

SECTION 084413: GLAZED ALUMINUM CURTAIN WALLS

This suggested guide specification has been developed using the current edition of the Construction Specifications Institute (CSI) "Manual of Practice," including the recommendations for the CSI three-part Section Format and the CSI Page Format. Additionally, the development concept and organizational arrangement of the American Institute of Architects (AIA) MasterSpec® Program has been recognized in the preparation of this guide specification. Neither CSI, AIA, USGBC, nor ILFI endorse specific manufacturers and products. The preparation of the guide specification assumes the use of standard contract documents and forms, including the "Conditions of the Contract," published by the AIA.

EDITOR NOTE: Instructions to the editor appear in RED. This style does not exist in the standard CSI template.

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section covers Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
- B. Types of Kawneer Aluminum Curtain Wall Systems include:

EDITOR NOTE: Choose Curtain Wall type based on project requirements. Delete Curtain Wall types that do not apply to this project.

- 1. Clearwall® Curtain Wall System - SS (Screw Spline):
 - a. Clearwall® (SS):
 - 1) Sightline: 2-1/2" (63.5 mm)
 - 2) Outside glazed with recessed glass edge spacer by qualified insulated glass unit (IGU) manufacturer
 - 3) System depth: 5-1/8" (130.2 mm) or 6-5/8" (168.3 mm)
 - b. Clearwall® (SSI):
 - 1) Sightline: 2-1/2" (63.5 mm)
 - 2) Outside glazed with metal interfaced insulating glass (interface shop applied with structural silicone)
 - 3) System depth: 6" (152.4 mm) or 7-1/2" (190.5 mm)
 - c. Clearwall® (SSIT):
 - 1) Sightline: 2-1/2" (63.5 mm)
 - 2) Outside glazed with metal interfaced insulating glass (interface shop applied with 3M™ VHB™ structural glazing tape)
 - 3) System depth: 5-7/8" (149.0 mm) or 7-3/8" (187.0 mm)
- 2. Clearwall® Curtain Wall System - SB (Shear Block):
 - a. Clearwall® (SB):

- 1) Sightline: 2-1/2" (63.5 mm)
- 2) Outside glazed with recessed glass edge spacer by qualified insulated glass unit (IGU) manufacturer
- 3) System depth: 10-1/8" (257.2 mm)
- b. Clearwall® (SBI):
 - 1) Sightline: 2-1/2" (63.5 mm)
 - 2) Outside glazed with metal interfaced insulating glass (interface shop applied with structural silicone)
 - 3) System depth: 11" (279.4 mm)
- c. Clearwall® (SBIT):
 - 1) Sightline: 2-1/2" (63.5 mm)
 - 2) Outside glazed with metal interfaced insulating glass (interface shop applied with 3M™ VHB™ structural glazing tape)
 - 3) System depth: 10-27/32" (275.4 mm)

C. Related Sections:

EDITOR NOTE: The sections listed below are specified elsewhere. However, Kawneer recommends single-source responsibility for all of these sections as described in the Quality Assurance article below.

1. 072700: Air Barriers
2. 079200: Joint Sealants
3. 083213: Sliding Aluminum-Framed Glass Doors
4. 084113: Aluminum-Framed Entrances and Storefronts
5. 084313: Aluminum-Framed Storefronts
6. 085113: Aluminum Windows
7. 088000: Glazing
8. 122600: Interior Daylighting Devices

1.3 DEFINITIONS

- A. For fenestration industry standard terminology and definitions, refer to the Fenestration & Glazing Industry Alliance (FGIA) Glossary (AAMA AG-13).

1.4 PERFORMANCE REQUIREMENTS

A. General Performance:

1. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of glazed aluminum curtain walls representing those indicated for this project.
2. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
3. Failure includes any of these events:
 - a. Thermal stresses transferring to building structure
 - b. Glass breakage

- c. Loosening or weakening of fasteners, attachments, and other components
 - d. Failure of operating units
- B. Delegated Design:
 - 1. Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind Loads:

EDITOR NOTE: Provide wind load design pressures in PSF and include applicable building code and year edition.

- 1. The curtain wall system shall include anchorage that is capable of withstanding the following wind load design pressures:
 - a. Inward: () psf or () Pa
 - b. Outward: () psf or () Pa
 - 2. The design pressures are based on the () Building Code, () Edition.
- D. Air Leakage:

EDITOR NOTE: Performance results for air infiltration are based upon ASTM and AAMA standards. Consult your local Kawneer representative concerning specific project performance requirements.

- 1. The test specimen shall be tested in accordance with TAS 202 and ASTM E 283.
 - 2. Air infiltration rate shall not exceed 0.06 cfm/ft² (0.3 l/s · m²) at a static air pressure differential of 6.2 psf (300 Pa).
- E. Water Resistance:

EDITOR NOTE: Performance results for water resistance are based upon ASTM and FGIA/AAMA standards. Consult your local Kawneer representative concerning specific project performance requirements, sill flashing details, and installation instructions.

- 1. Static:
 - a. The test specimen shall be tested in accordance with TAS 202 and ASTM E 331.
 - b. There shall be no leakage at a minimum static air pressure differential of 15 psf (720 Pa) as defined in AAMA 501.
 - 2. Dynamic:
 - a. The test specimen shall be tested in accordance with AAMA 501.1.
 - b. There shall be no leakage at an air pressure differential of 15 psf (720 Pa) as defined in AAMA 501.
 - c. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation.
 - d. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.
- F. Structural-Test Performance:
 - 1. Test according to ASTM E 330 and TAS 202.
 - 2. When tested at positive and negative wind load design pressures, assemblies do not evidence deflection exceeding L/175 of clear span.

3. A static air design load of 40 psf (1915 Pa) shall be applied in the positive and negative direction.
 - a. When tested at 150% of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2% percent of clear span.
 - b. Minimum test duration according to ASTM E 330 is 10 seconds.
- G. Structural-Test Performance:
 1. Based on Aluminum Association "Specification for Aluminum Structures" or CSA CAN3-S157 "Strength Design in Aluminum".
 2. There shall be no deflection exceeding L/175 of the span of any framing member at design load.
- H. Deflection of Framing Members at Design Wind Pressure:
 1. Deflection Normal to Wall Plane:
 - a. Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite, or an amount that restricts edge deflection of individual glazing lites to 3/4" (19 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane:
 - a. Operable Units - Provide a minimum 1/16-inch (1.6 mm) clearance between framing members and operable units.

EDITOR NOTE: Two options follow for deflection parallel to glazing plane. Include the applicable one.
 - b. Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller
 - c. Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm)
 3. Cantilever Deflection:
 - a. Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.
- I. Thermal Movements:
 1. Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:
 - a. Temperature Change (Range): 120 °F (49 °C), ambient; 180 °F (82 °C), material surfaces.
 - b. Test Interior Ambient Air Temperature: 75 °F (24 °C).
 - c. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
- J. Seismic:
 1. When tested to AAMA 501.4, system must meet design displacement (elastic) of 0.010 times the story height and ultimate displacement (inelastic) of 1.5 times the design displacement.
 2. Clearwall® SSI/SSIT: When tested to AAMA 501.6, system must meet dynamic seismic drift causing glass fallout (Δ Fallout) of 6" or 0.0300 times the story height.

K. Thermal Transmittance (U-factor), Physical Test:

EDITOR NOTE: This document contains two Thermal Transmittance sections. Retain the one that applies to your project and delete the other one.

EDITOR NOTE: Refer to thermal transmittance charts in the Architectural Detail Manual in accordance with AAMA 507 for project-specific U-factors, solar heat gain coefficient (SHGC), and visible transmittance (VT). Refer to thermal performance matrix for NFRC values.

1. Thermal transmittance test results in accordance with AAMA 1503 are based upon 1-1/8" (28.6 mm) low-emissivity coated glass insulating unit, e=0.04 #2, air filled, with aluminum spacer.
2. Clearwall® SS: When tested using AAMA 1503, fixed glazing and framing areas shall have U-factor of no more than 0.39 Btu/(hr·ft²·°F).

L. Thermal Transmittance (U-factor), Simulation:

EDITOR NOTE: This document contains two Thermal Transmittance sections. Retain the one that applies to your project and delete the other one.

EDITOR NOTE: Refer to thermal transmittance charts in the Architectural Detail Manual in accordance with AAMA 507 for project-specific U-factors, solar heat gain coefficient (SHGC), and visible transmittance (VT). Refer to thermal performance matrix for NFRC values.

1. Thermal transmittance simulation results using NFRC 100 or AAMA 507 are based on a Center of Glass (COG) U-factor of 0.24 Btu/(hr·ft²·°F) and a warm-edge spacer.
2. Clearwall® (SS): When simulated using NFRC 100 or AAMA 507, the U-factor shall not be more than 0.30 Btu/(hr·ft²·°F) or project specific (____) Btu/(hr·ft²·°F) per AAMA 507 or (____) Btu/(hr·ft²·°F) per NFRC 100.
3. Clearwall® (SSI/SSIT): When simulated using NFRC 100 or AAMA 507, the U-factor shall not be more than 0.27 Btu/(hr·ft²·°F) or project specific (____) Btu/(hr·ft²·°F) per AAMA 507 or (____) Btu/(hr·ft²·°F) per NFRC 100.
4. Clearwall® (SB): When simulated using NFRC 100 or AAMA 507, the U-factor shall not be more than 0.30 Btu/(hr·ft²·°F) or project specific (____) Btu/(hr·ft²·°F) per AAMA 507 or (____) Btu/(hr·ft²·°F) per NFRC 100.
5. Clearwall® (SBI/SBIT): When simulated using NFRC 100 or AAMA 507, the U-factor shall not be more than 0.27 Btu/(hr·ft²·°F) or project specific (____) Btu/(hr·ft²·°F) per AAMA 507 or (____) Btu/(hr·ft²·°F) per NFRC 100.

M. Condensation Resistance Factor (CRF) or Temperature Index (TI):

1. If using CRF, when tested using AAMA 1503, the CRF_{frame} and CRF_{glass} (with low-emissivity glazing) shall not be less than 78 and 61 respectively for Clearwall® SS.
2. If using TI, when tested to CSA A440-00, the TI_{frame} and TI_{glass} (with low-emissivity glazing) shall not be less than 74 and 56 respectively for Clearwall® SS.

N. Solar Heat Gain Coefficient:

1. Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than (____) as determined according to NFRC 200.

O. Sound Transmission Loss:

1. Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:

- a. Clearwall® (SS): STC 33 or OITC 28 when tested for laboratory sound transmission loss according to ASTM E 90 and ASTM E 1425, and based on 1-1/8" (28.6 mm) insulating glass (1/4", 5/8" AS, 1/4").
 - b. Clearwall® (SSI): STC 37 or OITC 30 when tested for laboratory sound transmission loss according to ASTM E 90 and ASTM E 1425, and based on 1" (25.4 mm) insulating glass (1/4", 1/2" AS, 1/4" laminated).
- P. Windborne-Debris-Impact Resistance Performance:
- 1. Performance shall be tested in accordance with ASTM E1886 and information in ASTM E1996:
 - a. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade
 - b. Small-Missile Impact: For aluminum-framed systems located above 30 feet (9.1 m) of grade
- Q. Environmental Product Declaration (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.5 SUBMITTALS

- A. Product Data:
- 1. For each type of product indicated, include:
 - a. Construction details
 - b. Material descriptions
 - c. Dimensions of individual components and profiles
 - d. Finishes
 - 2. Recycled Content:

EDITOR NOTE: Include these Recycled Content specifications if needed to meet project requirements or for a project that includes Green Building Certifications such as LEED, Living Building Challenge (LBC), etc.

EDITOR NOTE: If Recycled Content requirements are not specified, prime (zero recycled content) aluminum could be supplied.

 - a. Provide documentation that aluminum has a minimum of 50% mixed pre- and post-consumer recycled content.
 - b. Provide a sample document illustrating project-specific information that will be provided after product shipment.
 - c. After product has shipped, provide project-specific recycled content information:
 - 1) Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
 - 2) Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
 - 3) Indicate the location for recovery of recycled content.
 - 4) Indicate the location of the manufacturing facility.
 - 3. Environmental Product Declaration (EPD):
 - a. Include a Type III Product-Specific EPD created from a Product Category Rule.

- B. Shop Drawings:
 - 1. Plans
 - 2. Elevations
 - 3. Sections
 - 4. Full-size details
 - 5. Attachments to other work
- C. Samples for Initial Selection:
 - 1. Provide samples for units with factory-applied color finishes.
- D. Samples for Verification:
 - 1. Provide a verification sample for each type of exposed finish required, in manufacturer's standard sizes.
- E. Product Test Reports:
 - 1. Provide test reports for glazed aluminum curtain walls.
 - 2. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
 - 3. Test reports must indicate compliance with performance requirements.
- F. Fabrication Sample:
 - 1. Provide a fabrication sample of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
 - a. Joinery
 - b. Glazing

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer must have successfully installed the same or similar systems required for the project and other projects of similar size and scope.
- B. Manufacturer Qualifications:
 - 1. Manufacturer must be capable of fabricating glazed aluminum curtain walls that meet or exceed the stated performance requirements.
- C. Source Limitations:
 - 1. Obtain aluminum curtain wall system through one source from a single manufacturer.
- D. Product Options:
 - 1. Information on drawings and in specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

2. 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.

E. Mockups:

1. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
2. Build mockups for the type(s) of curtain wall elevation(s) indicated, in location(s) shown on drawings.

F. Pre-installation Conference:

1. Conduct conference at project site to comply with requirements in Division 01 Project Management and Coordination Section.

1.7 PROJECT CONDITIONS

A. Field Measurements:

1. Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication.
2. Indicate measurements on shop drawings.

1.8 WARRANTY

A. Submit manufacturer's standard warranty for owner's acceptance.

B. Warranty Period:

1. Two years from Date of Substantial Completion of the project provided however that in no event shall the Limited Warranty begin later than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

EDITOR NOTE: Retain this article for proprietary method specification; add product attributes, performance characteristics, material standards, and descriptions as applicable. DO NOT USE the phrases "OR EQUAL," "OR APPROVED EQUAL," or similar. Use of such phrases causes ambiguity in the specifications because of the different interpretations among the divergent parties of the construction process and readers of the specifications. Such phrases require extensive and complete requirements (procedural, legal, regulatory, and responsibility) for determining "OR EQUAL."

A. Basis-of-Design Product:

1. Kawneer Company, Inc.
2. Clearwall® Curtain Wall System
 - a. Clearwall® Curtain Wall System - SS (Screw Spline):
 - 1) Clearwall® (SS):
 - a) Sightline: 2-1/2" (63.5 mm)

- b) Outside glazed with recessed glass edge spacer by qualified insulated glass unit (IGU) manufacturer
 - c) System depth: 5-1/8" (130.2 mm) or 6-5/8" (168.3 mm)
 - 2) Clearwall® (SSI):
 - a) Sightline: 2-1/2" (63.5 mm)
 - b) Outside glazed with metal interfaced insulating glass (interface shop applied with structural silicone)
 - c) System depth: 6" (152.4 mm) or 7-1/2" (190.5 mm)
 - 3) Clearwall® (SSIT):
 - a) Sightline: 2-1/2" (63.5 mm)
 - b) Outside glazed with metal interfaced insulating glass (interface shop applied with 3M™ VHB™ structural glazing tape)
 - c) System depth: 5-7/8" (149.0 mm) or 7-3/8" (187.0 mm)
 - b. Clearwall® Curtain Wall System - SB (Shear Block):
 - 1) Clearwall® (SB):
 - a) Sightline: 2-1/2" (63.5 mm)
 - b) Outside glazed with recessed glass edge spacer by qualified insulated glass unit (IGU) manufacturer
 - c) System depth: 10-1/8" (257.2 mm)
 - 2) Clearwall® (SBI):
 - a) Sightline: 2-1/2" (63.5 mm)
 - b) Outside glazed with metal interfaced insulating glass (interface shop applied with structural silicone)
 - c) System depth: 11" (279.4 mm)
 - 3) Clearwall® (SBIT):
 - a) Sightline: 2-1/2" (63.5 mm)
 - b) Outside glazed with metal interfaced insulating glass (interface shop applied with 3M™ VHB™ structural glazing tape)
 - c) System depth: 10-27/32" (275.4 mm)
3. Test to AAMA 501-05 and TAS 202.

B. Subject to compliance with requirements, provide a comparable product by the following:

EDITOR NOTE: Retain the information below for alternate manufacturers/products as specified in the contract documents. Coordinate this information with bid documents (if any) and the Division 01 Alternates Section. Consult with Kawneer Company for recommendations on alternate manufacturers and products that meet the design criteria and project requirements. Kawneer recommends that other manufacturers who request approval to bid their product as an equal must submit their request in writing ten (10) days prior to the close of bidding.

- 1. Manufacturer: (_____)
- 2. Series: (_____)
- 3. Profile Dimension: (_____)

C. Substitutions:

1. Refer to Division 01 Substitutions Section for procedures and submission requirements.
2. Pre-Contract (Bidding Period) Substitutions:
 - a. Submit written requests ten (10) days prior to bid date.
3. Post-Contract (Construction Period) Substitutions:
 - a. Submit written request in order to avoid installation and construction delays.
4. Product Literature and Drawings:
 - a. Submit product literature and drawings modified to suit specific project requirements and job conditions.
5. Certificates:
 - a. Submit certificate(s) certifying that the substitute manufacturer (1) attests to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacture, and fabrication of aluminum curtain walls for a period of not less than ten (10) years. (*Company Name*).
6. Test Reports:
 - a. Submit test reports verifying compliance with each test requirement required by the project.
7. Samples:
 - a. Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

D. Substitution Acceptance:

1. Acceptance will be in written form, either as an addendum or modification.
2. Acceptance will be documented by a formal change order signed by the owner and contractor.

2.2 MATERIALS

A. Aluminum Extrusions:

1. Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish
2. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame
3. Complying with ASTM B221: 6063-T6 alloy and temper
4. Recycled Content:

EDITOR NOTE: Include these Recycled Content specifications if needed to meet project requirements or for a project that includes Green Building Certifications such as LEED, Living Building Challenge (LBC), etc.

EDITOR NOTE: If Recycled Content requirements are not specified, prime (zero recycled content) aluminum could be supplied.

- a. Shall have a minimum of 50% mixed pre- and post-consumer recycled content.
- b. Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
- c. Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
- d. Indicate the location for recovery of recycled content.

- e. Indicate the location of the manufacturing facility.
- B. Aluminum Sheet Alloy:
 - 1. Shall meet the requirements of ASTM B209.
- C. Fasteners:
 - 1. Nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories:
 - 1. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.
 - 2. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.
- E. Reinforcing Members:
 - 1. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.
 - 2. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.
- F. Sealant:
 - 1. For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- G. Tolerances:
 - 1. References to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 CURTAIN WALL FRAMING

- A. Framing Members:
 - 1. Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads
 - 2. Glazing System: Retained mechanically with toggles on four sides , vertical SSG, horizontal SSG
 - 3. Glazing Plane: Front
- B. Glass:
 - 1. Clearwall® (SS)/(SB):
 - a. Outside glazed with 1-1/8" (28.6 mm) insulating glass with 5/8" (15.9 mm) recessed glass edge spacer supplied by qualified glass supplier
 - 2. Clearwall® (SSI)/(SBI):
 - a. Outside glazed with metal interfaced 1" (25.4 mm) insulating glass
 - b. Interface shop applied with structural silicone

3. Clearwall® (SSIT)/(SBIT):
 - a. Outside glazed with metal interfaced 1" (25.4 mm) insulating glass
 - b. Interface shop applied with 3M™ VHB™ structural glazing tape
- C. Brackets and Reinforcements:
 1. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.
- D. Framing Sealants:
 1. Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.
- E. Fasteners and Accessories:
 1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.
 2. Where exposed, fasteners and accessories shall be stainless steel.
 3. Toggle Assembly: As tested by manufacturer.
- F. Perimeter Anchors:
 1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
- G. Packing, Shipping, Handling, and Unloading:
 1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- H. Storage and Protection:
 1. Store materials so that they are protected from exposure to harmful weather conditions.
 2. Handle material and components to avoid damage.
 3. Protect material against damage from elements, construction activities, and other hazards before, during, and after installation.

2.4 GLAZING

- A. Glazing to meet requirements in Division 08 Glazing Section.
- B. Available Glazing Options:
 1. System: Outside toggle glazed format with 1" (25.4) or 1-1/8" (28.6 mm) double glazed insulating glass.
 2. Clearwall® (SS)/(SB): Outside glazed with 1-1/8" (28.6 mm) insulating glass with 5/8" (15.9 mm) recessed glass edge spacer supplied by qualified glass supplier.
 3. Clearwall® (SSI)/(SBI): Outside glazed with metal interfaced 1" (25.4 mm) insulating glass (interface shop applied with structural silicone).
 4. Clearwall® (SSIT)/(SBIT): Outside glazed with metal interfaced 1" (25.4 mm) insulating glass (interface shop applied with 3M™ VHB™ structural glazing tape). 3M™ to conduct application review prior to start of each project.
- C. Glazing Gaskets:

1. Gaskets to meet requirements of ASTM C864.
- D. Spacers and Setting Blocks:
 1. Manufacturer's standard elastomeric type
- E. Bond-Breaker Tape:
 1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
- F. Glazing Sealants:
 1. As recommended by manufacturer for joint type.

2.5 OPERABLE UNITS

- A. Doors comply with Division 08 Aluminum-Framed Entrances and Storefronts Section.
- B. Windows comply with Division 08 Aluminum Windows Section.

2.6 ACCESSORY MATERIALS

- A. Bituminous Paint:
 1. Cold-applied asphalt-mastic paint
 2. Complies with SSPC-Paint 12 requirements except containing no asbestos
 3. Formulated for 30-mil (0.762 mm) thickness per coat

2.7 FABRICATION

- A. Extrude or form aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations
 2. Accurately fitted joints
 3. Physical and thermal isolation of glazing from framing members
 4. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances
 5. Provisions for field replacement of glazing from exterior
 6. Fasteners, anchors, and connection devices that are concealed from view to the greatest extent possible
 7. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior
 8. Double seal design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- C. Curtain Wall Framing:
 1. Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.

- D. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

2.8 ALUMINUM FINISHES

EDITOR NOTE: Select the appropriate finish and color from Kawneer's standard colors listed below. Custom colors are available upon request from Kawneer. Other pigmented organic coatings conforming to AAMA 2603 are available. Consult with your Kawneer representative for other surface treatments and finishes.

- A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Factory Finishing:
 - 1. Kawneer Permanodic® AA-M10C21A44, AAMA 611, Architectural Class I Color Anodic Coating (Color _____)
 - 2. Kawneer Permanodic® AA-M10C21A41, AAMA 611, Architectural Class I Clear Anodic Coating (Color #14 Clear) (Optional)
 - 3. Kawneer Permanodic® AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard)
 - 4. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating (Color _____)
 - 5. Kawneer Permادize® (50% PVDF), AAMA 2604, Fluoropolymer Coating (Color _____)
 - 6. Kawneer Permacoat™ AAMA 2604, Powder Coating (Color _____)
 - 7. Other: Manufacturer _____ Type _____ (Color _____)

PART 3 EXECUTION

3.1 EXAMINATION

- A. With installer present, examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of the work.
- B. Proceed with installation only after correcting unsatisfactory conditions.

3.2 INSTALLATION

EDITOR NOTE: Coordinate this article with manufacturer's recommended installation details and installation instructions.

- A. Curtain Wall System Installation:
 - 1. Install curtain wall systems plumb, level, and true to line, without warp or rack of frames, within manufacturer's prescribed tolerances, and complying with installation instructions.
 - 2. Provide support and anchor in place.
 - 3. Dissimilar Materials:
 - a. Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 4. Glazing:
 - a. Glass shall be outside-glazed.

- b. Glass shall be held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners that are spaced no more than 9" (228.6 mm) on center.
- 5. Water Drainage
 - a. Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations.
 - b. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

B. Related Products Installation:

- 1. Sealants (Perimeter):
 - a. Refer to Joint Treatment (Sealants) Section.
- 2. Glass:
 - a. Refer to Glass and Glazing Section.
 - b. Reference: ANSI Z97.1, CPSC 16 CFR 1201, and GANA Glazing Manual.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

- 1. Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter-caulked, and cured.
- 2. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
- 3. Tests that do not meet the specified performance requirements and units that have deficiencies shall be corrected as part of the contract amount.
- 4. Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
- 5. Air Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E 783.
 - b. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
- 6. Water Infiltration Tests:
 - a. Conduct tests in accordance with ASTM E 1105.
 - b. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

B. Manufacturer's Field Services:

- 1. Upon owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjusting: Not applicable.

B. Protection:

- 1. Protect installed product's finish surfaces from damage during construction.

2. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- C. Cleaning:
1. Repair or replace damaged installed products.
 2. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.
 3. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
 4. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 084413

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