SECTION 086300 - METAL-FRAMED SKYLIGHTS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

MasterSpec includes provisions for LEED 2009, LEED v4, IgCC, and Green Globes. Sustainable design requirements may be inserted in the Section Text using the hypertext links.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes skylights with metal framing.

Refer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and are to remain as Editor’s Notes. Remove referenced specification sections within the body of the specification if not applicable to the project.

Section 084433 "Sloped Glazing Assemblies" for glazed curtain walls in which the glazed panels are primarily on a sloped plane.

Section 086200 "Unit Skylights" for skylights without framing except at the perimeter of the glazing.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified, except as noted below, and tabbed (for combined submittals).

Submit Qualification Data as specified in Quality Control Submittals first.

* + - * 1. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal-framed skylights.

Include manufacturer’s installation instructions.

Retain "Motors" subparagraph below if electric motor operators are required for operable metal-framed skylights.

Motors: Show nameplate data, power requirements, ratings, characteristics, and mounting arrangements.

* + - * 1. Sustainable Design Submittals:
				2. Shop Drawings: For metal-framed skylights.

Include plans, elevations, sections, and attachment details.

Indicate structural loadings and reactions to be transmitted to supporting curbs.

Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.

Include full-size isometric details of each vertical-to-horizontal intersection of assembly, showing the following:

Joinery including concealed welds.

Anchorage.

Expansion provisions.

Glazing.

Flashing and drainage.

Retain "Manual Operators" subparagraph below for manually operated metal-framed skylights.

Manual Operators: Show locations, mounting, and details for installing operator components and controls.

Retain both "Motor Operators" and "Wiring Diagrams" subparagraphs below if electric motor operators are required for operable metal-framed skylights.

Motor Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

Wiring Diagrams: For power, signal, and control wiring for electric motors of operable metal-framed skylights.

* + - * 1. Samples for Initial Selection: For units with factory-applied finishes.
				2. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

Retain "Fabrication Sample" paragraph below to verify details of assembly if required. In lieu of a fabrication sample, consider retaining isometric drawings as part of Shop Drawings.

* + - * 1. Fabrication Sample: Of each framing intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

Joinery including concealed welds.

Anchorage.

Expansion provisions.

Glazing.

Flashing and drainage.

Retain "Delegated Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated Design Submittal: For metal-framed skylights indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Quality Control Submittals: Qualification Data: For Installer.

For structural-sealant-glazed skylights, retain "Compatibility and Adhesion Test Reports" paragraph below and requirement for testing of structural-sealant glazing in "Quality Assurance" Article.

Compatibility and Adhesion Test Reports: For structural-sealant-glazed skylights, test reports from sealant manufacturer indicating that joint sealants have been tested for each material that will come in contact with sealants.

Product Test Reports: For metal-framed skylights, for tests performed by a qualified testing agency.

Field quality-control reports.

Sample Warranties: For special warranties.

* + - * 1. Contract Closeout Submittals:

Maintenance Data: For metal-framed skylights [**and**] [**metal-framed skylight operating system**] to include in maintenance manuals.

* + - 1. QUALITY ASSURANCE
				1. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of metal-framed skylights required for this Project.

Retain "Structural-Sealant Glazing" paragraph below for structural-sealant glazing.

* + - * 1. Structural-Sealant Glazing: Comply with recommendations in ASTM C1401, "Guide for Structural Sealant Glazing," for joint design and quality-control procedures.

Joint designs are reviewed and approved by structural-sealant manufacturer.

Quality-control program development and reporting comply with ASTM C1401 recommendations for material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for fabrication and installation reviews and checks.

Perform manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants.

* + - * 1. Benchmarks: Build benchmarks to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

Retain first subparagraph below for large-scale benchmark. Indicate metal-framed skylights represented by benchmark on Drawings or draw benchmark as separate element.

Build benchmark of typical metal-framed skylights as shown on Drawings.

Approval of benchmarks does not constitute approval of deviations from the Contract Documents contained in benchmarks unless Director’s Representative specifically approves such deviations in writing.

* + - 1. WARRANTY

When warranties are required, verify with Director’s Representative that warranties stated in this article are not less than remedies available to the Facility under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of metal framed skylights that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures including, but not limited to, excessive deflection.

Noise or vibration caused by thermal movements.

Delete option in first subparagraph below if retaining "Special Finish Warranty, Factory-Applied Finishes" or "Special Finish Warranty, Anodized Finishes" paragraph below

Deterioration of metals[**, metal finishes,**] and other materials beyond normal weathering.

Retain first subparagraph below if glazing sealants are specified in this Section.

Adhesive or cohesive sealant failures.

Water leakage.

Verify available warranties and warranty periods for assemblies with manufacturers listed in Part 2.

Warranty Period: [**Two**] [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

Verify available special finish warranties with manufacturers. Extended 20-year finish warranties are sometimes available for 70 percent fluoropolymer coatings.

* + - * 1. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

Retain first subparagraph below for factory-painted finishes. Coordinate color fading and chalking limits with finishes retained in Part 2.

Deterioration includes, but is not limited to, the following:

Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

Coordinate "Warranty Period" subparagraph below with "Aluminum Finishes" Article. AAMA 2604 is intended to represent five years of performance; AAMA 2605 is intended to represent 10 years of performance. Some manufacturers also offer a 20-year warranty. Verify available warranties and warranty periods for finishes.

Warranty Period: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

Retain first subparagraph below for anodized finishes. Coordinate color fading and chalking limits with finishes retained in Part 2.

Deterioration includes, but is not limited to, the following:

Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

Cracking, peeling, or chipping.

Coordinate "Warranty Period" subparagraph below with "Aluminum Finishes" Article. Five years is standard for Class I anodized finishes, although several manufacturers offer a 10- or 20-year warranty. Class II anodized finishes often carry less than a five-year warranty. Verify available warranties and warranty periods for finishes.

Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in this Section are neither recommended nor endorsed by the AIA or Deltek. Before selecting manufacturers and products, verify availability, suitability for intended applications, and compliance with minimum performance requirements.

Product options commonly available from manufacturers are included in square brackets throughout the Section Text. Not every manufacturer listed can provide every option offered; verify availability with manufacturers.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Structural Loads: [**As indicated on Drawings**] <**Insert loads**>.
				2. Deflection of Framing Members: At design wind pressure, as follows:

Depending on Project conditions, more stringent deflection criteria than specified in "Deflection Normal to Glazing Plane" and "Deflection Parallel to Glazing Plane" subparagraphs below may be required; see "Seismic Loads" Article in the Evaluations. First option in first subparagraph is based on recommendations in the BCNYS for framing members supporting glass. Second option is based on recommendations in AAMA TIR-A11.

Deflection Normal to Glazing Plane: 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**] [**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 more than 13 feet 6 inches**] <**Insert deflection limit**> or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

First option in "Deflection Parallel to Glazing Plane" subparagraph below is based on typical deflection criteria for glass. Second option is based on GANA's "Glazing Manual."

Deflection Parallel to Glazing Plane: Limited to [**L/360 of clear span or 1/8 inch, whichever is smaller**] [**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**] <**Insert deflection limit**>.

Usually retain "Lateral Bracing of Framing Members" paragraph below. AAMA SDGS-1, "Structural Design Guidelines for Aluminum Framed Skylights," states that manufacturers sometimes assume glazing material provides continuous lateral bracing and base their designs on unbraced lengths equal to zero.

* + - * 1. Lateral Bracing of Framing Members: Compression flanges of flexural members are laterally braced by cross members with minimum depth equal to 50 percent of flexural member that is braced. Glazing does not provide lateral support.
				2. Structural-Test Performance: Metal-framed skylights tested in accordance with ASTM E330, as follows:

When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified deflection limits.

When tested at [**150**] <**Insert number**> percent 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**] <**Insert number**> percent of span.

Test Durations: As required by design wind velocity, but not less than [**10**] <**Insert number**> seconds.

Retain "Windborne-Debris Impact Resistance" paragraph below to suit Project. The BCNYS establishes criteria for buildings in hurricane-prone locations. In paragraph, "enhanced" option applies to essential facilities and has additional requirements. Verify requirements of authorities having jurisdiction. Verify which manufacturers have tested products and can demonstrate compliance. New York State is located in Wind Zone 2 and in a hurricane susceptible region.

* + - * 1. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone  2 for [**basic**] [**enhanced**] protection.

Insert increased heights if different from those in "Large-Missile Test" and "Small-Missile Test" subparagraphs below.

Large-Missile Test: For glazing located within [**30 feet**] <**Insert dimension**> of grade.

Small-Missile Test: For glazing located between 30 feet and [**60 feet**] <**Insert dimension**> above grade.

Usually retain "Air Leakage" paragraph below. ASTM E283 requires using a static-air-pressure difference of 1.57 lbf/sq. ft. unless otherwise indicated, which is equivalent to a 25-mph wind. Static-air-pressure difference of 6.24 lbf/sq. ft. is equivalent to a 50-mph wind.

* + - * 1. Air Leakage: Metal-framed skylights with maximum air leakage through fixed glazing and framing areas of [**0.06 cfm/sq. ft.**] <**Insert value**> of when tested in accordance with ASTM E283 at a minimum static-air-pressure difference of [**1.57 lbf/sq. ft.**] [**6.24 lbf/sq. ft.**] <**Insert value**>.

Usually retain "Water Penetration under Static Pressure" paragraph below. For water-penetration under static pressure tests, air-pressure difference of 20 percent of wind-load design pressure provides satisfactory performance in most parts of the U.S. Locations where high winds and heavy rains frequently occur simultaneously require higher test-pressure differences. Lower test-pressure differences are acceptable for some locations. Revise paragraph to suit Project.

* + - * 1. Water Penetration under Static Pressure: Metal-framed skylights that do not evidence water penetration through fixed glazing and framing areas when tested in accordance with ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than [**6.24 lbf/sq. ft.**] <**Insert value**>.
				2. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Differential values in "Temperature Change" subparagraph below (for aluminum in particular) are suitable for most of the U.S.

Temperature Change: [**120 deg F, ambient; 180 deg F, material surfaces**] <**Insert temperature change**>.

Retain "Condensation Resistance" paragraph below if required and insert condensation-resistance factor (CRF) needed for Project; options are examples only.

* + - * 1. Condensation Resistance: Metal-framed skylights with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than [**45**] [**53**] <**Insert number**> when tested in accordance with AAMA 1503.

Retain "Haze Factor" subparagraph below if required to diffuse direct sunlight.

Haze Factor: Greater than 90 percent when tested in accordance with ASTM D1003.

Retain "Structural Sealant" paragraph below for structural-sealant-glazed joints.

* + - * 1. Structural Sealant: Capable of withstanding tensile and shear stresses imposed without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant occurs before adhesive failure.

Retain "Energy Performance" paragraph below if required and insert U-factor and solar heat gain coefficient needed for Project; options are examples only.

* + - * 1. Energy Performance: Provide metal-framed skylights with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below[**and certified and labeled according to NFRC**]:

Thermal Transmittance (U-Factor): Fixed glazing and framing areas have U-factor of not more than [**0.80 Btu/sq. ft. x h x deg F**] [**0.65 Btu/sq. ft. x h x deg F**] <**Insert value**> as determined in accordance with NFRC 100.

Solar Heat Gain Coefficient: Fixed glazing and framing areas have a solar heat gain coefficient of no greater than [**0.6**] [**0.7**] <**Insert value**> as determined in accordance with NFRC 200.

Retain "Electrical Components, Devices, and Accessories" paragraph below if electric motor operators are required for operable metal-framed skylights.

* + - * 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
			1. METAL-FRAMED SKYLIGHTS
				1. Metal-Framed Skylights: Glazed skylight assemblies supported by aluminum framing.
				2. Aluminum Framing Systems: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
				3. Aluminum: Alloy and temper as recommended in writing by manufacturer for type of use and finish indicated.

Sheet and Plate: ASTM B209.

Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

Extruded Structural Pipe and Tubes: ASTM B429.

Structural Profiles: ASTM B308.

* + - * 1. Operable Systems: Equip operable metal-framed skylights with manufacturer's standard hinges, chain-driven operating hardware, and weather-sealing gaskets.

Retain "Manual Operator" or "Motor Operator" subparagraph below to suit Project.

Manual Operator: Manufacturer's standard, rotary-crank extension device.

Pole Operator: [**Manual, 60 inches long**] [**Manual, telescoping to 144 inches**] [**Rechargeable-motor, power-driven type, telescoping to 144 inches**] <**Insert requirements**>.

Motor Operator: Manufacturer's standard electronic control, including switch, transformer, low-voltage motor, cover, and mounting hardware.

Provide motor of size and capacity recommended by metal-framed skylight manufacturer to suit metal-framed skylight indicated.

Before retaining "Rain Sensors" or "Remote Control" subparagraph below, verify availability for products selected.

Rain Sensors: Provide rain sensor that automatically closes operable unit when water is detected.

Remote Control: Provide motor operator with portable remote-control device.

Revise "Pressure Caps" paragraph below if gaskets mechanically retain glazing; delete for four-sided, structural-sealant-glazed skylights.

* + - * 1. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

Include snap-on aluminum trim that conceals fasteners.

* + - * 1. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
				2. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

Retain first subparagraph below for glass retained by field-installed pressure caps.

At pressure caps, use ASTM A193 stainless steel screws.

Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

Reinforce members as required to receive fastener threads.

Retain subparagraph below for exposed fasteners if any.

Use exposed fasteners with countersunk Phillips screw heads[**, finished to match framing system**] [**, fabricated from Series 300 stainless steel**].

Retain "Concrete and Masonry Inserts" paragraph below if applicable or revise to suit Project.

* + - * 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

Retain "Anchor Bolts" paragraph below for fastening to wood curbs. If anchor bolts are required, coordinate locations.

* + - * 1. Anchor Bolts: ASTM A307, Grade A, galvanized steel.
				2. Concealed Flashing: [**Manufacturer's standard, corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials**] [**Dead-soft, 0.018-inch-thick stainless steel, ASTM A240 of type recommended in writing by manufacturer**].
				3. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than [**0.030 inch**] [**0.040 inch**] [**0.060 inch**] <**Insert dimension**> thick.
				4. Framing Sealants: As [**recommended in writing by manufacturer.**] [**specified in Section 079200 "Joint Sealants."**]
				5. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
			1. GLAZING
				1. Glazing: As specified in [**Section 088000 "Glazing."**] [**Section 088400 "Plastic Glazing."**]
				2. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
				3. Spacers and Setting Blocks: [**Manufacturer's standard elastomeric types.**] [**As specified in Section 088000 "Glazing."**] [**As specified in Section 088400 "Plastic Glazing."**]
				4. Glazing Sealants: As recommended in writing by manufacturer**.**

Retain "Structural Glazing Sealants" paragraph below and delete "Glazing Sealants" paragraph above if metal skylights are structurally glazed.

* + - * 1. Structural Glazing Sealants:

Structural Sealant: ASTM C1184, 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 metal-framed skylights indicated.

Color: [**Black**] [**Gray**] [**As selected by Director’s Representative from manufacturer's full range**].

Review weatherseal-sealant requirements in "Weatherseal Sealant" subparagraph below with metal-framed skylight manufacturers. For some systems, structural sealant is also weatherseal sealant; delete subparagraph for these systems.

Weatherseal Sealant: ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other components with which it comes in contact; and recommended in writing by structural- and weatherseal-sealant and metal-framed skylight manufacturers for this use.

Color: Matching structural sealant.

Retain "Bond-Breaker Tape" subparagraph below for structural-sealant-glazed skylights; bond-breaker tape is typically used with weatherseal sealants where conventional sealant backing cannot be used because of dimensional limitations and to avoid three-side adhesion that may be detrimental to proper sealant movement.

Bond-Breaker Tape: [Manufacturer's standard tetrafluoroethylene-fluorocarbon or polyethylene material to which sealants will not develop adhesion] <Insert requirements>.

* + - 1. FABRICATION
				1. Where practical, fit and assemble metal-framed skylights in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
				2. Fabricate aluminum components that, when assembled, have the following characteristics:

Profiles that are sharp, straight, and free of defects or deformations.

Accurately fitted joints with ends coped or mitered.

Internal guttering systems or other means to drain water passing joints and moisture migrating within skylight to exterior.

Physical and thermal isolation of glazing from framing members.

Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

* + - * 1. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
				2. Reinforce aluminum components as required to receive fastener threads.

Retain "Factory-Glazed, Metal-Framed Skylights" paragraph below for factory-glazed, metal-framed skylights. Many manufacturers factory assemble and glaze metal-framed skylights in whole or in part, then ship them to the site as a complete assembly or as partially assembled components. Verify, with manufacturers, availability of factory glazing. Four-sided, structural-sealant-glazed skylights are typically factory glazed.

* + - * 1. Factory-Glazed, Metal-Framed Skylights:

Factory install glazing to comply with requirements in [**Section 088000 "Glazing."**] [**Section 088400 "Plastic Glazing."**]

Retain "Structural-Sealant-Glazed, Metal-Framed Skylights" paragraph below and delete "Factory-Glazed, Metal-Framed Skylights" paragraph above for structural-sealant-glazed skylights.

* + - * 1. Structural-Sealant-Glazed, Metal-Framed Skylights: Prepare surfaces that will contact structural sealant according to structural-sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
				2. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.
			1. ALUMINUM FINISHES

Retain finishes in this article to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts. Aluminum-framing systems are available from some manufacturers with dual finish options, allowing different interior and exterior color finishes; verify with manufacturer.

Retain one of two options in "Clear Anodic Finish" paragraph below. Verify availability with manufacturers.

* + - * 1. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**] [**AA-M12C22A31, Class II, 0.010 mm**] or thicker.

Retain one of two options in "Color Anodic Finish" paragraph below. Verify availability with manufacturers.

* + - * 1. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**] [**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.

Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from full range of industry colors and color densities**] <**Insert color**>.

"Baked-Enamel or Powder-Coat Finish" paragraph below references AAMA standard for pigmented organic coating on aluminum extrusions and panels.

* + - * 1. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

Retain "High-Performance Organic Finish, Two-Coat PVDF," "Superior-Performance Organic Finish, Three-Coat PVDF," "Superior-Performance Organic Finish, Four-Coat PVDF," "Superior-Performance Organic Finish, Single-Coat FEVE," or "Superior-Performance Organic Finish, Two-Coat FEVE" paragraph below; if more than one finish is required, indicate location of each system on Drawings, in schedules, or by inserts. Coordinate finish system selected with special finish warranty period specified in Part 1 "Warranty" Article.

In "High-Performance Organic Finish, Two-Coat PVDF" paragraph below, retain AAMA 2604 with 50 percent resin content by weight in color coat or AAMA 2605 with 70 percent resin content by weight in color coat for high-performance organic coatings on extrusions and panels. If specific products are required, name coating manufacturers and products.

* + - * 1. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with [**AAMA 2604**] [**AAMA 2605**] and containing not less than [**50**] [**70**] percent PVDF resin by weight in color coat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Four-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

"Superior-Performance Organic Finish, Single-Coat FEVE" paragraph below is not suitable for seacoast and severe environments.

* + - * 1. Superior-Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - 1. SOURCE QUALITY CONTROL

Retain this article for structural-sealant glazing.

* + - * 1. Structural-Sealant Glazing: Perform quality-control procedures complying with ASTM C1401 recommendations including, but not limited to, material qualification procedures, sealant testing, and fabrication reviews and checks.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. General: Comply with manufacturer's written instructions.

Do not install damaged components.

Fit joints between aluminum components to produce hairline joints free of burrs and distortion.

Rigidly secure nonmovement joints.

Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

Seal joints watertight unless otherwise indicated.

* + - * 1. Metal Protection: Where aluminum will contact dissimilar materials, protect against galvanic action by painting contact surfaces with protective coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
				2. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.
				3. Install components to drain water passing joints, and moisture migrating within skylight to exterior.
				4. Install components plumb and true in alignment with established lines and elevations.
				5. Glazing: Install glazing as specified in [**Section 088000 "Glazing."**] [**Section 088400 "Plastic Glazing."**]

Retain "Structural-Sealant Glazing" paragraph below and delete "Glazing" paragraph above if metal skylights are structurally glazed.

* + - * 1. Structural-Sealant Glazing:

Prepare surfaces that will contact structural sealant according to structural-sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

Install weatherseal sealant according to weatherseal-sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind weatherseal sealant as recommended in writing by weatherseal-sealant manufacturer.

* + - * 1. Erection Tolerances: Install metal-framed skylights to comply with the following maximum tolerances:

Erection tolerances in "Alignment" and "Location and Plane" subparagraphs below are examples only and are based on manufacturers' literature. Coordinate with tolerances for support systems and revise to suit Project.

Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.

Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet but no greater than 1/2 inch over total length.

* + - 1. FIELD QUALITY CONTROL
				1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Generally retain inexpensive test in "Water-Spray Test" subparagraph below to check skylights' resistance to water penetration. Insert test area requirements to suit Project.

Water-Spray Test: Before installation of interior finishes has begun, skylights are tested in accordance with AAMA 501.2 and do not evidence water penetration.

If retaining "Water Penetration under Static Pressure" subparagraph below, verify with qualified testing agencies that Project conditions will allow satisfactory static-pressure field testing. A system's installed performance is generally less than its laboratory performance. Indicate test locations on Drawings.

Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas are tested in accordance with ASTM E1105.

Test Procedures: Test under [**uniform**] [**and**] [**cyclic**] static-air pressure.

Coordinate static-pressure, field-test performance requirements in "Static-Air-Pressure" subparagraph below with static-pressure, laboratory-test performance requirements specified in "Performance Requirements" Article. Generally, 0.67 times the pressure specified for laboratory testing in accordance with ASTM E331 is a realistic criterion.

Static-Air-Pressure Difference: <**Insert pressure**>.

Water Penetration: None.

Retain "Structural-Sealant Compatibility and Adhesion" and "Structural-Sealant Glazing Inspection" subparagraphs below for field-glazed, structural-sealant skylights.

Structural-Sealant Compatibility and Adhesion: Structural sealant is tested in accordance with ASTM C1401.

Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C1401, Appendix X2, is used.

A minimum of [**one**] [**two**] <**Insert number**> area(s) on each skylight face is tested.

Repair installation areas damaged by testing.

Structural-Sealant Glazing Inspection: After installation of metal-framed skylights is complete, structural-sealant glazing is inspected and evaluated in accordance with ASTM C1401 recommendations for quality-control procedures.

* + - * 1. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
				2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
				3. Prepare test and inspection reports.
			1. CLEANING AND PROTECTION
				1. Clean exposed surfaces immediately after installing skylights. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
				2. Remove and replace [**glass**] [**plastic glazing**] that has been broken, chipped, cracked, abraded, or damaged during construction period.
				3. Protect skylights from contact with contaminating substances resulting from construction operations. If contaminating substances do contact skylight surfaces, remove contaminants immediately according to manufacturer's written instructions.

Retain "Metal-Framed Skylight Operating System" paragraph below if electric motor operators are required for operable metal-framed skylights.

* + - * 1. Metal-Framed Skylight Operating System: Clean and lubricate joints and hardware. Adjust for proper operation.
			1. DEMONSTRATION

Retain this article if electric motor operators are required for operable metal-framed skylights.

* + - * 1. [**Engage a Company Service Advisor to train**] [**Train**] Facility’s maintenance personnel to adjust, operate, and maintain metal-framed skylight operating system.

END OF SECTION 086300