

**Purpose and Applications:** This guide specification document covers FreMarq Innovations ZERO.NET FW2500 aluminum punched opening system with fiberglass thermal break. The company began with a goal of providing the highest energy efficiency curtain wall system ever developed, with an overall system U-factor value of less than 0.30 with 1-inch insulated, single Low-E glass.

**Product Features:** FreMarq Innovations has over 35 years of experience in project applications ranging from new buildings to the retrofit and upgrading of existing systems. The company has developed a unique patented thermal break process that completely isolates the inside metal from all exterior elements. The process used is a composite fiberglass component that is attached to the interior framing. There are no penetrations from the exterior to interior. This thermal break in a curtain wall provides U-factor values of less than 0.30 with 1-inch insulated single Low-E glass and condensation resistance factor (CRF) values of 82 and above. Glazing is fully captured on all four sides. Once installed, the thermal break is completely concealed leaving only finished framing or covers exposed to view.

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**Contact Information:** For more information on this or other products made by FreMarq Innovations, contact manufacturer. Mailing address: P.O. Box 512, Merrill, WI 54452. Location: 8300 Highland Drive, Wausau, WI 54401. Telephone: (715) 842-6842. Web: [www.FreMarqInnovations.com](http://www.FreMarqInnovations.com) Email: [info@FreMarqInnovations.com](mailto:info@FreMarqInnovations.com)

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**Editor Note:** Edit document to suit Project requirements and specifier practice. Specifier notes are shown in blue text like this. Optional text [**is shown in bold with brackets like this**]. Locations where language for Project-specific requirements is to be inserted are shown like this: **<Insert requirements>**. Remove specifier notes and unused optional text in final version of the specification document.

**Editor Note:** The Construction Specifications Institute (CSI) recommends and supports use of its current MasterFormat section title and numbering system. Possible section numbers and titles are shown below. Edit to suit Project requirements.

SECTION 08 51 13 – ALUMINUM WINDOWS

(SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS)

(SECTION 08 44 00 – CURTAIN WALL AND GLAZED ASSEMBLIES)

(SECTION 08 40 00 – ENTRANCES, STOREFRONTS, AND CURTAIN WALLS)

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes: Glazed aluminum punched windows, installed as fabricated and factory glazed assemblies.

Editor Note: Revise paragraph below to suit Project requirements. Add division or section numbers and titles according to CSI MasterFormat and specifier practice. This paragraph is intended for use only when a reader might reasonably expect to find work requirements in this Section, but those requirements are actually located in another related section.

B. Related Sections: Sections related to this Section include:

1. **<Insert Division or Section Number>: <Insert title>.**

Editor Note: Standards numbers and titles in the article below are provided for specifier information and reference. The purpose of this Article is to fully identify standards that are referenced elsewhere using abbreviated nomenclature. Retain, edit or delete article to suit specifier practice and Project requirements.

### 1.2 REFERENCES

A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred by issuing authority abbreviation and designation only.

B. Aluminum Association:

1. Aluminum Alloys - Aluminum 6063/6063A Properties, Fabrication and Applications (AA 6063T5, AA 6063T6).

C. American Architectural Manufacturers Association (AAMA):

1. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
2. AAMA 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
3. AAMA 501.5 – Test Method for Thermal Cycling of Exterior Walls.
4. AAMA 1503: Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
5. AAMA CW-DG-1: Curtain Wall Design Guide Manual.

D. ASTM International (ASTM):

1. ASTM C794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
2. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
3. ASTM C1036 – Standard Specification for Flat Glass.
4. ASTM C1048 – Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
5. ASTM C1184 – Standard Specification for Structural Silicone Sealants.
6. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
7. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
8. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
9. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
10. ASTM E783 – Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
11. ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Wall by Uniform or Cyclic Static Air Pressure.
12. ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.

E. Insulating Glass Certification Council (IGCC): Insulating Glass Unit Certification.

F. Insulating Glass Manufacturers Alliance of Canada (IGMAC) and Canadian General Standards Board (CGSB): Insulating Glass Units Standard CAN/CGSB 12.8-97.

G. International Organization for Standardization (ISO):

1. ISO 14021 – Environmental Labels and Declarations.

H. National Fenestration Rating Council (NFRC):

1. NFRC 100 – Procedure for Determining Fenestration Product U-factors.
2. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

### 1.3 ADMINISTRATIVE REQUIREMENTS

Editor Note: Retain paragraph below if pre-installation meetings are required and edit to suit Project requirements.

A. Pre-installation Meetings: Conduct pre-installation meeting to clarify Project requirements, substrate conditions, manufacturer installation recommendations and manufacturer warranty provisions.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each component, include manufacturer's site preparation instructions and recommendations, methods of installation, profiles and dimensions, details, anchorage, interfaces with materials not supplied by curtainwall system manufacturer, accessories, requirements for installation, storage, handling and other recommendations.

Editor Note: Retain paragraph below if compliance with a whole-building rating system (such as USGBC LEED, GBI Green Globes, or other), or specific sustainability-related design and construction aspects, is required. Edit to suit Project requirements.

B. Sustainable Design Submittals: In compliance with **[ISO 14021]** [or] **[Section 01 81 13 – “Sustainable Design Requirements”]**.

C. Shop Drawings: Showing methods of installation, specified loads, plans, sections, elevations and details, identifying all proposed component parts and finishes including flashings, vents, sealants and interfaces with all materials not supplied by curtain wall manufacturer.

D. Samples: Selection and verification samples for finishes and colors. Submit two complete sample sets of each type of material required.

E. Sealant compatibility report prepared by sealant manufacturer.

F. Certificate of compliance from manufacturer that applied finishes meet AAMA standards.

### 1.5 INFORMATIONAL SUBMITTALS

A. Qualification statements for manufacturer and installer.

B. Product test reports.

C. Sample warranty documents.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For installed system components.
- B. Warranty Documents: Final manufacturer warranty documents.

## 1.7 QUALITY ASSURANCE

### A. Manufacturer Qualifications:

1. Over 30 years' experience in the custom curtain wall industry.
2. Capable of demonstrating an extended history of successfully supplying fabricated custom wall systems and a holistic approach to system design, innovation, production, application and installation.
3. Capable of providing delegated engineering design and documentation including Shop Drawings for the wall system.

### B. Installer Qualifications:

1. Minimum five years' experience in the commercial installation of products required for the Project.
2. Experience on at least five projects of similar size, type and complexity as the Project.
3. An entity utilizing workers competent in techniques required by manufacturer for product types and applications indicated.

### C. Source Limitations:

1. Obtain punched opening system components from a single manufacturer, bearing country of origin label "Made in USA" indicating that products are "all or virtually all" made in the United States of America.
2. Obtain aluminum extrusions from a manufacturer with more than 5 years' experience in the architectural aluminum industry.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Palletize loose fabricated extrusions by like size and protect to ensure surface finishes are not damaged during shipping and handling.

C. Deliver components to Project in manufacturer's original unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store components protected from exposure to damage from construction activities and to adverse weather and harmful environmental conditions, at temperature and humidity conditions recommended by manufacturer.

Editor Note: Coordinate article below with Conditions of the Contract and with Division 01 Closeout Submittals (Warranty) Section.

#### 1.9 WARRANTY

A. Special Warranty: Manufacturer's transferrable, non-prorated limited warranty in which manufacturer agrees to repair or replace curtain wall system components that fail within the warranty period.

1. Warranty Period, Components: **[1 year], [5 years] [10 years] <Insert years>** from date of substantial completion.

Editor Note: AMMA 2605 finish, 70 percent PVDF provides a standard warranty of 10 years and up to 20 years at additional cost. Finish will not chip, crack or peel. It will not chalk in excess of ASTM D4214, number 8 rating. It will not change color more than 5 delta-E Hunter units as determined by ASTM method D2244. Metallics Delta L only for color change. Exotic finishes require recommended clear top coat.

2. Warranty Period, Painted Finish, AAMA 2605 (70 percent PVDF): **[10 years] [20 years] <Insert years>** from date of substantial completion.

Editor Note: AAMA 2604 finish, 50 percent PVDF provides a standard warranty of 5 years and up to 10 years at additional cost. Finish will not chip, crack or peel. It will not chalk in excess of ATM D4214 number 8 rating. It will not change color more than 5 Delta-E Hunter units as determined by ASTM method D2244.

3. Warranty Period, Painted Finish, AAMA 2604 (50 percent PVDF): **[5 years] [10 years] <Insert years>** from date of substantial completion.

Editor Note: AAMA 2603 baked enamel finish provides a 1 year warranty with slight chalk and fade.

4. Warranty Period, Baked Enamel Finish, AAMA 2603: **[1 year] <Insert years>** from date of substantial completion.

Editor Note: Class I Anodized finish is provided with a standard warranty of 5 years and up to 10 years at additional cost. Finish will resist cracking, crazing, flaking or blistering. It will not chalk in excess of ASTM D4218 number 8 rating. It will not change color more than 5 Delta-E Hunter units as determined by ASTM method D2244.

5. Warranty Period, Anodized Finish: **[5 years] [10 years] <Insert years>** from date of substantial completion.

Editor Note: Retain sub-paragraph below if glazing is specified in this Section and edit to suit Project requirements. Glazing warranty period varies and is dependent on the type and configuration of the glazing and its manufacturer. Consult with the Project curtain wall and glazing manufacturers for more information.

6. Warranty Period, Glazing: **[5 years]** **[10 years]** **<Insert years>** from date of substantial completion.

B. Special Warranty: Installer's transferrable, non-prorated limited warranty in which installer agrees to repair or replace curtain wall system components that fail within the warranty period.

1. Warranty Period: **[3 years]** **[5 years]** **<Insert years>** from date of substantial completion.

## PART 2 PRODUCT

Editor Note: Add product features, performance characteristics, material standards, and descriptions as applicable. Use of terms such as "or equal" or "approved equal" or similar may cause ambiguity in specifications, requiring verification (procedural, legal and regulatory) and assignment of responsibility for the determination of "equal" products. Therefore, it is recommended that terms such as these be avoided.

### 2.1 MANUFACTURER **<Insert designation used on Drawings>**.

A. General: Provide functional punched opening system complying with design and performance requirements indicated.

B. Basis-of-Design Product: Subject to compliance with requirements, provide FreMarq Innovations: ZERO.NET FW2500 Aluminum Punched Opening System.

C. Substitution Limitations: **[No substitutions]** **[All other manufacturers: Submit substitution request in accordance with Section 01 25 00 – "Substitution Procedures"]** **<Insert substitution limitations>**.

Editor Note: Performance requirements for any given project may vary widely. Add or edit requirements in this article to suit Project requirements.

### 2.2 PERFORMANCE REQUIREMENTS – PUNCHED OPENINGS

A. General: Comply with performance requirements indicated, to withstand structural movement, thermal stress, glass breakage or other failures.

B. Delegated Design: **[Provide]** **[Owner will provide]** design of punched openings by a qualified professional engineer, using performance and design criteria indicated. **<Insert requirements>**.

C. Wind Loads: **[As indicated on Drawings]** **<Insert requirements>**.

D. Structural Test Performance, ASTM E330, conducted prior to air infiltration test (ASTM E283).

E. Air Infiltration, ASTM E283, conducted after structural test (ASTM E330): **[6.24 psf] <Insert requirements>**.

F. Deflection of Framing Members: **<Insert requirements>**.

G. Water Penetration, ASTM E331: **[15 psf] <Insert requirements>**.

H. Thermal Cycling and Condensation Assessment, AAMA 501.5: Pass.

I. Sound Transmission, ASTM E90 and ASTM E413: **<Insert requirements>**.

J. Energy Performance:

**Editor Note:** Coordinate requirements in following sub-paragraphs with specific assembly construction in the “Glazing” article below. For an assembly U factor = .31 center of glass U factor = .25 with warm edge spacer. Consult with manufacturer for assistance or more information.

1. Thermal Transmittance (U-factor), NFRC 100: **[0.31] <Insert requirements>**.

2. Solar Heat Gain Coefficient, NFRC 200: **<Insert requirements>**.

3. Frame Condensation Resistance Factor (CRF), AAMA 1503, of not less than 82.

L. Sealants:

1. Design of sealant joints and application shall comply with sealant manufacturer recommendations.

2. Provide in the form of a written report for Owner, results of sealant manufacturer adhesion tests to ensure material compatibility and adequate adhesion.

## 2.2.1 PERFORMANCE REQUIREMENTS –ZERO SIGHTLINE WINDOW

A. General: Comply with performance requirements indicated, to withstand structural movement, thermal stress, glass breakage or other failures. Per AAMA.

B. Delegated Design: **[Provide] [Owner will provide]** design of operable window by a qualified professional engineer, using performance and design criteria indicated. **<Insert requirements>**.

C. Wind Loads: **[As indicated on Drawings] <Insert requirements>**.



D. Structural Test Performance, ASTM E330, conducted prior to air infiltration test (ASTM E283):

E. Air Infiltration, ASTM E283, conducted after structural test (ASTM E330): **[6.24 psf] <Insert requirements>**.

G. Water Penetration, ASTM E331: **[12 PSF] <Insert requirements>**

J. Sound Transmission, ASTM E90: **<Insert requirements>**.

K. Energy Performance:

**Editor Note: Coordinate requirements in following sub-paragraphs with specific assembly construction in the “Glazing” article below. Consult with manufacturer for assistance or more information.**

1. Thermal Transmittance (U-factor), NFRC 100: **[0.36] <Insert requirements>**.
2. Solar Heat Gain Coefficient, NFRC 200: **<Insert requirements>**.
3. Frame Condensation Resistance Factor (CRF), AAMA 1503, of not less than 65.

L. Sealants:

1. Design of sealant joints and application shall comply with sealant manufacturer recommendations.
2. Provide in the form of a written report for Owner, results of sealant manufacturer adhesion tests to ensure material compatibility and adequate adhesion.

M. Life Cycle Test

1. For AW rated windows, tested in accordance with AAMA 910.

## 2.3 MATERIALS – PUNCHED OPENINGS

A. Pressure Plate and Snap Cover: Aluminum alloy, AA 6063T5 or AA 6063T6.

B. Reinforcement:

1. Steel, supplied by punched window manufacturer and as required to meet design loads indicated for typical and corner zone building conditions.
2. Coated with primer or bituminous paint prior to installation in aluminum framing.

3. Dimensions and attachment as shown in **[Drawings]** **[and]** **[Shop Drawings]**.

C. Thermal Barrier:

1. Glass fiber-reinforced polyurethane pultrusion, completely covering exterior face of structural aluminum framing member, designed to support weight of glazing infill, with no exposed aluminum in glazing pocket.
2. Fastened to aluminum framing by with glass fiber-reinforced pultrusion sliding into extruded aluminum reglet and mechanical attachment using stainless steel screws with average pull-out resistance of 1,438 pounds with no fasteners passing through thermal barrier.

2.3.1 MATERIALS – ZERO SIGHTLINE WINDOW

A. Aluminum alloy, AA 6063T5 or AA 6063T6.

B. Hardware: *Select from Below*

1. Hinge type: 4 bar arms stainless steel
2. Hold open and limit device: 4” limit stop
3. Handle type: Single handle multipoint lock
  - a. Handles to be Zamac casting
  - b. Finish [black], [white]
5. ADA hardware – locations as shown in **[Drawings]**

C. Thermal Barrier:

1. PUR fiberglass insert

D. Gaskets

1. EDPM gaskets

E. Screens

1. Aluminum frame
2. Wire or Fiberglass Mesh

2.4 FRAMING – PUNCHED OPENINGS

A. Framing Members:

1. Aluminum alloy, AA 6063T5 or AA 6063T6 to comply with structural requirements, minimum 1/8-inch wall thickness with screw spline assembly for hair-line joinery with no visible fasteners.

2. Dual-gasket, split vertical mullion, continuous pultruded fiberglass thermal break mechanically retained and fastened with stainless steel hex-washer-head fasteners.
3. System to be [**four-sided captured**], **structural silicone-glazed, vertical**] [**four-sided structural silicone-glazed**] and male to female engagement on vertical mullions with full-length integral extruded anti-rotation clip.
4. Glazing infill thickness [**1-1/8" inch**] [**1-1/4 inches**] [**1-3/8 inches**] [**1-1/2 inches**] <Insert requirements>.

B. Accessories:

1. Setting Blocks: Extruded silicone.
2. Exterior Gasket: EPDM rubber.
3. Interior Gasket: EPDM rubber with one-piece molded corners only.
4. Isolator Gasket: EPDM rubber.
5. Mullion Weathering Gasket: EPDM rubber.
6. End Water Dams: EPDM sponge rubber, closed cell.
7. Glass Pocket Filler: PVC, rigid, black.
8. Deadload and Windload Anchors: [**Primer-coated steel**] [**Extruded aluminum**], engineered and supplied by curtain wall manufacturer.

C. Fasteners:

1. 1/4-20 hex-washer head, series 300 stainless steel frame assembly screws, not exposed at joinery.
2. 1/4 inch coarse thread stainless steel hex-washer head fastener at pressure plate to fiberglass thermal break, not exposed at joinery.

#### 2.4.1 FRAMING – ZERO SIGHTLINE WINDOW

A. Framing Members:

1. Aluminum alloy, AA 6063T5 or AA 6063T6 to comply with structural requirements, .9375 wall thickness
2. Frame depth 3 3/4"
3. Zero sightline, structural glazed, mitered corners
4. Glazing infill thickness [**1-1/8" inch**]

B. Accessories:

1. Setting Blocks: Extruded silicone.
2. Glazing gasket: EPDM rubber.
5. Mullion Weathering Gasket: EPDM rubber.

C. Fasteners:

1. 300 stainless steel frame assembly screws, not exposed at joinery.

D. Screens: shall be \_\_\_\_\_ [Choose all that apply: flat or wicket] with frames the same finish as window surface. 18 x 16 black aluminum mesh, standard.

Editor Note: Retain article below if glazing is specified in this section and edit to suit Project requirements. Alternatively, delete article below and coordinate requirements in “Division 08 – Glazing” and the “Related Sections” paragraph above in the “Summary” article within this Section.

## 2.5 GLAZING – PUNCHED OPENINGS

A. Insulated Glazing Units (IGUs): Provide insulating glass units certified through **[Insulating Glass Certification Council as conforming to the requirements of IGCC and ASTM E2190] [Insulating Glass Manufacturers Alliance of Canada (IGMAC) conforming to the requirements of Canadian General Standards Board CAN/CGSB 12.8]**.

Editor Note: Glass unit configurations shown in paragraphs below are typical and are provided for general specifier information. Other combinations to achieve the same performance levels indicated are possible and other combinations to achieve different performance levels are also possible. Contact manufacturer for more information.

Editor Note: Retain paragraph below when assembly U-factor value of 0.31 is required and edit to suit Project requirements. Center of Glass (COG) U-factor value is 0.25. Coordinate with “PERFORMANCE REQUIREMENTS” article above.

B. Glass Unit Makeup for Assembly U-Factor Value 0.31:

1. Manufacturer Designation: **<Insert manufacturer designation>**.
2. Glazing Configuration: Dual-pane.
3. Exterior Glass: 1/4 inch, soft coat Low-E coating on #2 surface, **[clear] [tinted] <Insert color requirements> [annealed, ASTM C1036] [fully tempered, ASTM C1048]**.
4. Interior Glass: 1/4 inch, clear, **[annealed, ASTM C1036] [fully tempered, ASTM C1048]**.
5. Gas Fill: Argon 90/10.
6. Warm-Edge Spacer: 1/2 inch, stainless steel.

D. Consult manufacturer for other U factors.

E. Gaskets: Isolator gasket between thermal barrier and pressure plate, interior gaskets to have molded one-piece corners, EPDM rubber.

F. Weatherproofing Sealant: Silicone, meeting ASTM C794, ASTM C920, ASTM C1184, for weather seal at vertical mullion stack joint, at intersection of horizontal to vertical joints and for installation and sealing of foam end dams to vertical and horizontal thermal barrier as shown in **[Drawings]** **[and]** **[Shop Drawings]**.

1. Basis-of Design Product: Dow Corning **[795]** **[985]** **<Insert product designation>**.

## 2.5 GLAZING – ZERO SIGHTLINE WINDOW

A. Insulated Glazing Units (IGUs): Provide insulating glass units certified through **[Insulating Glass Certification Council as conforming to the requirements of IGCC and ASTM E2190]** **[Insulating Glass Manufacturers Alliance of Canada (IGMAC) conforming to the requirements of Canadian General Standards Board CAN/CGSB 12.8]**.

Editor Note: Glass unit configurations shown in paragraphs below are typical and are provided for general specifier information. Other combinations to achieve the same performance levels indicated are possible and other combinations to achieve different performance levels are also possible. Contact manufacturer for more information. Based on AAMA 1503-09 test size 24" x 59".

Editor Note: Retain paragraph below when assembly U-factor value of 0.36 is required and edit to suit Project requirements. Center of Glass (COG) U-factor value is 0.25. Coordinate with "PERFORMANCE REQUIREMENTS" article above.

B. Glass Unit Makeup for Assembly U-Factor Value 0.36:

1. Manufacturer Designation: **<Insert manufacturer designation>**.
2. Glazing Configuration: Dual-pane.
3. Exterior Glass: 1/4 inch, soft coat low-E coating on #2 surface, **[clear]** **[tinted]** **<Insert color requirements>** **[annealed, ASTM C1036]** **[fully tempered, ASTM C1048]**.
4. Interior Glass: 1/4 inch, clear, **[annealed, ASTM C1036]** **[fully tempered, ASTM C1048]**.
5. Gas Fill: Argon 90/10.
6. Warm-Edge Spacer: 1/2 inch, thermoplastic with stainless steel substrate.

## 2.6 ACCESSORY MATERIAL

Editor Note: Coordinate requirements for mineral wool insulation with Insulation Section.

A. Spandrel Insulation: Mineral wool, **[2]** **[3]** **[4]** inches thick, **<Insert density requirements>** attached to exterior side of galvanized steel back pan using compatible stick pins installed 4 inches on centers.

1. Basis-of Design Product: [Thermafiber] [Roxul] <Insert product designation>.

B. Safing Insulation: Mineral wool, [2] [3] [4] inches thick, <Insert density requirements> installed according to manufacturer's recommendations in safing area between slab edge and back of spandrel panel insulation.

1. Basis-of Design Product: [Thermafiber] [Roxul] <Insert product designation>.

## 2.7 FABRICATION

A. Formed: Break-formed metal flashings and trim shall be free of warping or oil canning. Form or weld exposed sheet metal prior to finishing. Rough, raw or unfinished exposed edges will not be permitted.

B. Extruded: Inspect all metal for surface quality and absence of bow and warp. Die lines and scratches on visible surfaces will not be permitted.

C. Fabricated: Cut extrusions square and free of burrs or sharp edges. Weather-seal frame joinery in factory. Remove waste metal shavings and chips during fabrication of framing system.

D. Fixed and Zero sightline operable windows to be factory fabricated assembled and glazed

## 2.8 METAL FINISHES

**Editor Note:** Retain one or more paragraphs below and edit to suit Project requirements.

A. Clear Anodized, AAMA 611: High-performance Class I acid-etched, minimum thickness 0.7 mils.

B. Color Anodized, AAMA 611: High-performance Class I acid-etched, minimum thickness 0.7 mils. [Black] [Dark Bronze] [Medium Bronze] [Light Bronze] [Champagne].

C. Basic Pigmented Coating, AAMA 2603: Baked enamel, minimum dry film thickness 8 mils.

D. High Performance Organic, AAMA 2604: PVDF fluoropolymer finish containing minimum 50 percent PVDF resins in a [two] [three] <Insert requirements> coat system, minimum thickness 1.2 mils.

E. High Performance Organic, AAMA 2605: PVDF fluoropolymer finish containing minimum 70 percent PVDF resins in a [two] [three] <Insert requirements> coat system, minimum thickness 1.2 mils.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Site Verification of Conditions: Verify that substrate and worksite conditions meet or exceed manufacturer recommendations for installation.

B. Do not begin installation until substrates have been properly prepared and any conditions not in compliance with manufacturer recommendations have been corrected.

### 3.2 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Conduct pre-installation steps in accordance with manufacturer's written recommendations.

### 3.3 INSTALLATION

A. General: Comply with all manufacturer recommendations, including but not limited to FreMarq installation information in manufacturer product literature and on product packaging.

B. Comply with recommendations in AAMA for preglaze window installation

C. Comply with Drawings [**and Shop Drawings**] for installation of all system components and accessories.

### 3.4 TOLERANCES

A. Install punched windows to comply with the following:

1. Plumb: <Insert requirements>.
2. Level: <Insert requirements>.
3. Alignment: <Insert requirements>.
4. Location: <Insert requirements>.

### 3.5 FIELD QUALITY CONTROL

A. Manufacturer Field Services: Provide manufacturer field service consisting of system use recommendations and installation in accordance with manufacturer recommendations.

B. Testing Agency: <Insert requirements>.

C. Testing Services:

1. Air Infiltration Test, ASTM E783: <Insert requirements>.
2. Water Penetration Test, ASTM E1105: <Insert requirements>.
3. Water Spray Test, AAMA 501.2: <Insert requirements>.

### 3.6 PROTECTION

A. Remove temporary coverings and protection of adjacent work areas after curtain wall installation.

B. Repair or replace damaged installed products.

C. Clean installed products in accordance with manufacturer recommendations.

D. Remove and lawfully dispose of construction debris from Project site.

E. Protect installed curtain wall system and all components from damage until completion of Project and acceptance by Owner.

END OF SECTION 08 51 13 – GLAZED ALUMINUM WINDOWS  
(END OF SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS)  
(END OF SECTION 08 44 00 – CURTAIN WALL AND GLAZED ASSEMBLIES)  
(END OF SECTION 08 40 00 – ENTRANCES, STOREFRONTS, AND CURTAIN WALLS)