SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 – GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 LESSONS LEARNED AND DESIGN CONSIDERATIONS

A. Anodized finish with Anodic Coating Class I Architectural Clear Film with thickness greater than 0.7 mil.
B. Sill and Head anchoring and attachments per manufacturer's standard details.
C. System design per wind pressure tables supplied by the Architect and Structural Engineer of Record.
D. All curtainwall system shall have 1" insulated glazing units.
E. Curtainwall system to match existing on the Career Development Center's exterior East Entrance. Refer to Part 4 – Appendix for additional information.

1.3 SUMARY

A. Section includes thermally improved field glazed stick built curtain wall and stick built curtain wall with shop glazed aluminum sub-frames, perimeter trims, stool trims, accessories, shims and anchors, and all weather seals at the perimeter and within the curtain wall framing.
   1. The systems are to be standard systems bidder designed to meet the Architectural design intent. Bidder's design must provide a second line of defense from water infiltration and a vapor/air barrier for all conditions. Bidder is responsible to provide method of attaching second line of defense and vapor/air barrier of adjacent systems and coordinating this connection with sub-contractors of surrounding systems.
   2. The curtain wall sub-contractor shall design, engineer, fabricate, deliver, install and guarantee all construction necessary to provide for the complete airtight and watertight enclosure of the building. The curtain wall systems shall be complete in every respect, including all measures that may be required to that end, notwithstanding any omission or inadequacies of the Contract Documents and/or Specifications. Curtain wall systems shall be provided by a single manufacturer.

B. System Descriptions:
   1. Features: Stick built outside glazed, structural silicone glazed (SSG) at verticals and captured at horizontals with nominally 1" thick low-e coated insulating glass units (IGUs). System shall also include prefinished vertical fins, horizontal sunshades, and 1/8" thick "glazed" aluminum panels at floor spandrels in addition to 1/8 inch thick shadow box panels at floor spandrels.
   2. Drainage: System shall be designed with secondary zone glazed drainage at each horizontal. Provide perimeter framing with an integral glass pocket filler for acceptance of perimeter weather seals.
   3. Basis of Design: 1600 Wall System 2 manufactured by Kawneer.

C. Related Sections:
   1. Section 07 41 13 – Metal Roof Panels
   2. Section 08 43 13 – Aluminum-Framed Storefronts.
   3. Section 08 80 00 – Glazing.

1.4 BID SUBMITTALS

A. Section Proposal Drawings:
   1. Preliminary design drawings of all typical conditions shall be submitted with the bid. Comply with all design requirements as described in the Contract Documents.
   2. The Proposal Drawing shall show all typical items of work at full scale as far as practical. Aluminum framing, panels, glass thicknesses, arrangement of components, stick wall construction and jointing details of all field connections and anchorage system diagrams and details explaining sealing methods, glazing methods, flashing methods and all other pertinent information.

3. Proposal Drawing shall include typical details for each system. Although all systems should be described it should be noted that Proposal Drawings shall be reviewed for the quality of engineering design and the compliance with the architectural requirements and not quantity of drawings submitted.
4. Proposal drawings will include configuration of previously tested mock up demonstrating proposed system meets or exceeds performance requirements specified herein. Include mock up test report(s) with Bid Submittal.

B. Preliminary Structural Calculations
1. The bidder shall be required for submit preliminary structural calculations to substantiate that the proposed system is capable of withstanding the design loads specified.

1.5 PREINSTALLATION MEETINGS

A. AAMA Pre-installation Conference: Conduct conference at Project site. Review methods and procedures related to the aluminum curtain wall systems including, but not limited to, the following:
1. Review structural load limitations.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 ACTION SUBMITTALS

A. See General: All submittals will be complete, coordinated and in the required form, not partial or phased. Resubmittals shall include requested corrections and shall respond to previous comments. Each revised sheet shall bear a revision date and number. Revisions shall be clearly flagged and identified. Failure of submittals to be complete, in the proper form, responsive to comments, or identify revisions shall be cause for disapproval and return of documents without review. Failure of review comments to note a noncompliance with plans and specifications shall not relieve the Contractor from his obligation to comply. Failure of review comments to note a noncompliance on a given submittal shall not preclude a directive to comply on future submittals. A maximum of two reviews will be performed without additional cost to the Contractor. If a submittal does not achieve an approved status by the second submittal, cost of additional reviews by Architect and Consultant shall be borne by the Contractor.
1. No work shall be fabricated until shop drawings for that work have been approved for fabrication.

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

C. Shop Drawings: Shall be complete and include scale elevations, floor plans, sections and full-size details. Details shall be fully drawn and not outlined or annotated. Drawings and components in drawings shall be drawn to scale. Drawings shall contain the following information.
1. Joinery and internal seals.
2. Glass and metal thickness.
3. Metal alloy, temper and finish.
4. Glass strength, tint, coating, opacifier, frit and safety backing.
5. Fastener alloy, strength, finish, diameter, length and spacing.
6. Glazing materials identification.
7. Sealants identification by product name.
8. Relative layout of walls, beams, columns and slabs with dimensions noted.
9. Dimensioned position of glass edge relative to metal.
10. Provisions for movement.
11. Gutter and weep system.
12. Locations of, and details for, embedded anchors.
13. Identification of, and details for, thermal insulation and Safing insulation.
14. Weld information and weld symbols conforming to AWS conventions.
15. Glazing details applicable to replacement glass, with outline of procedure for glass replacement.
16. Provisions for adjustment of anchors relative to tolerances of building structure.
17. 3-D drawings/details will be provided to fully describe or explain aesthetics, anchorage, three-dimensional profiles, water infiltration control or prevention, complex joinery or internal seals that are otherwise difficult to understand using two-dimensional drawings.
18. Relationship to the work of others shall be clearly indicated when necessary to coordinate the work with other building trades.

D. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer experienced in detailing fabrication and assembly of aluminum curtain wall systems.

1. Submit structural calculations sealed by a Professional Engineer licensed in the State of Texas. Calculations shall be legible and shall incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable. Test reports are not an acceptable substitute for calculations. Calculations shall include:
    a. Analysis of framing members.
    b. Analysis of anchors, including anchors embedded in concrete.
    c. Section property computations for framing members.
    d. Analysis of stress in structural silicone.
    e. Seal and signature of professional engineer.
2. Include structural analysis and drawings signed and sealed by the Professional Engineer responsible for their preparation.
    a. The structural design of the curtain wall system shall meet all pertinent requirements of the 2015 Edition of the International Building Code.
    b. The cover sheet of the calculations and each sheet of the curtain wall design/shop drawings must bear the seal of the above mentioned professional engineer.
    c. The curtain wall system may be inspected in the shop during fabrication, and field inspected during installation by an approved special inspection agency chosen by the owner.

E. Samples for Initial Selection: For materials with factory-applied color finishes.
F. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
G. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12 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

1.7 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Qualification Data: For Installer.
C. Preconstruction Sealant Test Reports: 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 sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum curtain wall systems.
E. Preconstruction Test Reports: For aluminum curtain wall systems.
F. Quality-Control Program: Developed specifically for Project.
G. Quality-Control Program Reports: Documenting quality-control procedures and verifying results for glazed curtain wall systems.
H. Field quality-control test reports.
I. Warranties:
    1. Submit written warranty agreements as specified in this Section.
    2. Submit manufacturer’s documentation indicating all requirements to achieve the specified warranty.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.
    1. Engineering Responsibility: Preparation of data for aluminum curtain wall systems including the following:
        a. Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Welding shall be in conformance with AWS Structural Welding Code D1.1 for steel and D1.2 for aluminum as well as AISC "Specification for Architecturally exposed Structural Steel."
   1. Engage skilled and qualified welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.

D. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401.

E. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

F. Review required testing, inspecting, and certifying procedures.

1.9 TESTING AND MOCK-UPS

A. General
   1. Full scale portions of the Work of this Section shall be tested for compliance with Section 2.1 Performance Requirements.
   2. The Test Specimens shall be as described in the architectural documents. Architectural documents indicate areas of the building facade that are to be incorporated into the performance mock up. The contractor will propose a configuration that includes and combines the significant segments of all the areas shown in the drawings. Architect must approve configuration prior to submitting mock up drawings.
   3. The test assembly shall be of the materials, profiles, finishes, colors and design approved for the finished Work complete in all respects including glass and glazing. The test assembly shall serve as a visual representation of the Work.
   4. Samples of all materials for the mock-up shall be submitted and approved prior to mock-up fabrication.
   5. Tests shall be conducted at an independent test facility proposed by the Contractor and approved by the Architect and the Owner. The Contractor shall provide the test assembly and all associated work.
   6. All costs associated for additional testing and or remediation and retesting shall be at the Contractor's expense. Additional expense shall include those of the testing agency, Architect and Consultant.
   7. No pre-testing of the test assembly shall be allowed except by express written consent from the Architect.
   8. The test assembly shall be erected by and under the supervision of the same personnel that will supervise and install the work at the project site.
   9. Contractor shall provide at least one extra lite for each glass type and size on the test assembly for use in the event of breakage. Repeated glass failure shall constitute failure.
   10. Contractor shall submit for approval detailed descriptions and shop drawings of the test assembly, transducer locations, test procedure, test schedule, test location, and test report consistent with the submittal requirements of the Contract Documents.
   11. Mock-up materials and assemblies as tested and approved will govern materials and assemblies furnished for field erection. Contractor shall revise all shop drawings to conform to the approved mock-up and resubmit for approval.
   12. Mock-up approval shall be properly scheduled to avoid construction delays.
   13. Mock-up material shall not be installed as part of building.

B. Laboratory Mock-Up Testing
   1. The following tests shall be conducted in the order listed and conform to the requirements of this section and those of related work:
      a. Preload:
         1) Load the test assembly to 0.5 times the specified design wind pressure and inspect the Assembly for detrimental effects.
      b. Air Infiltration.
      c. Static Water Penetration.
      d. Dynamic water penetration
      e. Structural Performance
      f. Static Water Penetration
      g. Live Load Vertical movement
      h. Air Infiltration
      i. Static Water
      j. Dynamic Water
      k. Structural Performance (Proof Load)
      l. Load on all types of window washing stabilization anchors.
         1) Apply a load of 600 lbs outward for a period of 10 seconds.

2) Apply a load of 600 lbs sideways in each direction for a period of 10 seconds.
3) Apply a load of 600 lbs. up and down for a period of 10 seconds.
4) There shall be no deformation or damage to the test assembly or the anchor.

m. Deglaze and reglaze glass lites as requested by the Architect.
n. Approval of the test assembly and the test results rests with the Architect and the Owner.

C. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by curtain wall systems.
1. Test a minimum of five samples of each metal panel, stone, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

D. Product Engineering Tests:
1. All products and individual or aggregate components for which acceptable engineering or test data is not available shall be physically tested.
2. Unless otherwise specified herein, the Contractor shall propose the specific test procedures for approval by the Architect and the Owner.

E. Structural Silicone Testing
1. Silicone joints proposed for structural glazing application shall be tested for performance in tension, in shear, and tension and shear combined.
2. Test specimens shall be approximately 2 inches in length, full dimension in width and depth, and be composed of the specified materials, colors and finishes.
3. Ten specimens for each condition shall be tested and the values for elongation-to-failure vs. stress recorded for each specimen, and the mean and standard deviation calculated for each condition.
4. Test shall be performed by the sealant manufacturer(s) whose product(s) are being considered for the structural silicone joint(s).
5. In addition to the above, production test samples and testing shall be performed at regular intervals during assembly of the Work, in accordance with the recommendations of the sealant manufacturer.
6. Completed glazed units shall be periodically de-glazed to confirm the homogeneity and integrity of the structural seal. De-glazing shall be performed as required by the structural sealant manufacturer.

F. Embedded Anchor Testing:
1. Embedded anchors without approved evaluation reports shall be tested as follows.
2. Representatives of each anchor type embedded into concrete or reinforced masonry shall be site tested in accordance with the specification.
3. Each anchor type shall be tested for shear, tension, and shear and tension combined to 1.5 times the design load.
4. Testing shall comply with ASTM E 488.
5. Where anomalies in the construction are detected during visual inspections or there are failures during embed testing, a minimum of 5 percent but no less than 5 anchors of each anchor type shall be tested for the floor.
6. There shall be no failure or permanent deformation to the anchor or the concrete or reinforced masonry.

G. Weld Testing
1. Welds shall be tested in accordance with the specifications.
2. Any welds which do not pass visual inspection shall be tested.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum curtain wall systems by field measurements before erection and notify the Architect of any discrepancies that exceed acceptable tolerances so as to not delay the work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum curtain wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.11 WARRANTY

A. Provide Special Assembly Warranty: Submit a written warranty, guaranteeing to correct failures in work without reducing or otherwise limiting any other rights to correction which the Owner may have under the contract documents. Submit Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum curtain wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
   1. Warranty to be signed by manufacturer, installer, and Contractor.
   2. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Loose or missing parts.
      c. Water or air leakage exceeding specified limits.
      d. Noise or vibration caused by thermal movements.
      e. Deterioration of metals and other materials beyond normal weathering due to oxidation, electrolytic damage or deterioration of protective coatings.
      f. Staining of curtain wall surfaces caused by incompatibility of adjacent materials.
      g. Failure of operating components to function normally.
      h. Glass breakage.
      i. Edge separation or any other deterioration of laminated glass.
      j. Failure of tapes, gaskets or sealants.
      k. Failure to conform to profiles, locations or arrangements shown on drawings.
      l. Failure to conform to manufacturer's recommendations and industry standards as they apply to the various curtain wall components.
      m. Objectionable appearance or performance resulting from either defective or nonconforming materials or workmanship.
      n. Failure of the system to meet any other specified performance requirement.
   3. Warranty Period: 5 years from date of Substantial Completion.

B. Sealant Installer Warranty:
   1. Installer shall submit a written warranty agreeing to repair or replace any and all sealant failure as defined in Section 07 92 00 – Joints Sealants.
   2. Warranty shall cover all labor and material cost for sealant replacement for a period of 2-years from the date of issuance of a certificate of occupancy for the building or the minimum Installer Warranty period required as part of the 20-year Special Manufacturer Labor and Material Warranty noted herein.
   3. Warranty shall cover all structural sealant glazing (SSG) and weather seals as part of the curtain wall system.

C. Manufacturer’s Special 20-year Warranty:
   1. Manufacturer shall submit a written warranty agreeing to repair or replace any and all sealant failure as defined in Section 07 92 00 – Joints Sealants.
   2. Warranty shall cover all labor and material cost for sealant replacement for a period of 20-years from the day of expiration of the Installer Warranty noted above.
   3. Warranty shall cover all structural sealant glazing (SSG) and weather seals as part of the curtain wall system.

D. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum curtain wall systems, including anchorage, capable of withstanding, without failure or damage of any kind, the effects of the following:
   1. Basis Structural loads.
   2. Thermal movements.
   3. Movements of supporting structure ad identified in the structural drawings including, but not limited to, story drift, column shortening, and deflection from live loads.
   4. Dimensional tolerances of building frame and other adjacent construction.
   5. Failure includes the following:
      a. Deflection exceeding specified limits.

b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Glazing-to-glazing contact.
e. Noise or vibration created by wind and thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.

B. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by curtain wall systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

C. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.

D. Structural Loads:
1. Design Wind Loads for Cladding shall be per ASCE

E. Structural-Test Performance: Provide aluminum curtain wall systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
a. No glass breakage, permanent damage to panels, fasteners or anchors shall occur.
2. Deflection of Framing Members spanning floor to floor for glass and aluminum panel areas:
a. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches, and to 1/240 of clear span plus 1/4 inch, for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
b. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite below 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.
c. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.
3. Transverse members spanning between vertical framing members:
a. Deflection Normal to Wall Plane: Limited to 1/240 of clear span. Deflection in the plane of construction shall be limited to 1/360 of the span between supports or 1/8 inch whichever is less.
4. Deflection of framing at edge of Insulted Glass:
a. Deflection of framing shall be limited to $0.4 (L / 100)^2$. Where L is the length, in inches, of the glass edge being supported or as required by the insulated glass manufacturer.
5. Deflection of framing at edge of Monolithic Glass:
a. Deflection of framing shall be limited to $0.6 (L / 100)^2$. Where L is the length, in inches, of the glass edge being supported.
6. Center Deflection Glass Lites:
a. Deflection of glass at the center of the lite shall not exceed L / 254t for the loaded lite where L is the short span and “t” is the thickness, in inches of the loaded lite, or 1 inch, whichever is less.
7. Center Deflection of Metal Panels:
a. Center Deflection of metal panels shall not exceed L / 120 where L is either the short dimension of the panel or the clear span of the face material between supporting members (stiffeners), whichever is less.
8. Center Deflection of Back Pans:
a. Center Deflection of back pans shall not exceed L / 90 where L is either the short dimension of the pan or the clear span between supporting members (stiffeners), whichever is less.
9. Proof load: When tested at 150 percent of positive and negative wind-load design pressures.
a. No glass breakage, permanent damage to panels, fasteners or anchors shall occur.
b. Permanent deformation to wall framing members shall not exceed 0.2 percent of their clear spans.
10. Test Duration: 10 seconds.

F. Live Load Vertical Deflections:
1. Design Displacement: 1/2 inch upward or downward.

2. Test Performance: No glass breakage, anchor failures, or structural damage when tested according to AAMA 501.4.
3. System shall have been tested for live load deflection by applying a vertical load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified live load deflection.

G. Thermal Movements: Provide aluminum curtain wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Test Performance: No buckling, stress on glass, glazing-edge seal failure, sealant failure, excess stress on curtain wall framing, anchors and fasteners, noise, vibration or reduction of performance when tested according to AAMA 501.5.
a. Test High Exterior Temperature: That which produces an exterior metal surface temperature of 180 deg F.
b. Test Low Exterior Ambient Air Temperature: 27 deg F.
c. Test Interior Ambient Air Temperature: 75 deg F with 50% relative humidity.
2. Submit previous test reports that include thermocouples at interior surfaces, to confirm condensation resistance with a minimum of ten thermocouple positions, to include: center of glass, edge of glass, mullion side, mullion back, etc.

H. Air Infiltration: Provide aluminum curtain wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283, at a minimum static-air-pressure differential of 6.24 lb/sq. ft.

I. Water Penetration under Static Pressure: Provide aluminum curtain wall systems that do not evidence water penetration when tested according to ASTM E 331, at a minimum differential static pressure of 12 lb/sq. ft. for 15 minutes.

J. Water Penetration under Dynamic Pressure: Provide aluminum curtain wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 12 lb/sq. ft. for 15 minutes.
1. Maximum Water Leakage: Water leakage is defined as any water infiltrating the system or appearing on any interior surface from sources other than condensation. Water controlled by flashing and gutters that is drained to the exterior and cannot damage adjacent materials or finishes is not considered water leakage.
2. Water collected and drained down the vertical mullions shall be limited to a maximum of 4 ounces per vertical mullion per unit height for a fifteen minute test.

K. Average Thermal Conductance: Provide aluminum curtain wall systems with average U-factor of not more than 0.45 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

2.2 FRAMING SYSTEMS

A. Aluminum: Alloy and temper for type of use and finish indicated.
1. Basis Extruded Structural Shapes:
a. A 6061-T6, ASTM B 429.
b. Minimum wall thickness shall be 1/8 inch.
2. Extruded Bars, Rods, Shapes, and Tubes:
a. AA 6063-T5 or T6, ASTM B 221 (ASTM B 221M).
3. Sheet and Plate:
a. Painted Finish: AA3003 H14, ASTM B 209 (ASTM B 209M).
b. Anodized Finish: AA5005 H34 (Anodizing Quality), ASTM B 209 (ASTM B 209M).
c. All sheet shall be stretcher leveled and stress relieved.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard 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/A 570M.

C. Stainless Steel:
1. Sheets, strips, bars, plates and shapes (exposed): AISI Type 316, ASTM A666
2. Sheets, strips, bars, plates and shapes (concealed: AISI Type 304, ASTM A666

3. Fasteners: AISI Type 303, 304 or 316 non-magnetic.
    a. Bolts and screws: ASTM F593, Alloy Groups 1 and 4.
    b. Nuts: ASTM F594, Alloy Groups 1 and 4
    c. Button and countersunk head screws: ASTM F879, Alloy Groups 1 and 4.
4. All stainless steel shall be cleaned and passivated after fabrication per the recommendations of ASTM A380.

D. Brackets and Reinforcements: High-strength aluminum with non-staining, nonferrous shims for aligning system components.

E. Fasteners and Accessories: Corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Self-drilling fasteners shall be Dril-Flex as manufactured by Elco Industries, Inc.
3. Reinforce members as required to receive fastener threads.
4. For approved exposed fasteners use countersunk Phillips screw heads.
5. Finish exposed portions to match framing system.
6. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

F. Anchors: Three-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/A 123M or ASTM A 153/A 153M requirements.

G. Concealed Flashing: Corrosion-resistant, non-staining, nonbleeding flashing compatible with adjacent materials, Dead-soft, 0.018 inch (0.457 mm) thick stainless steel, ASTM A 240/A 240M.
1. All joints to be lapped and sealed to a minimum of 6 inch. Provide sealed lap joints, end damns and transitions to gutters.

H. Weeps:
1. Type: Weep slots shall be baffled against water infiltration, which will not degrade under sunlight, water and fungus conditions, complete with attachments.
2. Size: Conform to weep slots size, profiles and arrangements.
3. Weep Baffles: PVC coated open cell reticulated urethane foam; 30-40 pores per inch.

I. Shim Types:
1. Stainless steel 300 series.
2. Hot-dipped galvanized steel, ASTM A36 or ASTM A283 quality.
3. High impact polystyrene.
4. Do not use at structural connections.
5. For Structural Connections: Use only metal shims.
6. U-Shaped Shims: Do not use at structural connections, slip connections or other locations where shims can become loose unless shim can be installed with open end pointing down.
7. Fiber Shims: Not acceptable.
8. All shims to be mechanically held in place.

J. Separators:
1. At Expansion Connections: Use Penn Fibre's "Nylatron", or other approved type of thickness required to meet design requirements.
2. Slip pads are required at all surfaces which are subject to movement.
3. Between dissimilar materials and at dynamic connections: Use rigid high impact polystyrene with smooth surfaces each side, of thickness required to meet design requirements.
4. Do not use polystyrene in close proximity to field welds.

K. Framing Gaskets: Vulcanized, extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal. Corners to be molded.
1. Cellular Neoprene or EPDM, ASTM C 509 (DIN 12365-1).
2. Silicone, ASTM C 1115, where gaskets are in contact with silicone sealant.
3. Dense Neoprene or EPDM ASTM C864.

L. Framing Sealants: Refer to Section 07 92 13.

2.3 GLAZING SYSTEMS

A. Aluminum-Framed Glazing: Refer to Section 08 80 00.
B. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Refer to Section 08 80 00.
C. Glazing Sealants: Refer to Section 07 92 13.
    1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in curtain wall systems indicated.
        a. Color: Black
        b. Type: Two component. One component for field reglazing only.
        c. Minimum Tensile Strength: 100 psi.
        d. Modulus of Elasticity: As required by structural-sealant-glazed curtain wall system design to meet performance requirements.
    2. Weatherseal Sealant: ASTM C 920 for Type A, Refer to Section 07 92 13.
        a. Joint Movement Capability: Accommodates a 50 percent increase or decrease in joint width at time of application when measured according to ASTM C 719.
        b. Color: As selected by Architect.

2.4 COMPONENTS

A. Controller: Back Pans:
    1. Aluminum back pan:
        a. Thickness: As required to meet structural loads
        b. Finish: Per exterior surface finish, color to match Architects sample.
        c. Texture: To match Architects sample.
    2. Back pan construction shall meet requirements of Aluminum Panels above and result in panel flatness acceptable to the Architect.
    3. Shadow box construction shall be designed to be vented and baffled as required against water infiltration.
    4. Maintain a minimum dimension of 2 inch from back surface of the glass to face of shadow box back pan.
    5. Thermal Insulation: Refer to Section 07 21 00.
B. Galvanized Back Pan
    1. Galvanized Back Pan:
        a. Thickness: As required to meet structural loads
    2. Thermal Insulation: Refer to Section 07 21 00.
    3. Back pans shall be designed to accept full structural load.
        a. Back pan shall be designed for a deflection of L/60 or 1 inch whichever is less.
        b. Back pan shall not bow or warp along perimeter edge in a manner that will tear sealants or disengage from fasteners when subjected to 1.5 times the design loads.
        c. Back pan will not make any noise when loads are applied and/or released.
C. Aluminum Angles
    1. Aluminum:
        a. Thickness: As required to meet structural loads or as indicated on Architectural drawings.
        b. Finish: Per exterior surface finish, color to match Architects sample.
        c. Texture: To match Architects sample.
    2. Angles shall be fabricated from specified alloys.
D. Aluminum Coping
    1. Aluminum:
        a. Thickness: As required to meet structural loads or as indicated on Architectural drawings.
        b. Finish: Per exterior surface finish, color to match Architects sample.
        c. Texture: To match Architects sample.
E. Embeds
    1. Embeds shall be hot dipped galvanized steel and shall incorporate minimum embed extension of 12 inches, with hooked profile for securing to structure reinforcement.

2.5 ACCESSORY MATERIALS

A. Perimeter Fire-Containment Systems (Safing Insulation): Refer to Section 07 84 46.
B. Insulating Materials: Refer to Section 07 21 00.
C. 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.

2.6 FABRICATION

A. Form aluminum shapes before finishing.

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

1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Structural-sealant joints that do not carry gravity loads of glazing.
7. Provisions for reglazing vision glass from the interior and spandrel glass from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures for structurally glazing.

C. Welding: Weld components to comply with referenced standards and shop drawings, unless otherwise indicated.

1. Weld before finishing components.
2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish.
3. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. Factory-Assembled Frame Units:

1. Rigidly secure non-movement joints.
2. Seal joints watertight, unless otherwise indicated.
3. Pressure equalize system at its interior face.
4. Install glazing to comply with requirements in Section 08 80 00. 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.

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

F. Exposed fasteners on exposed finishes will not be permitted.

G. Provide protection against galvanic action.

2.7 ALUMINUM FINISHES

A. Clear Anodized Aluminum: AA-M10C21A41, AAMA 611, Architectural Class I, Color #14 Clear, 0.7 mil.

B. PPG Metal Coatings; Duranar XL, color and gloss as indicated on drawings.

2.8 SOURCE QUALITY CONTROL

A. Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, sealant testing, and system fabrication reviews and checks.

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 work.

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

3.2 INSTALLATION

A. General:

1. Examine insert plate locations, bench marks provided by the General Contractor, verifying such supports and markings are properly located and ready to receive anchor bracket assemblies provided by the curtain wall manufacturer. Notify General Contractor of any discrepancies or inadequacies.
2. Comply with manufacturer's written instructions.
3. Do not install damaged components.
4. Fit joints to produce hairline joints free of burrs and distortion.
5. Rigidly secure non-movement joints.
6. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
7. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing

surfaces from welding.
8. 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 the system 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 Division 8 Section "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.

G. Install sealants as specified in Section 07 92 13 and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Install insulation materials as specified in Section 07 21 00.

I. Install perimeter fire-containment systems (safing insulation) as specified in Section 07 84 46.

J. Erection Tolerances: Install aluminum curtain wall systems to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 12 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:
a. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
b. 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.
c. Where surfaces are separated by reveal or protruding element from 1/2 or wider, limit offset from true alignment to 1/8 inch.
d. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
a. Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2 shall be used.
1) A minimum of six areas on each building face shall be tested.
2) Repair installation areas damaged by testing.
2. Structural-Sealant Glazing Inspection: After installation of curtain wall systems are complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401, recommendations.
3. Field Water Testing: Testing of curtain walls for air infiltration and water resistance shall be performed according to ASTM E783 and ASTM E1105, applying same test pressures and requirements as listed under Section 1.2. Modified such that uncontrolled water is defined as water infiltrating the system or appearing on any interior surface from sources other than condensation.
4. Testing Extent: Five tests, areas as selected by Architect. All tests are to be certified by an accredited testing agency.
5. Curtain wall test to incorporate at least two bays wide by 1 floor high including the stack joint.
6. Any failed test will require an additional two areas to be tested in addition to retesting of the remediated failed specimen.

7. Construction sequence shall include provisions for timely completion of test areas.
8. Remedial measures shall maintain standards of quality and durability and are subject to approval
9. Test Reports: Shall be prepared according to AAMA 503.
10. Provide powered scaffold, water supply, power supply, manpower and necessary equipment.

C. Contractor is to repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
D. Contractor is to test all internal gutters by temporarily plugging weep holes and filling with water. After minimum fifteen minutes, inspect for water leakage. Correct deficiencies and retest until successful tests are achieved. Remove temporary weep hole plugs.
E. Contractor is responsible for ensuring adequate water supply and pressure to meet the specified requirements.
F. Additional testing and inspection due to failed tests will be performed to determine compliance of remediated or additional work with specified requirements. All costs for remediation and retesting shall be at the Contractor's expense. Additional expense shall include those of the testing agency, Architect and Consultant.

3.4 PROTECTION AND CLEANING

A. The Contractor shall remove from the installed work all mastic smears or other unsightly marks caused by his workmen, and shall be responsible for any damage to or disfigurement of the work caused at any time by other trades, as well as final cleaning and washing of glass and aluminum. The Wall Contractor shall advise the Contractor of proper and adequate protection and cleaning procedures during remainder of construction period so that system will be without damage and deterioration at time of acceptance.
B. Clean debris and excess fireproofing debris from behind curtain wall and exterior wall system secondary gutters during erection. Provide temporary closures to prevent accumulation.

3.5 ACCEPTANCE

A. Installed materials which are damaged, or which in the opinion of the Architect do not conform to the specification requirements, shall be removed and replaced with acceptable material at no additional cost to the Owner.
B. Demonstrate proper cleaning methods and materials to the Owner’s maintenance personnel.
C. Provide "As built" shop drawings and maintenance manuals per requirements of the project documents.
D. Prior to installation of any insulation, the secondary gutter system shall be inspected for cleanliness. The insulation shall not be installed until the Architect accepts the condition of the gutter system.

PART 4 APPENDIX

4.1 PRODUCT DATA / CUT SHEETS

A. Kawneer, 1600 Wall System 1 and System 2
B. Kawneer, 350 Medium Stile Entrance
C. Kawneer, Anodized Finishes chart

END OF SECTION

1600 Wall System™1 / System™2

Imposing Statements – Used Together or Independently

Knight Oil Tools Corporate Facility, Lafayette, LA
Architect: Donald J. Breaux Architect, Lafayette, LA
Glazing Contractor: Advantage Glass & Mirror, New Iberia, LA, with installation assistance from DeGeorge Glass Company, Inc., Metairie, LA

Building on the proven success of Kawneer's 1600 Wall System™ which set the standards for curtain wall engineering, 1600 Wall System™1 and 1600 Wall System™2 provide reliability with versatile features. Both are stick-fabricated, pressure glazed curtain walls for low-to-mid-rise applications and are designed to be used independently or as an integrated system to provide visual impact for almost any type of building.

- 1600 Wall System™1 is an outside glazed, captured curtain wall
- 1600 Wall System™2 is a Structural Silicone Glazed (SSG) curtain wall

Aesthetics

Even the smallest details of 1600 System™1/1600 Wall System™2 reflect the aesthetics and reliability that derive from Kawneer's precise engineering and experience. The joinery for both systems is accomplished with concealed fasteners to create unbroken lines and a monolithic appearance. When using optional, open back horizontal mullions, the fillers snap at the edge, producing an uninterrupted sight line.

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Performance

Key aspects of 1600 System™1 and 1600 Wall System™2 are enhanced for higher performance. Pressure equalization has been designed into the system and all components are silicone compatible to provide superior longevity. For installations where severe weather conditions are prevalent, 1600 Wall System™1 has been large missile hurricane impact and cycle tested. Proven through years of high performance, both systems are tested according to industry standards:

Air Performance	ASTM E-283
Static Water Penetration	ASTM E-331
Dynamic Water Penetration	AAMA 501.1
Structural Performance	ASTM E-330
"U" Value, CRF	AAMA 1503.1
Sound Transmission Rating	ASTM E 90-90
Seismic Performance	AAMA 501.4

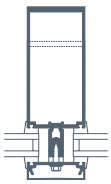
For the Finishing Touch

Architectural Class I anodized aluminum finishes are available in clear and Permanodic™ color choices.

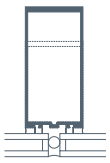
Painted Finishes, including fluoropolymer, that meet AAMA 2605 are offered in many standard choices and an unlimited number of specially-designed colors.

Solvent-free powder coatings add the green element with high performance, durability and scratch resistance that meet the standards of AAMA 2604.

Hunter Henry Center at Mississippi State University, Mississippi State, MS
Architect: Foil Wyatt Architects & Planners, P.A., Jackson, MS
Glazing Contractor: American Glass Company, Inc., Columbus, MS



1600 Wall System™1



1600 Wall System™2

1600 Wall System™1/1600 Wall System™2:

- for reliability
- for performance
- for versatility
- for a smooth, monolithic appearance
- for uninterrupted sight lines

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1600 Wall System™2 Curtain Wall

Features

- 1600 Wall System™2 is an outside glazed structurally silicone glazed curtain wall
- 1600 Wall System™2 has a 2-1/2" (63.5) sight line
- Standard 6" (152.4) or 7-1/2" (190.5) depth systems
- Standard infill options 1/4" (6.4) and 1" (25.4), other infills available
- Thermally Broken by means of a continuous 1/4" (6.4) low conductance spacer
- Concealed fastener joinery creates smooth, monolithic appearance
- Open-back horizontals and perimeters are available for cost savings
- Shear block fabrication method
- Corners and splayed mullions
- Offers integrated entrance framing systems
- Silicon compatible glazing materials for long-lasting seals
- 1600 Wall System™2 has been small and large missile impact and cycle tested
- Two color option
- Permanodic™ anodized finishes in seven choices
- Painted finishes in standard and custom choices

Optional Features

- Steel reinforcing
- Rain screen and backpans
- Optional deep profile and bull-nose covers
- Deep and heavy-weight mullions
- Fiberglass pressure plates
- Veneer system
- Integrates with standard Kawneer windows and GLASSvent™ windows for curtain wall
- Integrates with Versoleil™ SunShade Outrigger System and Horizontal Single Blade Systems
- Profit$Maker™ Plus die sets
- Hurricane impact resistant framing option: 7-13/16" (198.4)

Product Applications

- Ideal for low to mid-rise applications where high performance is desired
- It is also the right choice for high span applications

For specific product applications,
Consult your Kawneer representative.

190, 350 and 500 Standard Entrances

Single Source Packages Generate Versatile First Impressions

Garland Special Events Center, Garland, TX
Architect: HKS, Inc., Dallas, TX
Glazing Contractor: B & B Glass, Inc., Dallas, TX

Tough yet attractive, the clean lines of Kawneer's Standard Entrances are designed as a single-source package of door, door frame and hardware that is easily adaptable to custom requirements. Designed to complement new or remodel construction, modern or traditional architecture, they are engineered, constructed and tested to make good first impressions while withstanding the rigors of constant use by occupants and visitors.

Performance

To resist both lever arm and torsion forces that constantly act on any door, all three entrances feature welded corner construction with Sigma deep penetration and fillet welds plus mechanical fastenings at each corner – a total of 16 welds per door. Each door corner comes with a Limited Lifetime Warranty, good for the life of the door under normal use operation. It is transferable from building owner to owner and is in addition to the standard two-year warranty covering material and workmanship of each Kawneer Door.

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1. Thermoplastic elastomer weatherstrip in blade-stop of frame jambs, header or transom bar.
2. Integral polymeric fin is attached to adjustable astragal creating an air barrier between pairs of doors.
3. Optional surface-applied bottom weatherstrip with flexible blade gasket. Extruded raised lip on threshold to provide a continuous contact surface for bottom weatherstrip.
4. Standard 1/4" beveled glass stops sheet water and dirt off without leaving residue.
5. Available in all finishes offered by Kawneer.

The 190 Narrow Stile Entrance

- Is engineered for moderate traffic in applications such as stores, offices and apartment buildings
- Vertical stile measures 2-1/8"; top rail 2-1/4" and bottom rail 3-7/8"
- Results in a slim look that meets virtually all construction requirements

The 350 Medium Stile Entrance

- Provides extra strength for applications such as schools, institutions and other high traffic applications
- Vertical stiles and top rails measure 3-1/2"
- Bottom rail measures 6-1/2" for extra durability

The 500 Wide Stile Entrance

- Creates a monumental visual statement for applications such as banks, libraries and public buildings
- Vertical stiles and top rail are 5"; bottom rail measures 6-1/2"
- Results in superior strength for buildings experiencing heavy traffic conditions

Economy

Kawneer's Sealair™ bulb neoprene weatherstripping forms a positive seal around the door frame and provides a substantial reduction in air infiltration, resulting in improved comfort and economies in heating and cooling costs. The system is wear and temperature-resistant and replaces conventional weathering. Bottom weatherstrip at the interior contains a flexible blade gasket to meet and contact the threshold, enhancing the air and water infiltration performance characteristics.

For the Finishing Touch

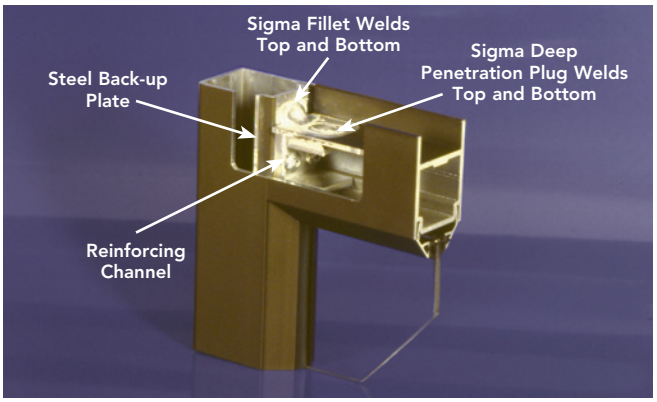
Architectural Class I anodized aluminum finishes are available in clear and Permanodic™ color choices.

Painted finishes, including fluoropolymer, that meet AAMA 2605 are offered in many standard choices and an unlimited number of specially designed colors.

Solvent-free powder coatings add the green element with high performance, durability and scratch resistance that meet the standards of AAMA 2604.

General

- Heights vary to 10'; widths range from approximately 3' to 4'
- Door frame face widths range to a maximum of 4", while depths range to 6"
- Door operation is single or double-acting with maximum security locks or Touch Bar Panics standard
- Architect's Classic one inch round, bent bar push/pull hardware is available in various finishes and sizes
- Infills range from under 1/4" to more than 1"



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Norcross, GA 30092

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Features

- 190 narrow stile has 2-1/8" (54) vertical stile, 2-1/4" (57.2) top and 3-7/8" (98.4) bottom rail
- 350 medium stile has 3-1/2" (88.9) vertical stile, 3-1/2" (88.9) top and 6-1/2" (165.1) bottom rail
- 500 wide stile has 5" (127) vertical stile, 5" (127) top and 6-1/2" (165.1) bottom rail
- Door is 1-3/4" (44.5) deep
- Dual moment welded corner construction
- Single or double acting
- Infills range from 1/4" (6.4) to 1" (25.4)
- Offset pivots, butt hinges, continuous geared hinge or center pivots
- MS locks or panic hardware
- Surface mounted or concealed closers
- Architects Classic push/pulls
- Adjustable astragal utilizing pile weathering with polymeric fin at meeting stiles
- Polymeric bulb weatherstripping in door frames
- Permanodic™ anodized finishes in seven choices
- Painted finishes in standard and custom choices

Optional Features

- Paneline™ exit device or Paneline™ EL exit device
- Wide variety of bottom rail and cross rail

Product Applications

- 190 narrow stile - engineered for moderate traffic in applications such as offices and stores
- 350 medium stile - provides extra strength for schools, institutions and other high traffic applications
- 500 wide stile - creates a monumental visual statement for banks, libraries or buildings that experience heavy traffic conditions

For specific product applications,
Consult your Kawneer representative.