

DIVISION 8 – OPENINGS

SECTION 08 45 13

ALUMINUM FRAMED STRUCTURED POLYCARBONATE SKYLIGHTS

Items in blue indicate specification comments or choices to be selected, deleted or filled in as appropriate.

I. GENERAL

A. Work Included:

1. Single source factory fabricated and installed aluminum clear span pre-engineered skylight structure with framework, polycarbonate and glazing.
2. Sill cap flashing and other required flashings, anchorages, sealant, closures, attachments and other equipment as described herein for a complete watertight installation.
3. Engineering and drafting of production documents, including structural design calculations.
4. Shop drawing submittals.
5. When shown on the drawings, fabrication and erection of the aluminum gutter system including insulation and pitched liners.
6. Applied finish to aluminum extrusions and flashings.

B. Related Work Not Included:

1. Section 05120: Structural Steel.
2. Section 05160: Space Frames.
3. Section 05500: Metal Fabrications.
4. Section 07600: Other Flashing and Sheet Metal not included herein.
5. Section 08800: Other Glazing not included herein.
6. Section 08900: Glazed Curtain Walls.
7. Section ~~xxxxx~~: Roofing.
8. Section ~~xxxxx~~: Sealants.

C. Performance Requirements:

1. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:
 - a. Structural loads.
 - b. Thermal movements.
 - c. Movements of supporting structure.
2. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Water leakage.
 - c. Thermal stresses transferred to building structure.
 - d. Noise or vibration created by wind and thermal and structural movements.

- e. Loosening or weakening of fasteners, attachments, and other components.
- 3. Structural Loads:
 - a. Wind and Snow Loads: As indicated on structural Drawings.
 - b. Concentrated Live Loads on Overhead Assemblies: 200 lbf applied to assemblies at locations that will produce greatest stress or deflection.
 - c. Deflection of Assemblies: limited to 1/100 of clear span for each assembly component.
- 4. Thermal Movements:
 - a. Allow for thermal movements from ambient and surface temperature changes.
 - b. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - c. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Submittals:

- 1. Prior to starting fabrication, submit manufacturers' product specifications, test results showing compliance with performance criteria described below, complete shop drawings, handling installation and protection instructions. Indicate pertinent dimensioning, general construction, component connections and locations, anchorage methods, locations and installation details.
- 2. Provide pairs of samples for initial color selection on 6" long sections of extrusions or formed shapes. Where normal color variations are anticipated, include two or more units in each set indicating limits of color variations.
- 3. Submit structural calculations prepared in accordance with the Aluminum Association's Specifications for Aluminum Structures (SAS30) by a structural engineer qualified in the design of self-supporting sloped glazed systems and licensed to practice in the state where the skylight is manufactured.
- 4. Submit only if specifically requested:
 - a. Submit (2) 12-in. x 12-in. samples of each type of polycarbonate.
 - b. Submit (2) manufacturer's samples of each type of sealant.
 - c. Submit (2) 6-in. long samples of extrusions (with appropriate finish).
 - d. Submit (3) sets of as-built drawings and cleaning and maintenance manuals
 - e. Certification that insulating polycarbonate units will withstand specified design loads.

E. Quality Assurance:

- 1. The skylight installers must be permanent full-time employees of the skylight manufacturer.
- 2. Engage a single source manufacturer/installer for the metal-framed skylights. Skylight source will assume undivided responsibility for all components, including structural design, engineering, fabrication, finishing, preparation at the job site, erection and glazing of the skylight system and the weatherproof integrity of the system in place.
- 3. The manufacturer shall be able to demonstrate that he has performed successfully on comparably sized projects and of comparable design complexity over at least the previous ten years.
- 4. Comply with recommendations of Flat Polycarbonate Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of polycarbonate and glazing terms not otherwise defined in this Section or referenced standards.

F. Design Loading requirements:

- 1. Design loads: as prescribed by governing building codes.

2. Concentrated load of 250 lb applied to any framing member at a location that will produce the most severe stress or deflection.
3. American National Standard “Minimum Design Loads for Buildings and Other Structures” ANSI A58.1 -- latest edition.
4. Design assembly to safely carry all dead, snow, wind, thermal and building movement loads, as well as any additional service and construction loads.
5. The deflection of a framing member in a direction parallel to the plane of polycarbonate, when carrying its full dead load, shall not exceed an amount which will reduce the polycarbonate or panel bite below 75% of the design dimension and the member shall have a 1/8-in. minimum clearance between itself and the edge of the fixed panel, polycarbonate, or component immediately adjacent, nor shall it impair the function of or damage any joint seals.
6. Deflection of members shall not exceed design span divided by 175 (L/175) or one (1) inch for clear spans under 20-ft., or L/240 for clear spans greater than 20-ft.

G. Performance:

1. Provide assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.
2. When tested in accordance with ASTM E-283, air infiltration shall not exceed .06 cfm/sf of fixed area at a test pressure of 6.24 psf.
3. When tested in accordance with ASTM E-331, there shall be no uncontrolled water penetration at a test pressure of 12.0 psf.
4. When tested in accordance with NRFC 100-91/ASTM C 1199/ASTM E 1423, the thermal performance Condensation Resistance Factor (CRF) shall be 52 or higher.
5. The system shall perform to these criteria under a combined load as dictated by the state building codes for dead load and live load.
6. Properties of the Structured Polycarbonate Panels:
 - a. Translucent, extruded-polycarbonate sheet with cellular cross section that provides isolated airspaces and that is coextruded with a UV-protective layer.
 - b. Fire Rating:
 - i. Plastic Self-Ignition Temperature: 1058 deg F or more per ASTM D 1929.
 - ii. Burning Extent: Class CC2 or better per ASTM D 635.
 - iii. Smoke-Developed Index: 450 or less per ASTM E 84, or 75 or less per ASTM D 2843.
 - iv. Flame-Spread Index: Not more than 200 per ASTM E 84.
 - c. Panel U-Factor: Not more than 0.26 Btu/sq. ft. x h x deg F according to ASTM C 236.
 - d. Solar Performance:
 - i. Color: As selected by the Architect from manufacturer's standard color selection.
 - ii. Light Transmission per ASTM E1175: to be determined based on color selection
 - iii. Solar Transmission per ASTM #1084 at “normal” (90°) angle of incidence: to be determined based on color selection.
 - e. Weatherability:
 - i. Color Stability: Not more than 3.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering according to procedures in ASTM D 1435.
 - ii. Outdoor Weathering Conditions: 60 months in Arizona or 120 months in a moderate North American climate.

- iii. The light transmission as measured by ASTM D1003, shall not decrease more than 6% over ten (10) years.
- f. E. Impact Resistance:
 - i. No failure at impact of ice balls of up to 1.1” at velocity up to 82’ per ASTM E-822-81 second using ice balls of up to 1.1”.
 - ii. Impact and shatter resistance of 200 ft. lbs per ASTM D-3841.
- 7. Thermal Movement: Provide for such expansion and contraction of component materials as will be caused by the ambient surface temperature range without buckling, stress on polycarbonate, failure of seals, undue stress on structural elements, reduction of performance or other detrimental effects.
- 8. Where permitted by code, a 1/3 increase in allowable stress for wind or seismic load shall be acceptable, but not in combination with any reduction applied to combined loads. In no case shall allowable values exceed the yield stress.
- 9. Compression flanges of flexural members may be assumed to receive effective lateral bracing only from anchors to the building structure and horizontal glazing bars or interior trim which are in contact with 50% of the member's total depth.
- 10. The skylight framing is designed to be self-supporting between the supports. The skylights will impose reactions to the supporting construction. All adjacent construction must support the transfer of all loads exerted by the skylights. Design or structural engineering services for the supporting structure or building components are not included in the skylight work of this section.
- 11. Rigid frame design: ~~If this item is to be included, delete the item immediately above.~~ The skylight framing is to be designed to exert no horizontal reactions under vertical gravity type loads, (dead, snow, live). Unbalanced live loads, wind, seismic, etc., acting upon the skylight will produce horizontal reactions that cannot be controlled by the skylight but must be resisted by the support structure.

H. Warranty:

- 1. Provide written warranty from the skylight manufacturer stating that all work of this Section will remain free from defects in materials and workmanship. The work shall remain free of leaks, defective design, defective materials and construction.
- 2. Provide written warranty stating that all insulating polycarbonate units will remain free of defects in manufacture. Defects include the following:
 - a. Delamination.
 - b. Color changes from original in excess of 3.0 units Delta E when measured per ASTM D 2244.
 - c. Losses in light transmission beyond 6 percent from original when measured per ASTM D 1003.
- 3. Warrant that skylight shall be free from harmonic vibration, wind whistles, noises caused by thermal movement, loosening, weakening or fracturing attachments to other adjacent components.
- 4. Warranty period: (5) five years after the date of substantial completion.

II. PRODUCTS

A. Manufacturers:

- 1. The specifications are based on the skylight products of Wisconsin Solar Design, wisconsinsolar.com. The following manufacturers will be accepted when

complying with the specifications herein: Super Sky Products, Inc., supersky.com, and Naturalite/EPI, vistawall.com.

2. Other manufacturers must pre-qualify with the Architect before the bid closing date.

B. Aluminum Framing System:

1. Extruded Aluminum Framing Members: ASTM B221 Alloy G.S. 10A-T6, 6063-T6 alloy and temper.
2. Structural members: 0.125" thick minimum.
3. Extruded caps, closures and miscellaneous trim: 0.040" thick minimum.
4. Aluminum sheet for Closures and Flashings: ASTM B209-86 3003-H14 with a minimum thickness of .040 inch, finished to match framing members.
5. Sheet metal flashings/closures/claddings are to be furnished shop formed to profile in min. 10-ft. lengths. When lengths exceed 10-ft., field trimming of the flashing and field forming the ends is necessary to suit as-built conditions. Sheet metal ends are to overlap 6-in. to 8-in. minimum, set in a full bed of sealant and riveted if required.

C. Aluminum Finishes:

1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
3. All aluminum to receive a painted Class I Architectural (insert color) factory applied, oven baked high performance two-step fluorocarbon painted finish or an Architectural Class I color anodized finish (insert color selected here) with a 0.7 mil minimum film thickness, conforming to Aluminum Association Standard AA-M21C22A42/A44 and AAMA 606.1 or AAMA 608.1.

D. Glazing Panels:

1. GE Structured Products, Lexan® Thermoclear® Plus or equal products by Gallina USA meeting specified properties
2. 26 mm thick 7 wall structured polycarbonate
3. Properties: U = .26 (K=1.5), Visible light transmission = 44% minimum, Shading Coefficient = 66%
4. Both sides U.V. protected
5. Weatherability, maximum yellowing = 1 unit Delta E after 15 years
6. Impact resistance, 220 ft/lbs
7. Color: choice of white, clear or bronze.

E. Accessory Materials:

1. Fasteners: ASTM B221 2024-T4 aluminum or 300 series stainless steel with integral color coating to match finish of aluminum where exposed to view; cadmium plated steel for connections to supporting structure.
2. Glazing gaskets -- manufacturer's standard.
3. Setting blocks -- extruded Type II silicone rubber, manufacturer's standard.
4. Sealant -- Dow Corning ® 795 Silicone Building Sealant, a one-part, neutral-cure, medium-modulus silicone rubber. The cured sealant tensile adhesion strength at ±50 percent elongation = 50 psi in accordance with ASTM C 1135.

III. EXECUTION

A. Delivery:

1. Deliver fabricated units and component parts to the jobsite completely identified with labels corresponding to the erection drawings. Protect surfaces from damage during

shipping. Inspect materials for damage upon delivery to the jobsite. Touch-up or replace items with minor defects or scratches with the appropriate material.

B. Pre-installation:

1. The furnishing of temporary covering, weatherproofing and protection of the skylight area before and after the skylight installation are excluded from the work of this section.

C. Installation:

1. Manufacturer shall be totally responsible for the complete erection and glazing of the skylight installation.
2. Prior to the installation of the skylight system, arrange for the representative of the skylight manufacturer to examine the structure and substrate to determine that they are properly prepared, sized and ready to receive the skylight work specified herein.
3. Assist general contractor to coordinate installation with adjacent work such as roofing, sheet metal and other work to ensure a complete weatherproof assembly.
4. Contact between aluminum and dissimilar metals shall receive a protective coating at asphalt paint for the prevention of electrolytic action and corrosion.
5. Install skylight frame, polycarbonate and accessory items as needed in accordance with the manufacturer's printed instructions matching profiles, sizes and spacing indicated on approved shop drawings.
6. During installation, remove labels, part number markings, sealant smears, handprints, and construction dirt from all components. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
7. Anchor work securely to supporting structure, but allow for differential and thermal movement.
8. Erect system plumb and true and in proper alignment and relation to established lines and grades as shown on the approved shop drawings.
9. Handle polycarbonate in accordance with the recommendations of the FNMA, latest edition. Use rubber spacers to maintain separation of polycarbonate and adjacent metal framework.
10. Touch-up areas damaged during installation.
11. Locate weep holes in sill to positively drain condensation to exterior of skylight at each rafter connection.
12. Sealants to be installed per sealant manufacturers' instructions. Do not perform structural silicone sealant work when the metal temperature is below that recommended by the sealant manufacturer.
13. Before application, remove mortar dirt, dust moisture and other foreign matter from surfaces sealant will contact. Apply sealant in a tooled and uniform manner to completely fill joint. Remove excess sealant to leave uniform smooth edge.

D. Site Tolerances:

1. All supporting and adjacent construction will be held to within + 1/2" of theoretical.
2. Tolerances for the installation of related products: Refer to the sections noted in the "Related Work Not Included" paragraph above for specified tolerances for adjoining construction.

E. Cleaning:

1. Remove any temporary skylight coverings and protection of adjacent work areas at the completion of skylight installation. Repair or replace damaged installed products. Clean

- installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
2. The skylight subcontractor is required to leave polycarbonate and metal surfaces clean at the conclusion of the installation. Final cleaning is to be performed by the general contractor, not the skylight subcontractor, just prior to acceptance of the project by the owner.

END OF SECTION 08 45 13