

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Design, engineering, production drawings, and documents. Detailed design and attachment of shelters structure will be provided as noted in the following specifications.
- B. Head, sill, horizontal, and verticals sections will be capped with pressure caps and snaps to conceal all screws.
- C. All applied finishes of aluminum extrusions and sheet to be thermo set powder coat painted finish.
- D. Glazing to be considered at the selection of the P.M. / Architect in accordance with glazing section 08800.
- E. Flashings to be provided as detailed on the drawings.

1.2 RELATED SECTIONS

- A. Section 033000 – Cat-in-Place Concrete
- B. Section 055000 – Metal Fabrications
- C. Section 079200 - Joint Sealants
- D. Section 088000 – Glazing

1.3 REFERENCES

- A. Aluminum Association Incorporated (AA)
 - 1. SAS-30: Specifications for Aluminum Structures.
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A 513 - Standard Specification for Electric-Resistance-Welded Carbon And Alloy Steel Mechanical Tubing.
 - 3. ASTM A 653/A - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. ASTM A 1008/A - Standard Specification for Steel Bars, Carbon and Alloy, Cold-Finished.
 - 5. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 6. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 7. ASTM B 632/B 632M - Standard Specification For Aluminum-Alloy Rolled Tread Plate.
 - 8. ASTM C 578 - Standard Specification For Rigid, Cellular Polystyrene Thermal Insulation.
 - 9. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass - Kind Hs, Kind Ft Coated and Uncoated Glass.
- C. American Society of Civil Engineers (ASCE)
 - 1. Minimum Design Loads for Buildings and Other Structures.
- D. APA – The Engineered Wood Association
 - 1. PRP-108 Performance Standards and Policies for Structural-Use Panels
 - 2. PFS PRP-133 Performance Standards and Policies for Structural-Use Panels.
- E. Underwriters Laboratories Inc. (UL)
 - 1. UL 752: Standard for bullet Resisting Equipment
- F. American National Standards Institute (ANSI)
 - 1. ANSI A117.1 Accessible and Useable Buildings and Facilities.

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.
 2. Condensation guttering and weep system to be integral with gutter grid system framing members for positive drainage of condensation at the exterior sill.
 3. All rafters and purlings segments will be caps concealing all fasteners and sealants used.
 4. Full seals along all flashing to the building and structure will be provided.
 5. *Optional* aluminum rain gutters, with insulation and pitched liners will be installed, when applicable.
- B. Performance Requirements:
1. Structural Members: gutter grid structures 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 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.
 3. 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 structure.
 - 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 structure 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 exerted by the structures. Design or structural engineering services for the supporting structure or building components not included in the structure scope are not included under this section.
 9. *Optional limited reaction design:* The structure 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 structure will produce horizontal reactions that cannot be controlled by the structure, but must be resisted by the support structure.
 10. *Optional Hurricane and Impact Resistant Systems:* If the project is located in or near coastal areas, an impact resistant structure 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 systems 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 gutter grid systems 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 [] where gutter grid systems 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 joints 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 gutter grid system 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 installation.

1.6 QUALITY ASSURANCE

- A. The manufacturer must demonstrate a minimum of ten (10) years documented experience in the fabrication of gutter grid systems 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.

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. (Prepaid or schedule by General Contractor)
- B. Storage: Store products above the floor and under cover in a clean, dry area until ready for installation. Any protection on the gutter grid system 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 gutter grid system work was furnished and installed in accordance with the Contact Documents.

- B. Certify that the gutter grid system is free of defects in design, material, and construction for a period of ten (10) years from the date of completion.
- C. Warrant glazing material against defective materials, delamination, seal failure, and defects in manufacture per the manufacturer's standard warranties. Glass breakage is not covered by warranty.
- 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, email: sales@gsiskylights.com.
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 MATERIALS

- A. Structural Framing System:
 - 1. Principal Supporting Members: 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: Extruded aluminum, alloy 6063-T5 per ASTM B221.
 - 3. Supporting Aluminum Gutters: Thickness as prescribed by framing systems engineer, based on gutter grid system 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. Gutter grid 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: 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.

2.3 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 framed system. Color (Axalta Coatings, Tiger Drylac, 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.

2.4 GLAZING

- A. Standard Certification Requirements:
 - 1. Heat Treated Glass: ASTM C1048, with surface stress of 5,000 (+/-) 1500 psi.
 - 2. Laminated Glass: Two lites interleaved with polyvinyl butyral (PVB). Units must meet criteria of ANSI Z97.1- 1984 and CPSC 16 CFR 1201 for safety glazing. Provide PVB layer of 0.030-in. for all glass units unless a coating, and/or frit is applied to the inside face of the laminate thereby necessitating a 0.060-in. PVB layer.
 - 3. Insulating Glass: CBA rated by the Insulating Glass Certification Council (IGCC) when tested in accordance with ASTM E773 and ASTM E774. Dual edge seals with the secondary seal being silicone. Exterior lite of [heat strengthened] [fully tempered] glass and interior lite of laminated glass.
- B. Performance Requirements:
 - 1. Probability of breakage not to exceed 8/1000 for vertical glass and 1/1000 for sloped glass upon first application of design wind and live load pressures. For glass selection, design wind pressure for a one minute duration. For loads of longer duration use standard engineering practices for glass selection.
 - 2. Probability of breakage due to anticipated thermal stress not to exceed 8/1000 for vertical glass and 2/1000 for sloped glass.
- C. Glazing Unit Composition:
 - 1. Sloped glass units are to be [_____].
 - 2. Vertical glass units are to be [_____].
 - a. For Annealed Glass: 0.030 inch thick.
 - b. For Heat-Strengthened Glass: 0.060 inch thick.
- D. For impact resistant gutter grid, special tested glazing products are required for laminated, insulated glass, impact modify acrylic, and Hurrigard Storm polycarbonate panel.
- E. Glazing panels shall be 32mm translucent extruded five wall extruded polycarbonate structured panels (U=0.23 or better) manufactured by Gallina USA or equal. Panels shall contain co-extruded UV protection and be furnished in continuous sections in each slope of the roof and in sidewall and gable areas. Full panel widths shall be used wherever possible.

2.5 FABRICATION

- A. Construct metal-framed systems using extruded aluminum members.
- B. Where detailed at the sill construct systems using a continuous aluminum curb with expansion joints as required.
- C. Insofar as practicable fit and assemble work in the manufacturer's shop. Work that cannot be permanently assembled shall be shop-assembled, marked, and disassembled before shipment to the jobsite.
- D. Design rafter bars for slide-in-type spline glazing strips.
- E. Design glass retainer fasteners to resist uplift loadings. Spacing to be determined by structural calculations, when applicable.
- F. Use snap-on beauty caps to conceal glass retainers and glass retainer fasteners.
- G. Shop located drill and bolt, or weld aluminum clips to framing members.
- H. Set glass with interior and exterior EPDM glazing strips.
- I. Use silicone setting blocks to support glass and to provide edge clearances and glass bites as outlined below.
 - 1. Set blocks not less than 6-inches from edge of glass for support unit.
 - 2. Glass Bite: Not less than 1/2-inch nor more than 5/8-inch on any side of glass unit.
 - 3. Maintain 1/4-inch edge clearance between glass and adjacent metal framework.
 - 4. Use rubber spacers to maintain separation of glass and adjacent metal framework.
- J. Locate weep holes in curb to positively drain condensation to exterior of gutter grid systems at each rafter connection.

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 gutter grid system work included herein.
- B. Notify Architect of conditions that would adversely affect installation or subsequent utilization of systems. Report any discrepancies to the General Contractor.
- C. Correction of faulty work to be at the expense of the responsible party/s. Do not proceed with installation until unsatisfactory conditions are corrected.
- D. The system manufacturer is not responsible for faulty structure or substrate.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Ensure supports to receive systems 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. System manufacturer and manufacturer's erector excludes all field measuring, demolition, removal, replacement, or re-work of any existing material.

3.3 INSTALLATION

- A. Install metal-framed system including frame, glazing, and accessory items in accordance with manufacturer's instructions at locations indicated on the drawings.
- B. Install systems level, plumb, square, properly aligned, correctly located, and without warp or rack.
- C. Do not install gutter grid system components with deficiencies or dimensional errors. Do not proceed with installation until unsatisfactory components are replaced.
- D. Anchor gutter grid system 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 gutter grid system 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 join 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 gutter grid system 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 TOLERANCES

- A. All parts of the work, when completed, shall be within the following tolerances:
 - 1. Maximum variation from plane or location shown on approved shop drawings: 1/8-inch per 12-foot length, or 1/2-inch in total length.
 - 2. Maximum offset from true alignment between two members abutting end-to-end, edge-to-edge in line or separated by less than 3-inches: 1/32-inch.

3.5 FIELD QUALITY CONTROL

- A. Inspect installed system for required fasteners, wet-sealing and uniformity of retaining caps.
- B. Inspect system 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.

3.6 CLEANING

- A. Clean installed system in accordance with manufacturer's instructions.
- B. Clean gutter grid system 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.

3.7 PROTECTION

- A. No more than two bays are to be removed per crew. Bays are to be closed off at the end of each work day with tarps if not completed.
- B. The work areas, as well as the area under the sections being replaced are to be secured daily.
- C. Furnishing of temporary covering and weather-proofing of the system openings, if required by the General Contractor, and removal of protective measures during and after gutter grid system installation is excluded by the manufacturer. Any temporary coverings that may be required are not to obstruct or interfere with the system installation in any way.
- D. Protect installed products until completion of project in accordance with manufacturer's instructions.
- E. Maintain protection to ensure that, except for normal weathering, gutter grid system will be without deterioration at time of substantial completion.
- F. Remove and replace glass units that are chipped, cracked, abraded or otherwise damaged.

END OF SECTION