

## **PART 1 GENERAL**

### **1.1 SECTION INCLUDES**

- A. Design, engineering, production drawings, and documents. Detailed design and attachment of Factory-Glazed unit skylights will be provided as noted in the following specifications.
- B. Self-flashing, curb mounted, and assembled factory glazed unit skylights

### **1.2 RELATED SECTIONS**

- A. Section 076200 - Sheet Metal Flashing and Trim
- B. Section 079200 - Joint Sealants
- C. Section 077213 - Manufactured Curbs
- D. Section 088000 - Glazing

### **1.3 REFERENCES**

- A. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA 501.3: Field Check of Water Penetration Through Installed Exterior Windows, Curtain Walls, and Doors by Uniform Air Pressure Difference.
  - 2. AAMA 603.8: Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
  - 3. AAMA 1606-82: Voluntary Uniform Load Structural Standard for Plastic Domed Skylights.
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service or High Pressure Service and Other Special Purpose Applications.
  - 2. ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 3. ASTM B221-08: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 4. ASTM E283-04: Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - 5. ASTM E330-02: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - 6. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  - 7. ASTM E783-02: Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- C. Consumer Product Safety Commission (CPSC)
  - 1. CPSC 16CFR 1201: Safety Standard for Architectural Glazing Materials
- D. North American Fenestration Standard (NAFS): Specification for windows, doors, and skylights.
- E. Window and Door Manufacturers Association (WDMA):WDMA I.S.2 - Specification for windows, doors, and skylights.

### **1.4 SYSTEM DESIGN / PERFORMANCE REQUIREMENTS**

- A. Design Requirements:
  - 1. Extruded aluminum members with an integral gasket slots, weep gutters, condensation gutters, and screw slots for the secure attachment of exterior glazing retainers and screws. Caps will conceal all fasteners and sealants used on vertical rafters.
  - 2. Condensation guttering and weep system to be integral with skylight framing members for positive drainage of condensation at the exterior sill.
  - 3. Full seals along all flashing to the building and structure will be provided.

4. *Optional* aluminum rain gutters, with insulation and pitched liners will be installed, when applicable.
- B. Performance Requirements:
1. Structural Members: Factory glazed unit skylights are manufactured, fabricated, and installed as required to resist loads required by all applicable building codes and will provide performance standards required by these specifications without defects, damage, or failure.
  2. The deflection of the framing member in a direction normal to the plane of glass when subjected to a uniform load deflection test in accordance with ASTM E330, and per the above-specified loads, shall not exceed  $L/175$ , up to 1 inch maximum for clear spans less than 20 feet, or  $L/240$  for clear spans greater than 20 feet.
  3. 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 glass or panel bite below 75 percent of the design dimension and the member shall have a 1/8 inch minimum clearance between itself and the edge of the fixed panel, glass, or component immediately adjacent, nor shall it impair function of or damage joint seals.
  4. Water Penetration: No water penetration shall occur when the system is tested in accordance with ASTM E331 using a differential static pressure of 20 percent of the inward acting design wind load pressure, but not less than 12 pound per square foot. Water penetration is defined as the appearance of uncontrolled water other than condensation on the interior surface of any part of the skylight.
    - a. System is designed to drain water penetrating at joints, as well as condensation occurring within the system to exterior face of the work.
  5. Thermal Movement: System will provide for expansion and contraction of component materials as will be caused by an exterior surface range of (+/-) 85°F, ranging from -20°F to 150°F, and an interior surface temperature range of (+/-) 40°F, ranging from 40°F to 120°F. Adjustments in the exterior and interior temperature ranges should be made, based on specific project locations and conditions. The skylight system should allow for thermal movements without buckling, sealant failure, undue materials stress, and 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 assured 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 percent of member's total depth.
  8. All adjacent and support construction must support the transfer of all loads including horizontal and vertical, exerted by the skylight(s). Design or structural engineering services for the supporting structure or building components not included in the skylight scope are not included under this section.
  9. *Optional limited reaction design*: The skylight framing is to be designed to exert no horizontal reactions under vertical gravity type loads e.g. dead, snow, and live. Unbalanced live loads (wind, seismic, etc) acting upon the skylight will produce horizontal reactions that cannot be controlled by the skylights, but must be resisted by the support structure.
  10. *Optional Hurricane and Impact Resistant Skylight Systems*: If the project is located in or near coastal areas, an impact resistant skylight design may be required. Framing and Glazing manufacturers are to provide a tested system, in compliance with the IBC, Florida Building Code, and Miami-Dade County requirements having Notice of Acceptance Numbers;
    - a. Large and Small Missile Impact [insulated glass] [laminated glass]
    - b. Small Missile Impact: [insulated glass] [laminated glass]
- C. Design Loads: Framing components shall be designed to support following loads:
1. Live Load (downward):

- a. \_\_\_\_\_ psf.
  - b. As indicated on the Drawings.
  2. Wind Load (horizontal):
    - a. \_\_\_\_\_ psf.
    - b. As indicated on the Drawings.
  3. Dead Load:
    - a. \_\_\_\_\_ psf
    - b. As indicated on the Drawings.
  4. Load Combinations:
    - a. Live + Dead
    - b. Wind + Dead
    - c. Negative Pressure - Dead
    - d. (Live + Wind + Dead) / 1.33
  5. Alternate Design Loads: Conform to applicable state and local codes.
- D. Physical Properties: Allowable stresses shall incorporate following safety factors, unless otherwise specified:
1. Air Infiltration:
    - a. ASTM E 283: Not to exceed 0.05 cfm/sq ft at a static pressure of 6.24 psf (50 mph).
    - b. AAMA/WDMA 1600/I.S. 7, SKG-HC40: Not to exceed 0.10 cfm/sq ft at a static pressure of 6.24 psf (50 mph).
  2. Static Water Penetration:
    - a. ASTM E 331: No uncontrolled water leakage at a static pressure of 12 psf (69.3 mph) and a minimum water flow rate of 5 gal/hr/sq ft for 15 minutes.
    - b. AAMA/WDMA 1600/I.S. 7, SKG-HC40: No uncontrolled water leakage at a static pressure of 6 psf and a minimum water flow rate of 5 gal/hr/sq ft for 15 minutes.
  3. Structural Load Test:
    - a. ASTM E 330: Maximum allowable deflection of any member shall not exceed L/175.
    - b. AAMA/WDMA 1600/I.S. 7, SKG-HC40: Permanent set of any frame member shall not exceed 0.4 percent of its unsupported span at 60 psf positive and negative test pressures.
  4. Simulated Field Test: Test skylights for dynamic water resistance at a static pressure of 12 psf in accordance with AAMA 501.2. No uncontrolled water leakage.

## 1.5 SUBMITTALS

- A. Submit [ ] copies of shop drawings including plans, elevations, sections, and details, indicating dimensions, tolerances, profiles, anchorage, connections, fasteners, provisions for expansion and contraction, drainage, flashing, finish, glazing, and attachments to other Work to fully describe the skylight construction for the Architect's approval prior to the beginning of fabrication.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
  4. Maintenance instructions.
- C. Design Data:
  1. Submit manufacturer's structural calculations showing sizes of framing members and loads applied to supporting structure based on design loads.
  2. Structural calculations shall be prepared in accordance with Aluminum Association Specifications for Aluminum Structures SAS30 by a professional engineer qualified in the design of self-supporting, sloped glazed systems and licensed in [Illinois] where skylights are to be installed.
- D. With regard to structural silicone joinery, if specifically requested, submit:
  1. Certification that adhesion of sealant to samples of metal and glass is adequate when

- tested in accordance with ASTM C794.
2. Certification that materials in contact with sealant are compatible with sealant after being exposed to 2,000 - 4,000 micro watt ultra-violet radiation for twenty-one (21) days.
  3. Statement that stress on each detailed sealant join will not exceed design stress of sealant when exposed to specified wind loads.
- E. Test Reports: Submit certified test reports from a qualified independent testing agency, indicating skylights comply with specified requirements, based on testing of current products. Submit results from the following tests:
1. Air infiltration, ASTM E 283.
  2. Water penetration, ASTM E 331.
  3. Uniform load deflection, ASTM E 72 and E 330.
  4. Simulated Field Test, ASTM E 501.2.
- F. Selection Samples: Submit manufacturer's sample(s) of each type of finish and glazing material as requested before fabrication.
1. Submit [ ] 12-inch by 12-inch samples of each type of proposed.
  2. Submit [ ] manufacturer's samples of each type of sealant.
  3. Submit [ ] 6-inch long samples of extrusions (with appropriate finish).
  4. Submit [ ] sets of as-built drawings and cleaning and maintenance manuals upon completion of skylight installation.

## **1.6 QUALITY ASSURANCE**

- A. The manufacturer must demonstrate a minimum of ten (10) years documented experience in the fabrication of skylights of the type required for this project and be capable of providing field service representation during installation.
- B. The Installer is to have a minimum of five (5) years documented experience in the work of this section specializing in the installation of work similar to that required for this project and must be approved by the manufacturer.
- C. The Manufacturer shall be regularly engaged in the preceding phases of construction including pre-installation meetings requiring the attendance of parties directly affecting work of this section, including Contractor, Architect, installer, and manufacturer's representative. Review requirements for preparation, installation, cleaning, protection, and coordination with other work.
- D. Fire-Test-Response Characteristics of Plastic Glazing: Provide thermoformed domes fabricated from sheets identical to those tested for fire-exposure performance per test methods below, by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction. Identify plastic sheets with appropriate markings of applicable testing and inspecting organization.
1. Self-Ignition Temperature: 650 deg F (343 deg C) or greater for plastic sheets in thickness indicated when tested per ASTM D1929.
  2. Smoke-Production Characteristics: Comply with either requirement below:
    - a. Smoke-Developed Index: 450 or less when tested per ASTM D2843 on plastic sheets in manner indicated for use.
    - b. Smoke Density: 75 or less when tested per ASTM D2843 on plastic sheets in thickness indicated for use.
  3. Relative- Burning Characteristics: As follows, when tested per ASTM D635:
    - a. Acrylic Glazing: Class CC2, burning rate of 2.5 inches (64 mm) per minute for normal thickness of 0.060 inch (1.5 mm) or thickness indicated for use.
- E. Unit Skylight Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights, and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, and location of

- installation.
- B. Storage: Store products above the floor and under cover in a clean, dry area until ready for installation. Any protection on the skylights during transportation should remain in place until installed.
- C. Handling: Protect materials and finish from damage during handling and installation.

## **1.8 WARRANTY**

- A. Submit manufacturer's warranty certifying that skylight work was furnished and installed in accordance with the Contact Documents.
- B. Certify that the factory glazed unit skylight system is free of defects in design, material, and construction for a period of ten (10) years from the Date of Skylight Completion.
- C. Warrant plastic against defective materials, delamination, seal failure, and defects in manufacture per the plastic manufacturer's standard warranties.
- D. Warrant structural sealant for a period of ten (10) years per sealant manufacturer's standard warranty of merchantable quality. Warranty shall certify that cured sealant:
  - 1. Will not become brittle or crack due to weathering or normal expansion and contraction of adjacent surfaces.
  - 2. Will not harden beyond a Shore A durometer of 50, nor soften below a minimum of 10 points.
  - 3. Will not change color significantly when used with compatible back-up materials.
  - 4. Will not bleed significantly.
- E. Warrant finish per the manufacturer's standard warranties.
- F. Optional extended warranties may be available on some products at an additional cost.
- G. Warranty service becomes effective only following payment in full for the contract amount.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER**

- A. Contract documents are based on products manufactured by Energy-Glazed Systems Inc. (E-GSI), 350 Center St., Grayslake, IL. 60030 Phone: (847) 223-4500 Fax: (847) 223-6444, website: [www.gsiskylights.com](http://www.gsiskylights.com), email: [sales@gsiskylights.com](mailto:sales@gsiskylights.com).
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 016000.

### **2.2 FACTORY GLAZED UNIT SKYLIGHTS**

- A. Standard Skylights:
  - 1. Style: [Single Slope].
  - 2. Overall Dimensions: [ \_\_\_\_\_ width x \_\_\_\_\_ length]  
[As indicated on the drawings].

### **2.3 MATERIALS**

- A. Framing Materials:
  - 1. Principal Supporting Members: 0.125-inch minimum thickness extruded aluminum, alloy 6005-T5 or 6061-T6 per ASTM B221. Sizes, shapes, and profiles as per E-GSI products, standards, and methodology of design as indicated on the Contract Drawings.
  - 2. Snap-on Covers and Miscellaneous Non-supporting Trim: 0.062-inch minimum thickness extruded aluminum, alloy 6063-T5 per ASTM B221.
  - 3. Supporting Aluminum Gutters: Thickness as prescribed by skylight engineer, based on skylight reactions and applied design loads.
  - 4. Principal Formed Metal Members: 0.040-inch minimum thickness aluminum, alloy 5052 or 6061-T6 per ASTM B209.
- B. Glazing Strips:

1. Extruded EPDM rubber designed to comply with the following specifications:
    - a. Hardness: ASTM D2240, Type A: Durometer 50 (+/-5).
    - b. Tensile Strength: ASTM D412. 800 psi (min).
    - c. Elongation: 300% (min).
    - d. Color: Black.
  2. Compression Set: ASTM D395 Method B, 22 hours at 212°F: 25% max.
  3. Heat Aging Characteristics:
    - a. 70 hours at 212°F.
    - b. Hardness: ASTM D2240, Type A: Durometer 50 (+/-5).
    - c. Tensile Change: ASTM D412: -10%.
    - d. Elongation Change: ASTM D412: -20%.
  4. ASTM D1171 Weather Resistance at 1 Part Ozone per Million, 500 hours at 20% Elongation: No cracks.
  5. No visual checks, cracks or breaks after completion of tests.
- C. Flashing:
1. Formed Aluminum Components and Flashing: Alloy 5005-H34 or equivalent.
  2. Minimum Thickness: 0.040 inch.
  3. Sheet metal flashings are to be furnished shop formed to profile in minimum 10-foot lengths. When lengths exceed 10-feet, field trimming and forming of the ends is necessary to suit as built-in conditions.
- D. Setting Blocks: Extruded Type II EPDM.
1. Extruded Type II silicone rubber designed to permit adhesion and comply with the following specifications:
    - a. Hardness, ASTM D2240, Type A: Durometer 80 (+/-5).
    - b. Color: Black.
- E. Condensation Control System:
1. Mechanically design entire condensation control system to function properly with minimal dependency upon sealants.
  2. Skylight system provided with an integral weep transfer system on all framing members, including rafters.
- F. Glazing Caps:
1. Extruded aluminum, Alloy 6063-T6.
  2. Attach glazing caps with glazing cap fasteners located at a maximum of 9 inches on center or as required to resist negative loading.
- G. Fasteners:
1. For Framing Connections: As required by connection.
    - a. Aluminum: ASTM B211, Alloy 2024-T4.
    - b. Stainless Steel: ASTM A193, Series B8 300.
    - c. Aluminum Rivets: ASTM B316.
  2. For Exterior Cap Retainers: Stainless steel screws, ASTM A193, Series B8 300.
  3. For Anchoring: skylight to treated wood support structure ASTM A307 zinc / galvanized plated steel fasteners.
  4. Finish: Exposed fasteners to match aluminum finish
- J. Sealants:
1. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.
  2. Nonstructural Flush Glazed Joints and Weather Seal Joints: Silicone sealants. Apply in accordance with sealant manufacturer's instructions.
  3. Structural silicone sealant performance requirements:
    - a. Hardness: ASTM D2240 Type A: Durometer 30.
    - b. Ultimate Tensile Strength: ASTM D412, 170 psi.
    - c. Tensile at 150% Elongation: ASTM D412, 80 psi.
    - d. Joint Movement Capability After 14 Day Cure: ASTM C719, (+/-) 50%.
    - e. Peel Strength (aluminum, glass, concrete) After 21 Day Cure: ASTM C794, 50 ppi.
  4. Structural silicone shall not be used to support dead weight of vertical glass or panels.

## **2.4 ALUMINUM FINISHES**

- A. High-Performance Pigmented Organic Coating: AAMA 2605-05: All aluminum components shall be mechanically processed for proper adhesion of paint. All paint shall be thermo set electrostatic powder coat paint. Painting process shall be done in-house to maintain quality control, warranties, and sole responsibility of skylight system. Color (DuPont, Morton standards, architect shall specify). Paint shall pass Mandrel Bending Test ISO1519/ASTM D522 Results 5/32 in/4mm. Impact test 1/10 in. Distortion ISO 6272/ STMD 2794-90 up to 40in/lbs.
1. Color: \_\_\_\_\_.
  2. Color: As selected by Architect from manufacturer's standard colors.
  3. Color: As indicated on the Drawings.

## **2.5 GLAZING**

- A. Plastic Sheets: Monolithic, formable, transparent (colorless and tinted) or translucent (white) sheets with good weather and impact resistant.
1. Impact Glazing: ASTM D 4802, thermoformable, acrylic (methacrylate), Category C-2 or CC-2 Type UVA (formulated with ultraviolet absorber), with Finish 1 (smooth or polished), unless otherwise indicated.

## **2.6 FABRICATION**

- A. Factory glazed unit skylight shall be factory fabricated and preassembled in largest with considerations for shipping and jobsite handling.
- B. Skylight shall have properly designed integral weep systems for drainage to exterior and condensation control.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Upon arrival to the jobsite for installation of the specified work, the manufacturer's erector is to examine the structure and substrate to determine that they are properly prepared, dimensionally accurate, and ready to receive the skylight work included herein.
- B. Notify Architect of conditions that would adversely affect installation or subsequent utilization of skylights. Report any discrepancies to the General Contractor.
- C. Correction of faulty work to be at the expense of the responsible party. Do not proceed with installation until unsatisfactory conditions are corrected.
- D. The skylight manufacturer is not responsible for faulty structure or substrate.

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Ensure supports to receive skylights are clean, flat, level, plumb, and square.
- C. Aluminum Protection: Contact between aluminum and dissimilar metals shall receive a protective coating of asphaltic paint for the prevention of electrolytic action and corrosion.
- D. Skylight manufacturer and manufacturer's erector excludes all field measuring, demolition, removal, replacement, or re-work of any existing material.

### **3.3 INSTALLATION**

- A. Install factory glazed unit skylight including frame, glazing, and accessory items in accordance with manufacturer's instructions at locations indicated on the drawings.
- B. Install skylights level, plumb, square, properly aligned, correctly located, and without warp or rack.
- C. Do not install skylight components with deficiencies or dimensional errors. Do not proceed

- with installation until unsatisfactory components are replaced.
- D. Anchor skylights securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction as demonstrated in shop drawings.
  - E. Install skylights including flashings, fasteners, hardware, sealants, and glazing materials required for a complete, weatherproof installation.
  - F. Use high performance silicone sealants to seal horizontal joints between glass panels and silicone sealant to wet seal joints between snap-on cap retainers and glass.
  - G. Apply sealing materials in strict accordance with sealant manufacturer's instructions. Before application, remove dirt, dust, moisture and other debris from contact surfaces. Tool compounds to fill the joint and provide a smooth finish.
  - H. Isolate, with protective barrier, contact areas between aluminum and dissimilar metals.
  - I. Sheet Metal Flashing: Install sheet metal flashing at skylight perimeter as specified in Section 07620.
  - J. Sealants: Install sealants at sill flashing and perimeter framing as required to prevent air and water intrusion as specified in Section 07920.

### **3.4 FIELD QUALITY CONTROL**

- A. Inspect installed skylights for required fasteners, wet-sealing and uniformity of retaining caps.
- B. Inspect skylight framing members for level and plumb.
- C. Inspect installation of sheet metal flashing and sealants.
- D. Inspect glazing units for cracks, deep scratches, and other damage.

### **3.5 CLEANING**

- A. Clean installed skylights in accordance with manufacturer's instructions.
- B. Clean skylights inside and outside, including member connections and inside corners, immediately after installation and after sealants have cured.
- C. Remove temporary protective coverings and strippable coatings from prefinished metal surfaces.
- D. Remove labels and part number markings from components.
- E. Remove excess sealant in accordance with sealant manufacturer's instructions.
- F. Do not use harsh cleaning materials or methods that would damage metal finishes or glazing.

### **3.6 PROTECTION**

- A. Furnishing of temporary covering and weather-proofing of the skylight openings, if required by the General Contractor, and removal of protective measures during and after skylight installation is excluded by the manufacturer. Any temporary coverings that may be required are not to obstruct or interfere with the skylight installation in any way.
- B. Protect installed products until completion of project in accordance with manufacturer's instructions.
- C. Maintain protection to ensure that, except for normal weathering, skylights will be without deterioration at time of substantial completion.
- D. Remove and replace glass units that are chipped, cracked, abraded or otherwise damaged.

**END OF SECTION**