

## **PART 1 GENERAL**

### **1.1 SECTION INCLUDES**

- A. Design, engineering, production drawings, and documents. Detailed design and attachment of metal-framed green house will be provided as noted in the following specifications.
- B. The glazing lines, glazing gaskets and integral weep transfer system to provide a true weep system from the horizontals to the rafters.
- C. All verticals, head and sill sections will be capped with pressure caps and snaps to conceal all screws. All horizontals are to be glazed with two sided butt joint design silicone seal.
- D. All applied finishes of aluminum extrusions and sheet to be thermo set powder coat painted finish. All aluminum extrusions are to be finished after shop fabrication has been completed.
- E. Green House glazing to be considered at the selection of the P.M. / Architect in accordance with glazing section 08800.
- F. Green House related flashings to be provided as detailed on the drawings.
- G. Automatic roof and wall sash, doors, windows, fans, louvers, screens, shading, planting benches, ornaments, other attachments and equipment as described herein for a complete water tight installation (above description to be edit as need)

### **1.2 RELATED SECTIONS**

- A. Section 076200 - Sheet Metal Flashing and Trim
- B. Section 079200 - Joint Sealants
- C. Section 088000 - Glazing
- D. Section 133400 - Fabricated Engineered Structures
- E. Section 133413 - Glazed Structures
- F. Section 051200 – Structural Steel

### **1.3 REFERENCES**

- A. Aluminum Association Incorporated (AA)
  - 1. SAS-30: Specifications for Aluminum Structures.
- B. American Architectural Manufacturers Association (AAMA)
  - 1. AAMA 501.1: Standard Test method for metal curtain walls for water penetration using dynamic pressure.
  - 2. AAMA 501.2: Field check of metal curtain walls for water leakage.
  - 3. AAMA 501.3: Field Check of Water Penetration Through Installed Exterior Windows, Curtain Walls, and Doors by Uniform Air Pressure Difference.
  - 4. AAMA 603.8: Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
  - 5. AAMA 605.2 Specification for high performance organic coatings and architectural extrusions and panels.
  - 6. AAMA 606.1: Voluntary guide specification and inspection methods for integral color anodic finishes for architectural aluminum.
  - 7. AAMA 607.1: Voluntary guide specification and inspection methods for clear anodic finishes for architectural aluminum.
- C. 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 A307-10: Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  - 3. ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 4. ASTM B211-03: Standard Specification for Aluminum-Alloy Bar, Rod, and Wire.
  - 5. ASTM B221-08: Standard Specification for Aluminum and Aluminum-Alloy Extruded

- Bars, Rods, Wire, Profiles, and Tubes.
6. ASTM B316: Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods.
  7. ASTM C719: Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cycle Movement (Hockman Cycle).
  8. ASTM C794: Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
  9. ASTM C1036: Standard Specification for Flat Glass.
  10. ASTM C1048-04: Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  11. ASTM D395-03(2008): Standard Test Methods for Rubber Property- Compression Set.
  12. ASTM D412-06ae2: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
  13. ASTM D1171-99: Standard Test Method for Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens).
  14. ASTM D2240-05: Standard Test Method for Rubber Property - Durometer Hardness.
  15. 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.
  16. ASTM E330-02: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  17. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  18. ASTM E773: Test Method for Seal Durability of Sealed Insulating Glass Units.
  19. ASTM E774: Specification for Sealed Insulating Glass Units.
  20. ASTM E783-02: Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- D. Consumer Product Safety Commission (CPSC)  
1. CPSC 16CFR 1201: Safety Standard for Architectural Glazing Materials
- E. Flat Glass Manufacturers Association (FGMA): Glazing Manual
- F. Insulating Glass Certification Council (IGCC): Classification of Insulating Glass Units
- G. American National Standards Institute (ANSI): Z 97.1 -1984- Safety Glazing Materials Used in buildings – Safety Performance Specifications and Methods of Test.

#### **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. All purling segments will be sealed with two-sided continuous butt joint glazing.
  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: Metal-framed green houses 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 glazing, 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 green house 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 green house. Design or structural engineering services for the supporting structure or building components not included in the green house scope are not included under this section.
  9. *Optional limited reaction design:* The green house 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 green house will produce horizontal reactions that cannot be controlled by the green house, but must be resisted by the support structure.
  10. *Optional Hurricane and Impact Resistant Green House Systems:* If the project is located in or near coastal areas, an impact resistant green house 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 structural engineer qualified in the design of self-supporting, sloped glazed systems and licensed to practice in the state where the greenhouse is 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 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 only if specifically requested before fabrication.

1. Submit [ ] 12-inch by 12-inch samples of each type of glazing.
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, operation and maintenance manuals.

#### **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. 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.

#### **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 green house work was furnished and installed in accordance with the Contact Documents.
- B. Certify that the metal-framed green house 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 glazing 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. Specifications 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 MATERIALS**

- A. Framing Materials:
  - 1. Principal Supporting Members made of extruded aluminum, alloy and temper 6061-T6 or 6063-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 green house engineers, based on green house 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:
  3. 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.
  4. For Exterior Cap Retainers: Stainless steel screws, ASTM A193, Series B8 300.
  5. For Anchoring: skylight to treated wood support structure ASTM A307 zinc / galvanized plated steel fasteners.
  6. Finish: Exposed fasteners to match aluminum finish
- H. 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.
- I. Glazing:
  1. Flat roof glass to be 1/4" clear tempered over same (or 3/8" clear heat strengthened 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. (or) 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. For impact resistant green houses, special tested glazing products are required for laminated, insulated glass, impact modify acrylic, and Hurrigard Storm polycarbonate panel.
- J. Aluminum Finish:

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 (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.

  7. Color: \_\_\_\_\_.
  8. Color: As selected by Architect from manufacturer's standard colors.
  9. Color: As indicated on the Drawings.
- K. Equipment (to be edit as need):
  1. Shading systems: exterior roll-drop operable cloth shading system to cover roof and walls by Energy-Glazed Systems, Inc. Owner's choice from standard color chart.
    - A. The system shall be designed so that all individual curtains can be opened and closed automatically through a control system.
    - B. Systems shall be designed so that, when fully open, the curtain stores in a tightly folded or rolled configuration with minimum shading.
    - C. Systems shall be designed to provide a tight seal at all closures.
  2. Materials:

- A. Shall be fabric made of PVC polyester providing \_\_\_\_\_% transmission.
- B. Architect's choice of standard color chart.
- C. Shall be warranted for \_\_\_\_\_ years against ultra violet degradation.
3. Motors:
  - A. Shall have built in limit switch system and internal overload protection.
  - B. Shall be warranted against oxidation or corrosion failure due to typical conditions of humidity.
  - C. Shall be sized appropriately for the weight and length of each shade curtain assembly.
4. Other system components: drive cables, slide wires, clips, pulleys, sealing strips, etc. shall be selected to be compatible with the shade fabric.
5. 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 greenhouse.
  - A. Gear Motors--High-starting-torque, reversible, continuous-duty, Class A insulated, electric motors, with thermal-overload protection; sized to open and operate size and weight of roof sash without exceeding nameplate ratings or considering service factor, with the following specifications:
    1. Motors: Single phase, 110v, 60 Hz., 1/10hp.
    2. Limit Switches: Adjustable switches interlocked with motor controls and set to automatically stop roof sash at open and closed positions.
    3. Emergency Release Mechanism: Quick disconnect-release of electric-motor drives system, permitting manual operation in the event of operating failure.
1. Manual wall sash, aluminum awning vent windows, finished to match greenhouse, thermally broken, screens, manually operable by cam-lock latch, fully gasket closure, extending the full length of the greenhouse. (or) Motorized wall 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 greenhouse.
2. Thermostat, rain and wind sensors.
3. Exhaust fans.
4. Internal fans.
5. Door and hardware – narrow medium style aluminum, manufacturer's standard butt hinges, lockset, thumb-turn, closer, push-pull, weather-strip and sweep. Cylinder by others.
6. Charcoal Fiberglass Mesh Insect Screens: Provide at all vent locations.
7. Benches:
  - a. Benches shall be provided by others.
  - b. The table height shall be 30".
  - c. Corners posts shall be \_\_\_\_\_ square (finished size), sides \_\_\_\_\_, tabletop \_\_\_\_\_.
  - d. Benches shall be joined with stainless steel cross-dowel recessed corner connectors.
8. Misting system by others.
9. Grow light: by others.

### **2.3 FABRICATION**

- A. Construct metal-framed green houses using extruded aluminum members.
- B. Where detailed at the sill construct green house 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 glazing 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 glazing retainer fasteners.
- G. Shop located drill and bolt, or weld aluminum clips to framing members.
- H. Set glazing material with interior and exterior EPDM glazing strips.
- I. Use silicone setting blocks to support glazing material 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 green house 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 green house work included herein.
- B. Notify Architect of conditions that would adversely affect installation or subsequent utilization of green house. 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 green house manufacturer is not responsible for faulty structure or substrate.

#### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Ensure supports to receive green houses 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. Green house 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 green house including frame, glazing, and accessory items in accordance with manufacturer's instructions at locations indicated on the drawings.
- B. Install green house level, plumb, square, properly aligned, correctly located, and without warp or rack.
- C. Do not install green house components with deficiencies or dimensional errors. Do not proceed with installation until unsatisfactory components are replaced.
- D. Anchor green houses 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 green houses 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 glazing material.
- 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 green house 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 green houses for required fasteners, wet-sealing and uniformity of retaining caps.
- B. Inspect green houses 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 green houses in accordance with manufacturer's instructions.
- B. Clean green houses 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 area, 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 green house openings, if required by the General Contractor, and removal of protective measures during and after green houses installation is excluded by the manufacturer. Any temporary coverings that may be required are not to obstruct or interfere with the green house 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, green houses will be without deterioration at time of substantial completion.
- F. Remove and replace glazing units that are chipped, cracked, abraded or otherwise damaged.

**END OF SECTION**