

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

### 1.2 SUMMARY

- A. This section includes the following:
1. Aluminum-framed skylights to include the following geometries:
    - a) single pitch skylights with vertical or no gable ends.
    - b) pyramid skylights.
    - c) double pitch skylight with hipped, vertical, or no gable ends.
    - d) sawtooth skylight with vertical or no gable ends.
    - e) curved barrel vault skylight with vertical or no gable ends.
    - f) segmented barrel vault skylight with vertical or no gable ends.
    - g) lean-to skylight with vertical or no gable ends.
    - h) polygon skylight.
    - i) custom skylight enclosures and entries.
    - j) canopy skylights.
  2. Structural design, engineering, fabrication, and installation of the entire skylight system to include extruded aluminum framing, integral closures, trim, and perimeter flashing.
  3. Fasteners, anchors and related reinforcement of the framing system as required to resist design loads.
  4. Glass and glazing materials including gaskets, sealants, setting blocks, backer rods, and related materials.
  5. Installation of the entire metal-framed skylight system.
  6. Single subcontract responsibility: Retain a single firm or company, hereinafter referred to as “Skylight contractor” for design, fabrication, and installation of work of this section and related sections to establish undivided responsibility for entire system.  
*(customize below per project specific requirements)*
  7. *Optional design: Blast-rated skylights. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications)*
  8. *Optional design: Hurricane-rated skylights. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications) - (EXCEPT CURVED BARREL VAULT SKYLIGHT)*
  9. *Optional design: Limited thrusting design. (all above geometries apply; please consult factory for engineering and design assistance for specific project applications)*

B. Related Work *(customize below per project specific requirements)*

1. Section 05120: Structural steel for metal framing.
2. Section 05500: Metal fabrications.
3. Section 07210: Building insulation: Rigid insulation at skylight perimeter.
4. Section 07600: Flashing and sheet metal.
5. Section 07900: Joint sealers: Perimeter joint sealant and backer rod.
6. Section 08800: Glazing.
7. Section 08900: Glazed curtain walls.

**1.3 REFERENCES** *(customize below per project specific requirements)*

- A. Aluminum Association (AA): Specifications for Aluminum Structures SAS-30
- B. American Architectural Manufacturers Association (AAMA)
- C. American Society for Testing and Materials (ASTM)
- D. American Institute of Steel Construction (AISC)
- E. American National Standards Institute (ANSI)

**1.4 PERFORMANCE REQUIREMENTS**

- A. Framing system including glazing material shall be designed to support design loads as prescribed by the governing building code, and/or specified herein:

Negative wind load.....( )psf  
Positive wind load.....( )psf  
Snow load.....( )psf  
Concentrated load.....( )lbs.

- B. Thermal load of +/- 60 degrees F from ambient temperature without causing buckling, stresses on glass, failure of seals, undue stress on structural elements, reduction of performance or other detrimental effects.
- C. 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.
- D. Thermal breaks shall be assumed to have no ability to transfer shear stress for composite action of flexural members. Elements joined by a thermal break shall be assumed to act separately.
- E. The maximum allowable deflection of any framing member normal to the plane of the glass shall not exceed L/175. For spans 20'-0" or greater the maximum allowable deflection shall not exceed L/240.
- F. The maximum allowable deflection of any framing member parallel to the plane of the glass shall not exceed 1/8".
- G. Structural-Test Performance: Metal Framed Skylights tested according to ASTM E 330 as follows:
  1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified deflection limits.
  2. When tested at 150 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 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

- H. Allowable air infiltration shall not exceed 0.02 cfm/sqft. of the total glazed surface area when tested in accordance with ASTM E283 at static pressure of 6.24 psf.
- I. No uncontrolled water leakage shall occur when the system is tested in accordance with ASTM E331 at a static pressure of 12 psf.
- J. No uncontrolled water leakage shall occur when the system is tested for dynamic water resistance in accordance with AAMA 501 at a static pressure of 12 psf.
- K. Skylight framing is designed to be self-supporting between the support construction. The skylight(s) 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 skylight(s). Design or structural engineering services for the supporting structure or building components not included in the skylight scope and are not included under this section.
- L. Condensation Resistance Factor: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (crf) of not less than 62 when tested according to AAMA 1503-09.  
**(crf of 70 was achieved utilizing 1-5/16" I.G.U. Solarban 70 XL H.S. / clear H.S. laminated with argon spacer)**

*(customize below per project specific requirements)*

- M. *Optional blast rated design: Skylight framing will be designed, engineered and manufactured to resist blast loads per specific project requirements. Blast loads will be proven via 3D model analysis and structural calculations. Please consult factory for system capabilities and project assistance.*
- N. *Optional hurricane rated design: Skylight framing will be designed, engineered and manufactured to resist impact loads from wind-borne debris. Manufacturer will offer tested system for either Miami Dade County (large and small missile (laminated glass) or Florida-approved system (large missile insulated glass). Please consult factory for system capabilities and project assistance.*
- O. *Optional limited thrusting design: The skylight framing is to be designed to exert no horizontal reactions under vertical gravity loads, (dead, snow, 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. Please consult factory for system capabilities and project assistance.*

## **1.5 SUBMITTALS**

- A. Product data: Includes construction details, material descriptions, dimensions and profiles of components, and finishes for metal-framed skylights.
- B. Shop drawings: For metal-framed skylights includes plans, elevations, sections, details, and attachments/interfaces to other work. Must be drawn in the domestic USA by the manufacturer of the system.
- C. Includes air, water, and structural test data.
- D. Signed and sealed professional engineering calculations by a qualified professional engineer responsible for their preparation licensed in the state the project is located.
- E. Samples for initial selection: Manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
- F. Samples for verification: Finish samples, if required, are to be provided on pieces of 2"x3" aluminum sheet.

- G. Installer certificates: If required, signed by manufacturer certifying that installers comply with requirements – reference installer program.
- H. Product test reports: From a qualified testing agency indicating skylights comply with requirements, based on comprehensive testing of current products.
- I. Tested specification to incorporate all skylight geometries.
- J. Sealant compatibility and adhesion test reports: From sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with sealants; includes sealant manufacturer’s interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed for adhesion.
- K. Field test reports: If required.

#### **1.6 QUALITY ASSURANCE**

- A. Installer qualifications: An experienced installer who has specialized in installing metal-framed skylights similar to those indicated for this project and who is acceptable to manufacturer; also licensed within the state the project is located.
- B. Professional engineer qualifications: A professional engineer who is experienced in providing engineering services of the kind indicated. Engineer must be licensed in the state the project is located.
- C. Testing agency qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Manufacturer must use an extruded aluminum system comprised of domestically produced aluminum and is fabricated/assembled in the USA.
- E. Manufacturer must have accredited quality assurance program monitored by a third party certified agency.
- F. Pre-construction testing: If required.
- G. Pre-construction sealant compatibility and adhesion testing: If required.
- H. Welding: All welding shall comply with standards set forth by the American Welding Society.
- I. Pre-installation conference: When required, conduct conference at project site to comply with requirements in Division 1, Section “Project Meetings.” Review methods and procedures related to metal-framed skylights including, but not limited to, the following:
  - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review structural load limitations.
  - 3. Review skylight curb structural requirements.

4. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Review required testing procedures.
6. Review weather and forecasted weather conditions and procedures for unfavorable conditions.
7. Review protection of adjacent roof areas.
8. Review preparation and other requirements for installing structural silicone sealant.

### **1.7 PROJECT CONDITIONS**

- A. Field measurements: Where skylights are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
- B. Established dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating skylights without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

### **1.8 WARRANTY**

- A. Skylight manufacturer shall warrant that the framing system will be free of defects in materials and workmanship for a period of ten (10) years from date of substantial completion.
- B. Anodized Finishes: All anodized finishes shall be warranted for color and film integrity for a period of five (5) years from date of application.
- C. Painted finishes: All painted finishes shall be warranted for a period of ten (10) years from date of application.
- D. Glazing materials shall be warranted against defective materials, seal failure, and defects in manufacture per the glazing manufacturer's standard warranties, but not less than ten (10) years; only ten (10) years delamination warranty is available and breakage is not included.
- E. Skylight manufacturer/installer shall guarantee that the installation will remain weather tight for a period of one (1) year from date of substantial completion.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by Acurlite Structural Skylights, Inc. / 1017 N. Vine St. / Berwick, PA 18603 PH: 570-759-6882 FX: 570-759-9552 Email: sales@acurlite.com
- B. Substitutions: Manufacturers shall not be considered without prior approval in writing no later than ten (10) calendar days prior to bid. Substitute manufacturers must have been in the custom skylight business for not less than a period of ten (10) years and must submit to the architect the following:
  1. List of similar projects successfully completed within the last five years.
  2. Proof of financial capability.

3. Complete details of proposed skylight.
4. Complete specifications for architect's review.
5. Structural calculations for the specific project stamped by a professional engineer licensed in the state in which the project is located.

## **2.2 FRAMING SYSTEM**

- A. Extruded aluminum framing members to be 6063-T5, 6063-T6, or 6061-T6 alloy and temper. Other alloys and tempers may be used if they prove they do not void the warranties required in paragraph 1.8. Any substituted alloys and tempers must be clearly indicated on the shop drawings and in the structural calculations.
- B. Thickness of structural framing members shall depend on the design loading, cross sectional configuration, and fabrication requirements.
- C. Rafter bars shall have condensation gutters as a portion of the extrusion. Horizontal cross bar gutters sit on top of and drain into rafter gutters. Skylight systems with in line gutters, or guttering systems that require sealant, or systems using horizontal attachment with shear blocks that require sealants are unacceptable skylight systems.
- D. All formed aluminum flashing and closures to be a minimum of .063 inches in thickness.
- E. Snap-on covers and miscellaneous non-structural trim shall be the minimum thickness recommended by manufacturer.
- F. Glazing band: Glazing sits above the function water control band.
- G. Function band: allows moisture or condensation to move through the system without coming in contact with the glazing.
- H. Provide tubular shapes and profiles of manufacturer's standard construction for members of the skylight systems. Web, Flange and/or "I" Beam Systems are unacceptable.
- I. Locate weep holes to positively drain condensation to exterior of skylight as required.

## **2.3 FABRICATION**

- A. Framing components are as follows:
  1. Factory fit and assembled, where practical.
  2. All fabrication shall be done at the manufacturing location and not on site.
  3. Install gaskets and tapes at factory.
  4. Fabricate components that, when assembled, will have accurately fitted joints with ends coped; or mitered to produce hairline joints free of burrs and distortion.
  5. Fabricate components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
  6. Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.
  7. Fabricate components to ensure that glazing is thermally and physically isolated from framing members;
  8. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

9. Fit and assemble components to greatest extent practicable before finishing.
  10. Reinforce members as required to retain fastener threads.
  11. Attach retainer bars with gasketed stainless steel fasteners spaced at a maximum of 8 inches on center.
  12. Before shipping, shop assemble, mark, and disassemble components that cannot be permanently shop assembled.
- B. Provide continuous aluminum skylight sill pan / closure flashing with weatherproof joints sealed and fully welded corners. Locate weep holes in the assembly as required. Structural curb to support skylight is by others.
- C. Prepare framing to receive anchor and connection devices and fasteners.
- D. Field/factory glazing: Locate and size setting blocks and spacers in accordance with the glazing manufacturer's recommendations. At no point shall the glazing come in contact with the skylight frame or fasteners.

#### 2.4 ALUMINUM FINISH

- A. Applicator Qualifications: Certified by AAMA and listed on AAMA Verified Components List.
- B. Verify accuracy of components, quantities, and sizes prior to application of finishes.
- C. Applicator - PVDF-Based Finishes:
1. Use regenerative thermal oxidizer to destroy VOC's.
  2. Utilize chrome-based five-stage pretreatment system applied in accordance with AAMA and ASTM standards.
  3. Possess in-house blending capabilities, allowing for only specific amount of paint needed for each project.
  4. Utilize automated rotary atomization spray bell application providing uniform coverage with manual spray reinforcement for coverage in areas unreachable by automation.
  5. Employ skilled professional field service division to repair warranty or application issues arising at Project site.
  6. Utilize documented quality control protocol in accordance with AAMA 2605 test procedures.
    - a. Color uniformity: 8.1.1.
    - b. Performance: 8.1.2.
    - c. Specular gloss: 8.2.
    - d. Dry film hardness: 8.3.
    - e. Dry adhesion: 8.4.1.1.
    - f. Wet adhesion: 8.4.1.2.
    - g. Boiling water adhesion: 8.4.1.3.
    - h. Direct impact: 8.5.
    - i. Abrasion resistance: 8.6.
    - j. Muriatic acid resistance 8.7.1.
    - k. Mortar resistance: 8.7.2.
    - l. Nitric acid resistance: 8.7.3.
    - m. Detergent resistance: 8.7.4.
    - n. 24-hour window cleaner resistance: 8.7.5.
    - o. Online Quality Assurance Inspection:
      - i. Proper paint coverage: 5.0.
      - ii. Visual/appearance: 5.2.
      - iii. Dry-film thickness: 5.3.
      - iv. Color 2ÅE per ASTM D2244, Section 3.
      - v. Gloss: +/- 5 units of manufacturers specification.
    - p. Apply AAMA 2605 compatible water-based air-dry system.

- ii. Applicator - Anodize Finishes:
  - 1. Offer both caustic (traditional) and eco-friendly (acid) etching technologies.
  - 2. Utilize fully automated, computer-controlled process lines for consistency throughout Project.
  - 3. Utilize documented quality control protocol in accordance with AAMA 611 test procedures :
    - a. Color uniformity: 8.3.
    - b. Gloss uniformity: 8.4.
    - c. Oxide coating thickness: 9.1.
    - d. Oxide coating weight/density: 9.2.
    - e. Seal test: 9.8.
    - f. Online quality assurance inspection:
      - i. Random sample check for color uniformity: Maximum difference of 5ÅE.
      - ii. Random coating thickness testing: Minimum oxide coating of 18 microns (0.7 mil) for Class I clear and color anodize coatings and 10 microns (0.4 mils) for Class II clear anodize.

*(customize below per project specific requirements)*

- D. *Optional: Class I, color anodic finish: AA-M10C22A42/A44 (mechanical finish, as fabricated; chemical finish: etched, medium matte; anodic coating: Architectural class I, integrally colored or electrolytically deposited color coating 0.7 mil or thicker) complying with AAMA 606.1 or AAMA 608.1.*
- E. *Optional: Anodize Finish: AAMA 611, Architectural Class I anodized to 0.0007 inch minimum thickness, [champagne] [light bronze] [medium bronze] [dark bronze] [extra dark bronze] [black] [copper] [\_\_\_\_] color.*
- F. *Optional: PVDF-Based Coating: AAMA 2605, fluoropolymer finish containing minimum 70 percent kynar resins, [two] [three] [four] coat system, [custom] [\_\_\_\_] color [to be selected from manufacturer's full color range.*

## 2.5 GLAZING MATERIALS

- A. Skylight system can accommodate 1/4" single glazed – 2" insulated glazing (other glazing thickness can be accommodated per job specific requirements).
  - 1. Typical insulating glass: 1-5/16 inch consisting of 1/4 inch tinted, tempered exterior lite with soft coat low "e" on # 2 surface, 1/2 inch sealed air space, and 9/16 inch clear laminated safety glass with a .060 interlayer interior lite. (\*other as required-specified) \*Glass must meet the requirements of AAMA for the project. For impact tested system, consult factory for approved glazing.
- B. Glazing Gaskets:
  - 1. Continuous extruded black silicone gasket to meet or exceed the following for systems not reliant on compression sealed gasket design:
    - i. Hardness (shore A)            60+/- durometer
    - ii. Tensile strength                974 psi or greater
    - iii. Elongation                        273%



- C. Silicone setting blocks: Manufacturer's standard permanent non-migrating and hardness to comply with requirements.
- D. Glazing weatherseal sealant: Neutral-curing silicone sealant recommended by skylight and sealant manufacturers for this use.
  - 1. Sealant is capable of withstanding 50 percent movement in both extension and compression (total of 100 percent movement) when tested for adhesion and cohesion under maximum cyclic movement according to ASTM C 719.
  - 2. Sealant complies with ASTM C 920 for Type S, Grade NS, Class 50, uses NT, G, A, and O, as applicable to substrates including other sealants with which it comes in contact.
  - 3. Color: Dow 795 standard colors.
- E. Flashing Sealant: Single-component, non-sag, high-performance, non-priming, gun-grade elastomeric polyurethane furnished by skylight manufacturer.
  - 1. Sealant complies with ASTM C920, Type S, Grade NS, Class 50, Use NT, A, G, and O. Canadian Specification CAN2-19.13-M82
  - 2. Color: Dow 795 standard colors.

## **2.6 ANCHORS AND FASTENERS**

- A. Provide all anchors and fasteners required for complete installation.
- B. All fasteners in potential wet areas to be stainless steel.
- C. All lag screws, sleeve, stud, and through bolt-structural connections shall be zinc plated or stainless steel.
- D. Conceal fasteners where possible.

## **2.7 SEALANTS**

- A. Skylight manufacturer shall be responsible for the selection of all sealants.
- B. All surfaces shall be cleaned and primed in accordance with the sealant manufacturer's guidelines.
- C. All exterior seals shall be black in color. (Or standard color sealants, as available and selected by the client)

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting skylight performance.

1. Skylight installer shall notify the general contractor of obvious deficiencies or dimensional errors in the support system and/or adjacent construction. No installation work shall be performed until the deficiencies are corrected or written authorization is given to proceed with the as-built construction.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

A. Material Protection is as follows:

1. Where aluminum will contact dissimilar materials protect against galvanic action and corrosion.
2. All materials shall be delivered, stored, and covered to protect factory finishes from weather damage and construction dirt until installed.
3. Glazing materials shall be packaged to prevent breakage.
4. Skylight materials shall be installed in strict accordance with manufacturer's erection drawings and installation manual.

### **3.3 INSTALLATION**

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.

1. Fit frame joints to produce hairline joints free of burrs and distortion.
2. Rigidly secure non-movement joints.
3. Accommodate thermal and mechanical movements.
4. Install framing components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
5. Coordinate installation of curb flashings at skylight perimeters to maintain continuity of water barriers. Set continuous curbs and flashings in a full sealant bed, unless otherwise indicated; comply with requirements in Division 7 Section "Joint Sealants".
6. Set skylights plumb, level, and true to line, without warp or rack of frames or panels and anchor securely in place in accordance with approved shop drawings.

B. Erection tolerances: Install skylight components true in plane, accurately aligned, and without warp or rack. Adjust framing to comply with the following tolerances:

1. Variation from plane: Limit variation from plane or location shown to 1/8 inch in 10 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line and at corners and where surfaces are separated by less than 3 inches, limit offset from true alignment to less than 1/32 inch; otherwise, limit offset from true alignment to 1/8 inch.

- C. Field glazing: Locate and size extruded silicone setting blocks and spacers in accordance with the glazing manufacturer's recommendations. At no point shall the glazing come in contact with the skylight frame or fasteners.
- D. Install weather seals according to sealant manufacturer's written instructions to provide weatherproof joints. Install joint fillers behind sealant as recommended by sealant manufacturer.

### **3.4 FIELD QUALITY CONTROL**

- A. Water leakage: Field check in accordance with AAMA 501.2. There shall be no uncontrolled water leakage as defined in AAMA 501.2. Water supply to the skylights, with adequate water pressure, is to be furnished by the General Contractor. Tests are to be conducted upon completion of the installation with no remobilization or down time included to accommodate either water supply availability or witness personnel schedules. Testing is to be performed by the manufacturer's authorized personnel with a maximum of five (5) man-hours for set-up, testing and clean-up. Any retests due to failures of adjacent trades and any surrounding conditions will be performed at additional costs. Independent laboratory testing and reports, if required, are to be ordered and directed by the Owner and/or General Contractor at their expense.

### **3.5 CLEANING**

- A. Clean skylights inside and outside, immediately after installation, and after sealants have cured, according to manufacturer's written recommendations.
  - 1. Remove temporary protective coverings and strippable coatings from pre-finished metal surfaces.
  - 2. Remove labels and markings from all components.
  - 3. Remove excess sealants.
- B. The general contractor shall perform final cleaning and physical protection of all installed materials.

**END OF SECTION 086300 – Metal Framed Skylights**