

SECTION 08 44 13
CURTAIN WALL SYSTEMS (CWS) (Revised AD-8)

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: an outside-glazed, aluminum Curtain Wall Systems (CWS), including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
- B. Work installed but not furnished:
 - 1. Exterior Glass and glazing: Section 08 81 02.
 - 2. Finish Hardware (items not listed herein): Specified in Section 08 71 00.
- C. Section includes: an outside-glazed, aluminum framed Skylights and Sloped curtain wall areas , including perimeter trims, curb receivers, flashings, accessories, shims and anchors, and sealants.

1.2 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. Experienced in the installation of curtainwall systems similar in size and scope indicated for this project.
 - b. Installer who is trained by, and approved of by curtainwall manufacturer.
 - 2. Manufacturer Qualifications:
 - a. Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving installation methods.
- B. Pre-installation meeting:
 - 1. Conduct Pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
- C. Fabrication, erection and finishing standards: Applicable standards of AA, AAMA and AWS.
- D. Welding and welders:
 - 1. Utilize skilled and qualified welders, licensed where required in accordance with local building regulations.
 - 2. Perform welding in conformance with AWS structural welding code.

1.3 DESIGN CRITERIA

- A. Provide engineering design performed and sealed by registered Engineer, licensed to practice Structural Engineering in the State of New York.
 - 1. Design curtainwall system to satisfy requirements of applicable building codes.
- B. Design framing and anchorage systems to allow for:
 - 1. Expansion and contraction, caused by changes in surface temperature equal to DT (delta T).
 - a. DT for this project: 200 DegF.
 - b. Thermal contraction/expansion in this range shall not cause buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects over this temperature range.
 - c. Operating windows and doors shall function normally over this temperature range.
 - 2. Structural movements of building structure:
 - a. Inter-story drift caused by wind or earthquake forces.
 - 1) $h/400$ max.

- b. Live load deflection of the supporting members.
 - 1) $L/360$.
- C. Primary Seal at Perimeter:
 - 1. Locate inboard of back plane of glazing pocket.
- D. Drainage:
 - 1. Design Curtainwall System to intercept, collect, contain, and drain water (which may infiltrate system) harmlessly to exterior.

1.4 MOCK-UP WALL

- A. Erect a Mock-up Wall 2 bays wide and 2 stories high.
 - 1. Install complete with glass, glazing, insulation, spandrels, anchors and other components required to create entire assembly.
- B. Perform Field Testing on Mock-up Wall.
 - 1. Evaluate appearance, anchorage, and weathertightness.
 - 2. If unit is not acceptable, modify and/or remove and re-construct new Mockup Wall and retest, until assembly is accepted.
- C. Finally accepted Mock-up serves as standard of quality for remainder of curtain wall construction.
- D. Mock-up Wall may be retained in place as a permanent part of the building.
 - 1. If constructed separate from the building, Mock-up Wall shall remain intact during balance of curtainwall installation, and used for comparative purposes.

1.5 DESIGN LOADS

- A. Design Curtainwall systems and anchorage to meet Design Load.
 - 1. Use the greater of the following:
 - a. Wind Pressures listed on Design Requirements on Structural Drawings.
 - b. Wind Pressures defined by Building Code as locally adopted and amended.
 - 2. Limit deflection to values specified for "Uniform Load Test".
 - a. Comply with local Building Code where more restrictive.
- B. Design Skylights and/or Sloped Curtainwall Systems and anchorage to meet Design Load.
 - 1. Wind Load: Use the greater of the following:
 - a. Wind Pressures listed on Design Requirements on Structural Drawings.
 - b. Wind Pressures defined by Building Code as locally adopted and amended.
 - c. 195 kPa 40 PSF.
 - 2. Snow Load: Use the greater of the following:
 - a. Wind Pressures listed on Design Requirements on Structural Drawings.
 - b. Wind Pressures defined by Building Code as locally adopted and amended.
 - 3. Limit deflection to $L/175$ and allowable stress with a safety factor of 1.65
 - a. Comply with local Building Code where more restrictive.

1.6 LABORATORY TESTS

- A. General:
 - 1. Systems proposed for use on this project shall tested to ensure that they meet performance criteria listed in this Article.
 - a. Utilize independent testing laboratories specifically qualified to conduct performance tests required.
 - b. Laboratory tests may be conducted in manufacturer's laboratories provided they are witnessed and certified by qualified independent testing laboratory personnel.
 - 2. Perform tests on full sized unit for project or a minimum 2-story high, 20 FT-wide, unit.
 - a. Mount specimen in test chamber in exact accordance with job conditions including anchorage system, caulking, sealing, etc.

- b. Unit for test to be completely assembled glazed unit.
 - c. Thermal tests may be conducted on a 4x6 FT unit.
 - d. Test air infiltration first, water resistance second.
 - e. Other tests may be in any order.
3. Pre-construction Laboratory Testing from certified lab will be acceptable (in lieu of “job-specific testing”).
- a. Lab Test Reports, indicating compliance with specified criteria must be based on a test unit that accurately represents the product currently being produced for use on subject project.
 - 1) Base and Optional Manufacturers: Test reports may be up to 10 years old.
 - 2) Manufacturers not listed as Base or Optional: Test reports may be up to 5 years old.
- B. Air Infiltration Test:
- 1. Test specimens in accordance with ASTM-E283.
 - 2. Maximum Air Infiltration:
 - a. Fixed wall areas: 0.06 CFM/FT² when tested at 6.24 PSF.
 - b. Swinging Doors:
 - 1) Single: 0.50 CFM/FT² when tested at when tested at 6.24 PSF.
 - 2) Pairs: 1.0 CFM/FT² of perimeter crack, when tested at when tested at 1.56 PSF.
- C. Water Resistance Tests:
- 1. Static:
 - a. Test specimen in accordance with ASTM-E331.
 - b. No water leakage (as defined in AAMA 501) allowed with a when tested at static air pressure differential of 12 PSF.
 - 2. Dynamic:
 - a. Test specimen in accordance with AAMA 505.1.
 - b. No water leakage (as defined in AAMA 501) allowed with a when tested at an air pressure differential of 12 PSF.
- D. Uniform Load Tests:
- 1. Test specimen in accordance with ASTM-E330.
 - a. Apply 40 PSF static air pressure load to the specimen in the positive and negative direction.
 - 1) Spans less than 13 FT– 6 IN: There shall be no deflection in excess of L/175 of the span of any framing member.
 - 2) Spans greater than 13 FT– 6 IN: and less than 40 FT: There shall be no deflection in excess of L/240 plus 1/4 IN of the span of any framing member.
 - b. Increase test load pressure to 60 PSF: No glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
- E. Thermal Transmittance (U-Value):
- 1. When tested to AAMA Specification 1503, the thermal transmittance (U-value) shall not exceed the following as defined by AAMA 507:

Thermal Transmittance		
(Base Products: "1600 Wall - Systems 1 & 2" by Kawneer)		
System Type	Maximum U-Value (BTUH / FT ² / DegF)	
	Clear Glass	Low-E Glass
Units with pressure plate and caps (Captured)	0.66	0.45
Units with structural silicone glazing (SSG)	0.58	0.45

General Notes:

1. U-Values indicated are based on 1 IN insulating glass units made with 2 layers of 6mm glass and 1/2 IN air space.
2. Values for Low-E column: Based on E=0.20, Argon-filled space, and warm-edge spacer.

F. Condensation Resistance (CRF):

1. When tested to AAMA Specification 1503, the condensation resistance factor (CRF) shall not be less than the following:

Thermal Performance			
(Base Products: "1600 Wall - Systems 1 & 2" by Kawneer)			
System Type	Minimum CRF		
	Component	Clear Glass	Low-E Glass
Units with pressure plate and caps (Captured)	Glass	61	68
	Frame	71	73
Units with structural silicone glazing (SSG)	Glass	59	67
	Frame	76	75

General Notes:

1. CRF values indicated are based on 1 IN insulating glass units made with 2 layers of 6mm glass and 1/2 IN air space.
2. Values for Low-E column: Based on E=0.20, Argon-filled space, and warm-edge spacer.

G. Seismic:

1. When tested to AAMA 501.4, system must meet design displacement of 0.10 x the story height and ultimate displacement of 1.5 x the design displacement.

H. Sound Transmission Loss:

1. Test in accordance with ASTM-E90.
2. Minimum Sound Transmission Class (STC): Not less than 34.

I. Test of anodic seal:

1. Perform acid dissolution test on sealed anodized finish.
2. Perform in accordance with ASTM-B680.
3. Maximum permissible loss: 2.6 mg/IN².
4. Furnish certified test report indicating that test was performed on aluminum for this project.
5. Furnish 1 test for each 50,000 FT² of material.

1.7 SUBMITTALS

A. Shop Drawings.

1. Elevations, Sections & Details:
 - a. Show the locations of connections to building superstructure.
 - b. Key Shop Drawing Elevations to Structural Calculations and/or list the loads which will be imposed on the building superstructure by the curtain wall system.
 - c. Include depiction of glazing units showing locations and types for review and approval.

B. Samples.

1. Range of anodic finishes.
2. Manufacturer's standard line of PVF finishes for color selection by Architect.

3. Finish hardware and fastening items.
- C. Project information:
1. Structural calculations prepared by a registered Engineer (licensed to practice Structural Engineering in the state where project is located) made by or for curtainwall manufacturer for review of interface between curtainwall support system and building structural frame.
 - a. Employ loads specified in "Design Loads" article in PART 1.
 - b. Submit concurrently with Shop Drawings.
 2. Laboratory Test Reports:
 - a. Reports conducted by certified independent laboratory that demonstrate compliance with performance values listed in "Laboratory Tests" article in PART 1.
 3. Field Test Reports.
- D. Contract Closeout Information:
1. Warranty.
 2. Maintenance Data.
- E. LEED Information:
1. LEED Credits MR 4.1 and 4.2, Recycled Content: Product data indicating percentages by weight of post-consumer and post-industrial recycled content for products having recycled content; include statement indicating costs for each product having recycled content.
 2. LEED Credit MR 5.1 and 5.2, Regional Materials: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.8 WARRANTY

- A. Weathertightness Warranty:
1. Written warranty signed jointly by fabricator, installer and Contractor, agreeing to repair or replace work performed under this section which fails.
 2. Failure includes defects in materials, workmanship, water tightness of assembly, caulking, glazing or other defects in system which affects its ability to perform as weathertight envelope.
 3. Warranty period: 5 years.
- B. Warranty on color integrity of 70% Kynar PVDF finishes:
1. PVDF Warranty period: 20 years.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection:
1. Store materials protected from exposure to harmful weather conditions.
 2. Handle material and components to avoid damage.
 3. Protect curtainwall material against damage from elements, construction activities, and other hazards before, during and after curtainwall installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Acceptable manufacturers:

1. Curtainwall System (CWS):
 - a. Base:
 - 1) Kawneer.
 - b. Optional:
 - 1) Oldcastle Glass, Vistawall.
 - 2) Wausau Window and Wall Systems.
2. Skylights and/or Sloped Curtainwall Systems:
 - a. Base:
 - 1) Kawneer.
 - b. Optional:
 - 1) Wausau Window and Wall Systems.
 - 2) Vistawall Architectural Products..

2.2 FRAMING SYSTEM - GENERAL

- A. Materials - Aluminum Framing and Components:
 1. Material Standard: Extruded Aluminum, ASTM-B221, 6063-T5 alloy and temper.
 2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
 3. Member Depth and internal reinforcing:
 - a. Comply with frame depths indicated wherever possible.
 - b. Increase depth as required to structural strength necessary to resist Design Loads.
 4. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.
 5. Provide strike boxes at all openings in framing system.
- B. Base Product:
 1. Curtainwall:
 - a. 1600 Unit Wall System 1 by Kawneer Company, Inc.

2.3 ACCESSORIES

- A. Fasteners:
 1. Where exposed, shall be Stainless Steel.
 2. Where not exposed: Select material at manufacturer's option, subject to galvanic compatibility with materials being joined.
- B. Gaskets: Glazing gaskets shall comply with ASTM-C864 and be extruded of a silicone-compatible EPDM rubber that provides for silicone adhesion.
- C. Perimeter Anchors: Aluminum.
 1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- D. Thermal Barrier: Thermal separator shall be extruded of a silicone-compatible elastomer that provides for silicone adhesion.
- E. Interior Stools (aluminum):
 1. Aluminum extrusions and associated clips and fasteners.
- F. Doors:
 1. Fabricate of extruded sections assembled with tension rods, or welded corners.
 2. Dimensions:
 - a. Member Wall Thickness: 0.125 IN (minimum).
 - b. Member Depth: 1-3/4 IN.
 - c. Stiles and Top Rail:
 - 1) Medium:
 - a) 3-1/2 IN.
 - b) Base Product: "350 Swing Door, Medium Stile" by Kawneer.

- d. Bottom Rail: 12 IN.
 - 3. Include wear shield on bottom rail.
 - 4. Offset Pivots: Specified in Section 08 71 00.
 - 5. Provide manufacturer's standard weatherstripping at edges and door bottom.
 - 6. Prepare and reinforce doors to receive additional hardware specified in Section 08 71 00.
- G. Sun shades:
- 1. Inclusive of aluminum outriggers, louvers and fascia.
 - a. Wedge shaped outriggers supported from mullions, projecting approximately 30 IN from face of glass, unless otherwise indicated.
 - b. Minimum 4 evenly spaced circular louvers between outriggers.
 - c. Angular fascia.
 - 2. Mounted as indicated.
 - 3. Base product: Kawneer 1600 Sun Shade, Wedge Outrigger, Circular Louver, Angular Fascia.

2.4 RELATED MATERIALS

- A. Perimeter Sealants: Specified in Section 07 92 13.
- B. Glass and glazing:
 - 1. Specified in Section 08 81 02.

AD-8: Section 08 44 13: Add paragraph 2.4.C.

C. Shadow box panels: Aluminum composite material:

- 1. Specified in Section 07 42 43.
- 2. Sized to fit and cover opening.
- 3. Complete with stainless steel screw fasteners for attachment to backside of curtainwall frame.

2.5 FABRICATION - GENERAL

- A. General:
 - 1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
 - 2. Accurately fit and secure joints and corners.
 - 3. Make joints flush, hairline and weatherproof.
 - 4. Prepare components to receive anchor devices.
 - 5. Fabricate anchors.
 - 6. Arrange fasteners and attachments to conceal from view.
- B. Weld by methods recommended by manufacturer and AWS to avoid discoloration.
 - 1. Grind exposed welds smooth and restore finish.
- C. Maintain true continuity of line and accurate relation of planes and angles.
- D. Separate dissimilar metals with bituminous paint or preformed separators to prevent corrosion.
- E. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts to permanently prevent freeze-up of joint.
- F. Provide tubular and solid extruded aluminum mullions and horizontal rail shapes with sharp well defined corners and flush sight lines.
- G. Provide means to intercept, collect, contain and weep moisture accumulation harmlessly to exterior.
- H. Reinforce work as necessary for performance requirements, and for support to structure.
- I. Provide continuous solid or semi-rigid vinyl or cast urethane insulating materials to fully separate exterior exposed portions of aluminum from interior portions.

- J. Use no bolts, screws or other hardware components, metallic fastenings, etc. that will impair independent frame movement or thermal barrier effectiveness.
- K. Reinforce doors and frames and hardware.

2.6 FABRICATION SKYLIGHTS AND/OR SLOPED CURTAINWALL

- A. Major framing shall be factory prepared for job site assembly and sealed according to manufacturers recommended procedures.
- B. Rafters and Purlin Members:
 - 1. Integral drainage gutters in both the glazing pocket and inside the glass plane to drain moisture to the exterior.
 - 2. Flexible thermal break material at exterior side of the glass plane.
 - 3. Joints between Rafter and Intermediate Purlins:
 - a. Made without the use of clips.
 - b. Do not locate joint fasteners within the interior drainage gutter.
- C. Structural Silicone Glazed Purlin (where indicated):
 - 1. Minimum width of weather seal joint of silicone: 3/4 IN.
 - 2. Design interior structural joint design to withstand the maximum anticipated combined loads (with 6:1 safety factor).
 - 3. Apply silicone in accordance with sealant manufacturer's recommendations.
 - 4. Insulating glass units shall be of a construction suitable for structural silicone glazing.
 - 5. Completed joint will result in no through-metal or projecting fins exposed to the exterior.
- D. Sill Members:
 - 1. Run continuously past the Rafter Members creating a drainage gutter.
 - 2. Design with weep holes and silicone exterior glazing seal not less than 3/16 IN wide.
 - 3. Fasten aluminum pressure plates to the main grid members.
- E. Interior Glazing Seals:
 - 1. Resilient elastomers installed in the main framing members.

2.7 70% PVDF COATINGS

- A. General:
 - 1. Superior-performing, complying with AAMA 2605, and containing at least 70% PVDF (Hylar 500™ or Kynar 500®) resin.
 - 2. Pre-treatment process: Manufacturer's standard.
 - 3. Factory-applied, oven-baked.
 - 4. Specular Gloss (ASTM-D523): 30 +/-5 measured at 60 degree meter setting.
- B. Primer:
 - 1. DFT: 0.2 to 0.4 mils.
 - 2. Base Product: "Fluorprime" by Valspar.
- C. Topcoat:
 - 1. DFT: 1.0 to 1.3 mils.
 - 2. Base Product: "Fluropon" as formulated by Valspar for Kawneer.
 - 3. Base Product: "Fluropon" by Valspar.
 - 4. Base Product: "Duramar" by PPG.
 - 5. Base Product: "Sunstorm" by PPG.
 - 6. Base Product: "Trinar" by Akzo.
 - 7. Base Product: "Fluoroceram" by BASF.:
 - 8. Color:
 - a. Standard colors:
 - 1) To be selected from manufacturers stock colors.

2.8 SOURCE QUALITY CONTROL

- A. Source Quality:
 - 1. Provide Curtainwall systems and components specified herein from a single source.
 - 2. Curtainwall system (specified herein) and the following items shall be provided by the same manufacturer:
 - a. Aluminum Storefront.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Verify that substrate conditions, previously installed under other sections, are acceptable for Curtainwall installation in accordance with manufacturer's instructions.
 - 2. Verify openings are sized to receive Curtainwall System and sill plates are level in accordance with manufacturer's acceptable tolerances.
 - 3. Field Measurements:
 - a. Verify actual measurements/openings by field measurements before fabrication.
 - b. Show recorded measurements on Shop Drawings.
 - c. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION

- A. General:
 - 1. Install Curtainwall Systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions.
 - a. Provide adequate supports and anchor in place.
 - 2. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 3. Comply fully with manufacturer's shop drawings, erection drawings, and recommendations for installation.
 - 4. Anchor securely in place.
 - 5. Separate metal surfaces from sources of corrosion or electrolytic action.
 - 6. Set sill and base members in a bed of sealant.
 - 7. Provide joint fillers or gaskets for weathertight construction.
 - a. Calk joints within and at perimeter of system.
- B. Glazing:
 - 1. General:
 - a. Glass shall be outside-glazed.
 - b. Secure glass to mullions using one or more of the following, as indicated.
 - 2. Captured Lites: Mechanically secured in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9 IN on center.
 - 3. SSG Lites: Glass bonded in place with silicone bonded to aluminum mullions.
- C. Water Drainage:
 - 1. Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations.
 - 2. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

3.3 FIELD QUALITY CONTROL

- A. Field Tests - General:
 - 1. Architect shall select Curtainwall units to be tested as soon as a representative portion of each Curtainwall type used on the project has been installed, glazed, perimeter caulked and cured.

2. Where test results do not meet specified performance requirements: Correct deficiencies, and implement improved installation procedures for completing the balance of Curtainwall system.
- B. Hose Test (AAMA 501.2):
1. Test for water penetration in accordance with AAMA Standard 501.2, "Specifications for Field Check of Metal Curtain walls for Water Leakage".
- C. Manufacturer's Field Services:
1. Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation.

3.4 PROTECTION AND CLEANING

- A. Protection:
1. Protect installed product's finish surfaces from damage during construction.
 2. Protect Curtainwall System from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- B. Cleaning:
1. Repair or replace damaged installed products.
 2. Clean installed products in accordance with manufacturer's instructions prior to BNL's acceptance.
 3. Remove construction debris from project site and legally dispose of debris.

END OF SECTION