corrosion resistance, and for application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.
 - 1. Thermal break: Provide framing members with integral, concealed, structural, load-bearing, low conductance, thermal barrier separating exterior materials and exposed interior members, eliminating direct metal-to-metal contact.
 - 2. Fluoropolymer finish: Comply with AAMA 605.2 and AA-C12C42R1X (inhibited chemical-cleaned; acid chromate-fluoride-phosphate chemical coating; multi-coat, thermocured primer and topcoats, resin minimum 70 percent "Kynar 500" or "Hylar 5000").
 - a. Clean with inhibited chemicals, and conversion-coat with acid-chromate-phosphate treatment, in accordance with coating manufacturer's instructions.
 - 3. Color: Custom color as selected by the Architect.
- B. Steel:
 - 1. Steel members for plates, angles, tees and other rolled or built up shapes for anchoring to adjacent construction shall conform to ASTM A 36. Hot dip galvanizing shall conform to ASTM A 123, A 153 and A 384.
 - 2. Steel members used for internal supports shall conform to ASTM A 36 and shall be shop primed with zinc chromate primer.
- C. Fasteners: Aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive, non-corrodible, and compatible with aluminum components.
 - 1. Provide reinforcement where fasteners are screwed into aluminum members of less than 1/8 inch thickness.
 - 2. Do not use exposed fasteners.
- D. Shims, Blocking and Spacers:
 - 1. Metals used for shims, blocking and spacers shall be stainless steel incorporating separators for dissimilar materials, and at dynamic connections as and where required.
 - 2. Do not use aluminum or plastic shims at structural connections or horseshoe (U) shaped shims at dynamic or other connections where they could work free.
- E. Concealed Flashing: Dead-soft stainless steel, 26 gage minimum; extruded aluminum, 0.062 inch minimum; or an alloy and type selected by manufacturer for compatibility with other components.
- F. Miscellaneous Concealed Metal Members: Aluminum or nonmagnetic stainless steel; members which are not exposed to weather or abrasion may be hot-dip galvanized steel complying with

ASTM A 123; galvanized members located in internal drainage channels shall be completely coated with dissimilar metal coating.

- G. Joint Sealers: Use only non-hardening, non-shrinking, and non-migrating materials.
 - 1. For non-working metal-to-metal joints within framing members, use small joint sealant, conforming to 803.3-85, as described in AAMA 800-86.
- H. Glass: As specified elsewhere in Division 8.
 - 1. Glazing Gaskets: Comply with ASTM C 864; style as recommended by curtain wall manufacturer.
 - 2. Glazing Blocks, Spacers, and Accessories: As specified in Division 8.
- I. Metal Protection Materials:
 - 1. Bituminous coating: Cold applied asphalt mastic conforming to SSPC Paint 12, compounded for 30 mils thickness per coat.
 - 2. Aluminum metal-and-concrete paint: Standard product specifically recommended by the manufacturer to protect aluminum against alkaline, corrosive and galvanic action.
 - 3. Cadmium plating: ASTM A 165, Type NS.
 - 4. Paint for carbon steel used for internal supports: One shop coat of zinc chromate primer conforming to FS TT-P-645.
 - 5. Galvanizing of carbon steel for anchorage:
 - a. Steel sheets: FS QQ-S-775c.
 - b. Hot-dip for shapes, plates, bars and strip: ASTM A 123.
 - c. Electro-galvanizing: ASTM A 164 or FS QQ-A-325a.
 - 6. Preformed mastic tape: NAAMM Specifications for Non-Shrinking, Non-Resilient Preformed Sealing Compound.

2.3 ALUMINUM WINDOW/STOREFRONT FRAMING

- A. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
- B. Fabricate frame assemblies with joints straight and tight fitting.
- C. Reinforce internally with structural members as necessary to support design loads.
- D. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- E. Seal horizontals and direct moisture accumulation to exterior.

- F. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials. Form flashings from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".
- G. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.

2.4 ALUMINUM DOORS

- A. Aluminum doors shall be medium stile meeting the following resistance to corner racking when tested by the Dual Moment Load Test:
 - 1. Test section shall consist of a standard top door corner assembly. Side rail section shall be 24 inches long and top rail section shall be 12 inches long.
 - 2. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond bench edge.
 - 3. Anchor a lever arm positively to "side rail" at a point 19 inches from inside edge of "top rail". Attach weight support pad at a point 19 inches from inner edge of "side rail".
 - 4. Test section shall withstand a load of 235 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 degrees.
- B. Door Hardware: Provide pivots, panic hardware, etc., all finished to match aluminum framing.
- C. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds. Glazing stops shall be snap-in type with EPDM glazing gaskets.
- D. Door bottom rail of exterior doors shall have an EPDM blade gasket sweep strip applied with concealed fasteners.
- E. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds. Glazing stops shall be hook-in type with EPDM glazing gaskets.
- F. The door weathering on a single acting offset pivot or butt hung exterior door and frame (single or pairs) shall be thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
- G. The door weathering on a double acting, center pivoted door and frame (single or pairs) shall be pile cloth. The door bottom rail shall be weathered with an EPDM blade gasket sweep strip applied with concealed fasteners.
- H. The meeting stiles on pairs of doors shall be equipped with an adjustable astragal.

2.5 FABRICATION AND MANUFACTURE

A. Workmanship:

1. Carefully fabricate and assemble work with proper and approved provision for noiseless thermal expansion and contraction, fabrication and erection tolerances, adjoining building component tolerances and dynamic movements.
2. Execute forming and welding operations prior to finishing operations.
3. Work: True to detail with sharp, clean profiles, straight and free from defects, dents, marks, indentations, waves or flaws of any nature impairing strength or appearance; fitted with proper joints and intersections and with specified finishes.
4. Removable members such as glass stops, fillers, or closures shall be extruded and securely engaged into adjacent components. Extrusions to be tightly toleranced to eliminate edge projection or misalignment at joints.
5. Install sleeves, lugs and related items in a full bed of sealant and seal perimeter when component is in final installed position. Clean excess sealant from exposed surfaces.
6. Labels and Trademarks: Labels and trademarks, including applied labels, shall not be visible on the finished work.
7. Aluminum work shall be of extrusions, sheets, plates, or other forms or combinations thereof, as best suited for the production of the work and as per the shop drawings.

B. Connecting and Fastening Devices:

1. Fastenings: Of a strength sufficient to support both horizontal wind load and vertical dead load, with safety allowance specified herein and spacing and of such sizes as will develop the maximum strength of the members they secure or support, in terms of adequate unit stresses, in accordance with submitted shop drawings.
2. Seal and tool fasteners penetrating watertight or airtight assemblies.
3. Furnish to other trades proper anchoring inserts and other supporting devices which will be required to set into the concrete, attached to structural steel or otherwise attached to masonry or metal. Furnish location drawings along with the devices to be embedded well in advance of this work to assure job progress. Supporting devices shall be steel; aluminum devices will not be permitted for structural connections.

C. Protection of Metals:

1. Provide protection against galvanic action wherever dissimilar metals are in contact.
2. Aluminum which is to be in contact with cured concrete or masonry mortar shall have its contact surfaces protected wherever the contact surfaces may entrap moisture and corrosive elements. Metals which are to be in contact with concrete or masonry mortar shall have their contact surfaces protected with an acceptable coating or separator.

D. Welding:

1. Perform welding of aluminum work by the inert gas shielded arc or fluxless resistant techniques, in accord with recommendations of the American Welding Society and use electrodes or methods recommended by the suppliers of the metals being welded.
2. Welds behind finished aluminum surfaces shall be done in an approved manner to eliminate distortion and discoloration on the finished side. Remove weld spatter and welding oxides on finished surfaces by descaling and grinding. Provide low heat fillet welds using chill bar on finished side to eliminate dimpling, distorting and discoloration on the finished or exposed surface. Plug, puddle or spot welding will not be permitted.

E. Shop Painting of Carbon Steel: Items of carbon steel, unless galvanized, shall be thoroughly cleaned of loose scale, fillings, dirt and other foreign matter, and painted with zinc chromate primer.

F. Reinforcing: Provide internal steel reinforcing components as required to conform to performance criteria and as necessary and required to accommodate adjacent work relying on this work for support and hardware cuts in jambs as required. Internal reinforcing shall also be provided as required to receive decorative glass system supports installed on the interior by others. Paint internal steel as specified above.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surfaces and conditions to which this work is to be attached or applied, and correct any conditions or surfaces which are detrimental to the proper and expeditious installation of the work. Starting on the work shall imply acceptance of the surfaces and conditions to perform the work as specified.
- B. Verify dimensions taken at the job site affecting the work.
- C. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.
- D. Examine and spot check supporting elements to assure that tolerances specified herein have been adhered to. Check existing and new concrete surfaces and ensure that they are within the construction tolerances and conditions to install the work of this Section.
- E. Examine items which are furnished for incorporation into the work by other trades, to assure that they are properly located to accept all other related work.

3.2 INSTALLATION

- A. Perform work using skilled workmen, especially trained and experienced in the applicable trades employed and in full conformity with the reviewed shop drawings, samples and other submitted data.

- B. Carefully and accurately assemble the work with proper provision for contraction and expansion and install plumb and level at the required lines and elevations, within normal construction tolerances and finish straight, smooth and even, free from defects, and to profiles and sections shown on the drawings. Assemble work so that the joints are watertight, neat and finished smooth.
- C. Erection Tolerances: Components shall be erected plumb and true in proper alignment and relation to established lines and grades, as shown on reviewed shop drawings. the installed components shall conform to the following erection tolerances:
1. Amount or total deviation or misalignment in any direction for vertical members; 1/8 inch maximum in 24 feet or a maximum of 1/4 inch in a 48 foot run.
 2. Amount of total deviation or misalignment in any direction for vertical members; 1/8 inch maximum in a 25 foot run.
 3. Maximum offset from true alignment between 2 abutting members will be 1/32 inch. No edge projection will be permitted.
 4. Maximum joint gap or opening between removable glazing stop, filler or closure and its adjacent member will be 1/32 inch or a maximum 1/32 inch cumulative opening at both ends of removable members (1/64 inch each end).
- D. Wherever aluminum comes in contact with the steel surfaces, provide contact surfaces with approved type separators and other devices which will prevent galvanic action.
- E. Anchor the work to the structure by proper methods and in strict accordance with approved shop drawings. After the components are properly positioned rigidly fix the connections by welding or other positive means.
- F. Welding: Perform welding using skilled mechanics qualified or licensed in accord with local building regulations, and conform to the recommended practices of the American Welding Society. Clean welds and adjoining burned areas in prime coated surfaces thoroughly and repaint with one coat of primer and coat welds in galvanized steel with one coat of zinc-rich paint. Take special care to protect glass and other finished surfaces from damage and to prevent fires. Preheat structural steel building components as required for the full penetration and distribution of structural welds.
- G. Sealant Application:
1. Metal-to-metal joints between aluminum elements shall be thoroughly cleaned and sealed by buttering joints with sealant immediately prior to the final assembly of abutting sections. Clean excess sealant from exposed surfaces.
 2. Install sealant materials in strict accordance with manufacturer's instructions. Before applying sealant, remove dirt, dust, moisture and other foreign matter completely from the substrate surfaces as required to maintain a clean and neat appearance. Tool sealant compounds to fill the joint and provide a smooth finished surface.

3.3 ADJUSTMENTS, CLEANING AND PROTECTION

- A. Damage to Factory-Applied Finish: Should the factory-applied coatings become scratched, abraded, or damaged during transport, delivery, storage or erection, remove and/or repair those defective areas or components, to the satisfaction of the Architect.
- B. Protection and Cleaning:
 - 1. Upon completion of work, remove protective coverings from exposed surfaces, and clean surfaces of soil and discoloration. Cleaning shall be in accord with the provisions of the requirements of the applicable manufacturers of the aluminum, glass, gasket and aluminum finishing manufacturers.
 - 2. Weep holes and drainage channels shall be unobstructed and free of dirt, rubbish and sealants.
 - 3. Clean all exposed work erected by this Section including interior and exterior surfaces of exterior glass. Remove all glazing compound and other foreign matter and thoroughly clean metal using cleaning preparations which will in no way harm aluminum or glass surfaces. During this cleaning, repair damaged surfaces, scratches, marks, etc., found to the satisfaction of the Architect and Owner.
 - 4. Exercise care when cleaning the exterior portions of the building to protect other work and sealant to metal joint work.
- C. The finished installation of the work shall be free of defects. Before final completion and acceptance of the building, repair and/or replace defective work, to the satisfaction of the Owner and the Architect.

END OF SECTION 089100