

DIVISION 13 -- SPECIAL CONSTRUCTION

SECTION 13 34 13.16

SOLARIUMS

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 solarium structure with framework, glass and glazing, sill cap flashing and other required flashings, door, windows, ventilating fans, natural gas unit heater, screens, anchorages, sealant, attachments and other equipment as described herein for a complete watertight installation.
2. Engineering and drafting of production documents, including structural design calculations.
3. Shop drawing submittals.
4. When shown on the drawings, fabrication and erection of the aluminum gutter system including insulation and pitched liners.
5. 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: Flashing and Sheet Metal.
5. Section 08800: Glazing.
6. Section 08900: Glazed Curtain Walls.
7. Section xxxxx: Roofing.
8. Section xxxxx: Sealants.

C. Standards:

1. Comply with the standards that are applicable to the work of this Section except as otherwise indicated. Provide assembly that is weather tight, airtight and Department of Industry, Labor and Human Relations approved.
2. Aluminum Association Incorporated (AA):SAS-30 Specifications for Aluminum Structures.
3. American Architectural Manufacturers Association (AAMA):
 - i. 501.1: Standard Test Method for Metal Curtain Walls for Water Penetration Using Dynamic Pressure.
 - ii. 501.2: Field Check of Metal Curtain Walls for Water Leakage.

- iii. 501.3: Field Check of Water Penetration Through Installed Exterior Windows, Curtain Walls and Doors by Uniform Air Pressure Difference.
 - iv. 603.8: Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
 - v. 605.2: Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - vi. 606.1: Voluntary Guide Specification and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.
 - vii. 607.1: Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
4. American National Standards Institute (ANSI): Z 97.1 -1984- Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test.
 5. American Society for Testing and Materials (ASTM):
 - i. A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.
 - ii. A307: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - iii. B209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - iv. B211: Specification for Aluminum-Alloy Bar, Rod and Wire.
 - v. B221: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
 - vi. B316: Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods.
 - vii. C719: Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cycle Movement.
 - viii. C794: Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
 - ix. C1036: Specification for Flat Glass.
 - x. C1048: Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 - xi. D395: Test Methods for Rubber Property -Compression Set.
 - xii. D412: Test Methods for Rubber Properties in Tension.
 - xiii. D1171: Test Method for Rubber Deterioration -Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens).
 - xiv. D2240: Test Method for Rubber Property -Durometer Hardness.
 - xv. E283: Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - xvi. E330: Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
 - xvii. E331: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
 - xviii. E773: Test Method for Seal Durability of Sealed Insulating Glass Units.
 - xix. E774: Specification for Sealed Insulating Glass Units.
 - xx. E783: Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
 6. Consumer Product Safety Commission (CPSC): 16CFR 1202 - Architectural Glazing Standards and Related Material.
 7. Flat Glass Manufacturers Association (FGMA): Glazing Manual.
 8. Insulating Glass Certification Council (IGCC): Classification of Insulating Glass Units.

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 12" 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 solarium is manufactured.
4. Submit only if specifically requested:
 - i. Submit (2) 12-in. x 12-in. samples of each type of glass.
 - ii. Submit (2) manufacturer's samples of each type of sealant.
 - iii. Submit (2) 6-in. long samples of extrusions (with appropriate finish).
 - iv. Submit (3) sets of as-built drawings and cleaning and maintenance manuals
 - v. Certification that insulating glass units will withstand specified design loads.

E. Quality Assurance:

1. The solarium installers must be permanent full-time employees of the solarium manufacturer.
2. Engage a single source manufacturer/installer for the metal-framed solariums. Solarium source will assume undivided responsibility for all components, including structural design, engineering, fabrication, finishing, preparation at the job site, erection and glazing of the solarium system and the weatherproof integrity of the system in place.
3. The manufacturer shall be regularly engaged in the preceding phases of construction of solariums and 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 Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this Section or referenced standards.

F. Design Loading requirements:

1. Roof and snow live loads [select for local code: 30 \(40\) \(60\)](#) psf or applicable drifted snow loads per the applicable building code..
2. Wind live load [as appropriate for local code: 20](#) psf, exposure classification [C \(B\)](#) as applicable, stagnation pressure 17 psf.
3. Concentrated load of 250lb applied to any framing member at a location that will produce the most severe stress or deflection.
4. American National Standard "Minimum Design Loads for Buildings and Other Structures" ANSI A58.1 -- latest edition.
5. Design assembly to safely carry all dead, snow, wind, thermal and building movement loads, as well as any additional service and construction loads.
6. The deflection of a framing member in a direction parallel to the plane of glass, when carrying its full dead load, shall not exceed an amount which will reduce the glass 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, glass, or component immediately adjacent, nor shall it impair the function of or damage any joint seals.
7. 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. When tested in accordance with ASTM E-283, air infiltration shall not exceed .06 cfm/sf of fixed area at a test pressure of 1.56 psf.
2. When tested in accordance with ASTM E-331, there shall be no uncontrolled water penetration at a test pressure of 6.24 psf.
3. When tested in accordance with NRFC 100-91/ASTM C 1199/ASTM E 1423, the thermal performance Condensation Resistance Factor (CRF) shall be 77 or higher.
4. The system shall perform to these criteria under a combined load as dictated by the state building codes for dead load and live load.
5. 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 glass, failure of seals, undue stress on structural elements, reduction of performance or other detrimental effects.
6. 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.
7. 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.
8. The solarium framing is designed to be self-supporting between the support construction. The solariums will impose reactions to the support construction. All adjacent and support construction must support the transfer of all loads including horizontal and vertical, exerted by the solariums. Design or structural engineering services for the supporting structure or building components not included in the solarium scope are not included under this section.
9. Limited reaction design "LRD": **If this item is to be included, delete the item immediately above.** The solarium 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 solarium will produce horizontal reactions that cannot be controlled by the solariums, but must be resisted by the support structure.

H. Warranty:

1. Provide written warranty from the solarium 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 for ten (10) years after the date of acceptance.
2. Provide written warranty stating that all insulating glass units will remain free of seal failure, delamination, discoloration and defects in manufacture for ten (10) years after the date of acceptance.

II. PRODUCTS

A. Manufacturers:

1. The specifications are based on the solarium products of Wisconsin Solar Design Inc., 608-831-2112, , www.wisconsinsolar.com.
2. [Complete or delete this item.] Acceptable manufacturers:
 - a. [Manufacturer #2]
 - b. [Manufacturer #3]
3. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and pre-qualify with the Architect per section 016000 Product Requirements, [optional, specify how many days, i.e., no less than # days] prior to bid date.

B. Materials:

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: 0.060" 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.
6. All aluminum to receive a painted Class I Architectural (insert color -- stocked colors are clear, dark bronze or white, all colors available) 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.
7. Glass--Consult Solarium Manufacturer for glass recommendations. Almost limitless options are available. A general make-up for solarium glass is as follows. Flat roof glass to be 1/4" clear tempered tinted (add coating and/or color of tint here) over same (or 3/8" clear laminated), wall glass to be 1/4" clear tempered over same, bent glass to be 1/4" clear annealed over 3/8" clear laminated. All glass to be low-E with argon-filled air space, 1" overall thickness. See section 08800 for glazing requirements.
8. 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.
9. Glazing gaskets -- manufacturer's standard.
10. Setting blocks -- extruded Type II silicone rubber, manufacturer's standard.
11. Sealant -- High performance silicone sealant applied in accordance with manufacturer's recommendations.
12. Door and hardware - narrow stile aluminum, manufacturer's standard pivots (1 1/2 pair), lockset, thumbturn, closer, push-pull, weather-strip and sweep. Cylinder by others.
13. Aluminum awning vent windows, finished to match solarium, thermally broken, screens, manually operable by cam-lock latch, fully gasketed closure.

14. Motorized interior Roman folding Phifertex fiberglass weave cloth shading system to cover roof and front wall by Thermal Designs, 303-442-3485. Owner's choice from standard color chart.
15. Motorized roof sash, including gear motor, roller bearing pipe hangers, galvanized pipe, arm and rod linkage, open and close limit switches, screens, thermostat and other components as required for a complete operating system. Sash to be the full length of the solarium and a minimum of 2' wide. Inter-component wiring by solarium contractor; 110V power wiring to components by electrical.
 - a. Gear Motors: High-starting-torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with thermal-overload protection; sized to open and operate size and weight of roof sash without exceeding nameplate ratings or considering service factor.
 - i. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - ii. Enclosure: Open drip proof, unless otherwise indicated.
 - iii. Motors: Single phase, 110v, 60 Hz., 1/10hp.
 - iv. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop roof sash at open and closed positions.
 - v. Emergency Release Mechanism: Quick disconnect-release of electric-motor drive system, permitting manual operation in the event of operating failure.
16. Aluminum Wire Insect Screens: 18 x 16 fine mesh screening in 3/4" x 3/8" mill screen framing. Provide at all vent locations. Install gasketed closure to vent operating linkage.
17. Modine HD xx xx,xxx Btu/Hr power exhaust sealed combustion direct vent natural gas unit heater with low voltage thermostat and solid state ignition. Design for a minimum temperature differential of $\Delta T = 55^\circ$. Installation of unit by this section, gas and electrical hookups by others.

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 solarium area before and after the solarium installation are excluded from the work of this section.

C. Installation:

1. Prior to the installation of the solarium system, arrange for the representative of the solarium manufacturer to examine the structure and substrate to determine that they are properly prepared, sized and ready to receive the solarium work specified herein.
2. Assist general contractor to coordinate installation with adjacent work such as roofing, sheet metal and other work to ensure a complete weatherproof assembly.
3. Contact between aluminum and dissimilar metals shall receive a protective coating at asphalt paint for the prevention of electrolytic action and corrosion.
4. Install solarium frame, glass and accessory items as needed in accordance with the manufacturer's printed instructions matching profiles, sizes and spacing indicated on approved shop drawings.

5. 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.
6. Anchor work securely to supporting structure, but allow for differential and thermal movement.
7. Erect system plumb and true and in proper alignment and relation to established lines and grades as shown on the approved shop drawings.
8. Handle glass in accordance with the recommendations of the FNMA, latest edition. Use rubber spacers to maintain separation of glass and adjacent metal framework.
9. Touch-up areas damaged during installation.
10. Locate weep holes in sill to positively drain condensation to exterior of solarium at each rafter connection.
11. 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.
12. 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 + ½" 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:

The solarium subcontractor is required to leave glass and metal surfaces clean at the conclusion of the installation. Final cleaning is generally performed by the general contractor, not the solarium subcontractor, just prior to acceptance of the project by the owner.

Cleaning: Remove any temporary solarium coverings and protection of adjacent work areas at the completion of solarium 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.

END OF SECTION 13 34 13.16

(Notes to specifier: Portions of this solarium specification may not apply to your project. Items in blue indicate choices and may require deletions. Technical assistance is available from WSD staff at 608-831-2112.)