

General Specification for Fabricated Engineered Structures

Division 13-34-13 Glazed Structures

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pool and Spa Enclosures.
- B. Greenhouses
- C. Solariums
- D. Conservatories

1.2 RELATED SECTIONS

- A. Section 08-11-16 – Aluminum Doors and Frames
- B. Section 08-60-00 – Roof Windows & Skylights
- C. Section 07-09-00 - Joint Sealers.

1.3 REFERENCES

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ASTM B 308/B 308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
- C. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. FGMA - Flat Glass Marketing Association, Glazing Manual.

1.4 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide framing system supporting glazing, complete with all components necessary to provide a weather tight system, including perimeter flashing and sealants within the structure.
 - 1. Provide structural design, engineering, and fabrication by manufacturer.
 - 2. Design to withstand uniform structural load of 40 psf or as required by the local governing Building Code
 - a. **Ground Snow Load = ___ psf**
 - b. **Basic Wind Speed = ___ mph Exp C (Enclosed Structure)**
 - c. **Other loads such as utilities to be provided by the Owner's Representative.**
 - 3. Design framing system and glazing material to support design loads as prescribed by the local governing Building Code
 - 4. Design to withstand thermal variations of **60 degrees F (15.5 C)** from ambient temperature without causing buckling, stresses on glass, failure of seals, undue stress on structural elements, reduction of performance, or other detrimental effects.
 - 5. Allowable Deflection:
 - a. Not more than **L/175**.

6. No uncontrolled water leakage in system under normal circumstances.
- B. Performance Requirements System Design (**Doors & Windows, Roof Vents**): Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
1. Wall system when tested on a typical wall unit shall meet or exceed the following performance tests.
 2. Air Infiltration Test: ASTM E 283:
 3. Water Penetration Test: ASTM E 331 and ASTM E 547:
 4. Uniform Structural Load Test: ASTM E 330:
 5. Thermal Penetration Test: AAMA 1503-9:

1.5 SUBMITTALS

- A. Submit under provisions of Section 01-30-00.
- 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.
- C. Shop Drawings: Detailed drawings and structural calculations prepared specifically for the project by manufacturer; provide stamp or seal of licensed professional engineer if required by authorities having jurisdiction.
- D. Selection Samples: Two complete sets of color chips representing manufacturer's full range of standard colors.
- E. Verification Samples:
1. Aluminum Finish: Two samples, minimum size 2 by 3 inches (50 by 75 mm), representing actual product and color.
 2. Glass: Two samples, minimum size 12 inches (300 mm) square, of specified glass, including coatings or frit pattern.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
1. Air Infiltration: AAMA/NAFS 5.3.2 and ICC ES AC17
 2. Water Resistance: AAMA/NAFS 5.3.3 and ICC ES AC 17
 3. Uniform Structural Load: AAMA/NAFS

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Town & Country specializing in manufacturing products specified in this Section with minimum 5 years experience in fabrication and erection of glazed structures for projects of similar scope.
- B. Installer Qualifications: Experienced in performing work of this section that has specialized in installation of work similar to that required for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging, covered to protect factory finishes from damage, precipitation, and construction dirt until ready for installation.

- B. Protect factory finishes from damage, precipitation and construction materials until ready for installation.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Perform structural silicone sealant work when air temperature is above 10 degrees F (minus 12 degrees C).

1.9 WARRANTY

- A. Provide glazed structure manufacturer's warranty that installed structure will be free from significant defects in material, workmanship, and uncontrolled water leakage for two years from date of Substantial Completion. (Reference original warranty for complete warranty time frames).
- B. For standard or custom colors AAMA 2603 paint finish has a fifteen (15) year prorated (on foregoing schedule) limited warranty against finish peeling, cracking, and bubbling under normal use.
- C. For standard or custom colors AAMA 2605 paint finish has a fifteen (15) year prorated (on foregoing schedule) limited warranty against finish peeling, cracking, and bubbling under normal use.
- D. For glazing, provide glazing manufacturer's standard warranty against defective materials, de-lamination, seal failure, and defects in manufacturing for up to fifteen (15) years prorated or as otherwise provided in or limited by the Glass manufacturer's limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable: Town & Country Conservatories, 4256 N. Ravenswood Ave, Chicago, IL 60613
- B. Substitutions: Not permitted without approval

2.2 GLAZED STRUCTURES

- A. Pool/Spa Enclosures, Greenhouses, Solarium, Conservatory Structures:
 - 1. Framing Material: Extruded aluminum members sized per structural and project requirements.
 - 2. Accessories:
 - a. **Severe condensation control system where applicable.**
 - b. **Operable windows.**
 - c. **Ridge vents.**
 - d. **Doors and Operable Windows**
 - e. **Gutters & Downspouts**
 - f. **Decorative Moldings, Trim, Cresting and Finials**
 - g. **Corners, Pilasters, Transoms and Base Panels**
 - 3. Dimensions as per project design and layout. Including the following:
 - a. **Overall Height: _____**

- b. **Eave Height:** _____
 - c. **Roof Pitch:** _____ degrees
 - d. **Width:** _____
 - e. **Length:** _____
 - f. **Basic Mullion and Purlin Design: Uniform bay widths; dimension as recommended by Manufacturer As indicated on the drawings.**
- 4. Hardware: Doors
 - a. **Semi-concealed or surface mount triple knuckle aluminum hinges.**
 - b. **3 point lever handle lock sets on swing doors.**
 - c. **Aluminum threshold, door sweep and gasket weather stripping.**
 - 5. Hardware: Windows
 - a. **Crank dyad window operator**
 - b. **Cam lock**
 - c. **4 bar aluminum hinges**
 - d. **Fixed nylon mesh aluminum screens (interior side)**
 - 6. Thermal Break: Manufacturer's standard system to provide thermal separation between exterior and interior components.

2.3 MATERIALS

- A. Aluminum: 6063-T52, 6063-T6, or 6105-T5 alloy and temper. Other alloys and tempers may be used for non-structural members provided they do not void the required warranties. Indicate alloys and tempers clearly on shop drawings and in structural calculations.
 - 1. Framing Members: Thickness based on the design loading, cross sectional configuration, and fabrication requirement.
 - 2. Aluminum Flashing and Closures: Minimum of 0.040 inches (1.0 mm) thick.
 - 3. Snap-On Covers and Miscellaneous Non-Structural Trim: Minimum thickness recommended by the manufacturer.
- B. Insulation: Expanded polystyrene; provide in all filler and sheet metal members.
- C. Glazing: Provide glazing type as recommended by the manufacturer for the project (**See Attached Glazing Specification**).
- D. Flashings: Sheet aluminum, same finish as for system components; secured with concealed fastening method or fastener with head finished to match; thickness as required for conditions encountered.
- E. Thermal Break: Manufacturer's standard system to provide thermal separation between exterior and interior components.
- F. Internal Reinforcing:
 - 1. ASTM A 36/A 36M for carbon steel; or ASTM B 308/B 308M for structural aluminum.
 - 2. Shapes and sizes to suit installation.
 - 3. Shop coat steel components after fabrication with manufacturer recommended primer.
- G. Glazing Gaskets: Compression type design, replaceable, EPDM, complying with ASTM C 864, with solid strand cord to prevent shrinkage.
 - 1. Completely compatible with glazing sealant to be used.
 - 2. Profile and hardness as necessary to maintain uniform pressure for watertight seal.
 - 3. Manufacturer's standard black color.
 - 4. Factory molded corners at interior.

- H. Setting Blocks, Edge Blocks, and Spacers: As required by manufacturer and compatible with insulated glass where required.
- I. Structural Glazing Sealant: GE Silpruf; black.
- J. Perimeter Sealant: GE Silpruf; color to match framing finish if available; otherwise color as selected from manufacturer's standard range.
- K. Anchors and Fasteners:
 - 1. Aluminum and stainless steel of type which will not cause electrolytic action or corrosion.
 - 2. Finish exposed fasteners to match aluminum frame.
- L. Accessories: Provide accessories as scheduled to achieve design intent and environmental control.

2.4 FABRICATION

- A. Fabricate components in accordance with approved shop drawings. Remove burrs and rough edges. Shop fabricate to greatest extent practicable to minimize field cutting, splicing, and assembly. Disassemble only to extent necessary for shipping and handling limitations. Install gaskets and tapes in factory.
- B. Fabricate components true to detail and free from defects impairing appearance, strength or durability. Contour outdoor horizontal or purlin glazing retainers to minimize water ponding and ice or snow buildup.
- C. Fabricate components to allow for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush and weathertight. Ensure slip joints make full, tight contact and are weathertight.
- D. Reinforce components at anchorage and support points, at joints, and at attachment points for interfacing work.
- E. Glass: Accurately size glass to fit openings allowing clearances following recommendations of "Glazing Manual" published by Flat Glass Marketing Association.

2.5 FINISHES

- A. Aluminum Finish: Two coat, 70 percent fluoropolymer finish complying with AAMA 2605
 - 1. Color: Manufacturer's standard bronze color.
 - 2. Color: Manufacturer's standard Hartford green color.
 - 3. Color: Manufacturer's standard white color.
 - 4. Color: Manufacturer's standard sandstone color.
 - 5. Color: Manufacturer's standard black color.
 - 6. Color: Manufacturer's standard natural clay color.
 - 7. Color: Custom-Not One of Manufacturer Standards

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding. Work by Others. However, it is the installers responsibility to notify the Contractor and Architect if conditions are inappropriate for proper installation.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install glazed structure system in accordance with approved shop drawings and manufacturer's instructions.
- B. Separate dissimilar materials using nonconductive tape, paint, or other material not visible in finished work.
- C. Provide attachments and shims to permanently fasten system to building structure.
- D. Maintain dimensional tolerances and alignment with adjacent work.
- E. Anchor structure securely in place, allowing for required movement, including expansion and contraction.
- F. Install glazing and sealants in accordance with manufacturer's instructions without exception, including surface preparations.
- G. Set sill members in bed of sealant. Set other members with internal sealants to provide weather tight construction.
- H. Install flashings, bent metal closures, corners, gutters, and other accessories as required or detailed.
- I. Clean surfaces and install sealant in accordance with sealant manufacturer's instructions and structure manufacturer's guidelines.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF GLAZED STRUCTURE SPECIFICATION

GLAZING

1 PART GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Glazed structures

1.2 DEFINITIONS

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
- E. Fabricator: the building manufacturer and its authorized agent.
- F. Owner: the owner of the project and to include the Owner's general contractor or other authorized agent.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to the most stringent requirements of Massachusetts State Building Code 780CMR5301.2.1 and 780 CMR 1609, as applicable, and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings. Include gust effect and other factors applicable to the building configuration.
 - 1) Basic Wind Speed: 100 MPH (41.7 m/sec.).
 - 2) Importance Factor: Determine from building configuration.
 - 3) Exposure Category: C.
 - b. Specified Design Snow Loads: Based on 45 PSF ground snow load, but not less than snow loads applicable to Project as required by Massachusetts State Building Code 780CMR 5301, including shape and slope factors.
 - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - d. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
 - 1) Load Duration: 30 days.
 - e. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm for sloped glazing and metal framed entrances, not less than 3.0mm for windows and doors, unless otherwise indicated.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120⁰ F (67⁰ C), ambient; 180⁰ F (100⁰ C), material

surfaces.

- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.
- C. Glazing Schedule: As per manufacturers standard reference in Shop Drawings
- D. Warranties: Special warranties specified in Section **GLAZED STRUCTURE LIMITED WARRANTIES**

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance. and who employs glass installers experienced in this type of Project.
- B. Safety Glazing Products: Provide tempered glass, as specified herein by the architect of record except where laminated safety glass is specified.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide," GANA's "Glazing Manual" and GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors" unless more stringent requirements are indicated.
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- D. Insulating-Glass Certification Program: Permanently marked either on spacers with appropriate certification label of the Insulating Glass Certification Council, unless contrary to building or glass fabricators standard manufacturing procedure, in which case written certification to be provided upon request.

1.6 WARRANTY

- A. Fabricator's Warranty for Coated-Glass Products: Fabricator's standard form, made out to Owner and agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 10 years from date of Substantial Completion.
- B. Fabricator's Warranty on Laminated Glass: Fabricator's standard form, made out to Owner agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Fabricator's Warranty on Insulating Glass: Fabricator's standard form, made out to Owner agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 10 years from date of Substantial Completion, unless otherwise noted.

2 PART PRODUCTS

2.1 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 - 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

- C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.
 - 1. High Performance Solar Control Low-e Glass: Three layer metallic silver deposition coating with the following performance characteristics:
 - a. SHGC: 0.27; U-factor: 0.24; TDW: 0.43; Visible Light Transmission: 66%.
 - b. Available Product: Cardinal "LoE³-366" Glass.
 - 2. High Performance Low-e Glass: Two layer metallic silver deposition coating with the following performance characteristics:
 - a. SHGC: 0.41; U-factor: 0.25; TDW: 0.55; Visible Light Transmission: 72%.
 - b. Available Product: Cardinal "LoE²-272" Glass.

- D. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
 - 1. Interlayer: Polyvinyl Butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. Interlayer for Sloped Glazing: Minimum 0.030 inches (0.76mm) thickness.
 - 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

- E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 3. Sealing System: Dual seal.
 4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material, Wood Windows: Aluminum with black or dark bronze, color anodic finish or with powdered metal paint finish in color selected by Architect as indicated or directed.
 - b. Spacer Material, Doors: Aluminum with black or dark bronze color anodic finish, as selected by Architect.
 - c. Spacer Material, Engineered Glazed Enclosures: Warm-Edge Technology, low conductivity metal (tinned steel or stainless steel, desiccant filled) or molded foam strip, color as selected from available colors.
 - d. Corner Construction: Manufacturer's standard corner construction.
 - e. Internal Muntin Bars: Match spacer material, unless otherwise specified. Connecting clips shall be non-outgassing and of a type approved by glass unit fabricator for indicated warranty.
 5. Simulated Divided Light Muntins: As standard with manufacturer and acceptable to Architect, conforming to profiles of frames and sash, adhered to exterior and exterior of glass units.

2.2 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal, as per manufacturer's standard.
1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.3 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Silicone Glazing Sealants: Recommended by manufacturer or installer of glazed unit:
 - a. Type and Grade: S (single component) and NS (nonsag).
 - b. Class: 100/50.
 - c. Use Related to Exposure: NT (nontraffic).
 - d. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.4 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.
 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.7 MONOLITHIC FLOAT-GLASS UNITS

- A. Uncoated Clear Float-Glass Units MG-A (Interior only): Class 1 (clear) Kind FT (fully tempered) float glass.

1. Thickness: 6.0 mm. minimum.

2.8 LAMINATED-GLASS UNITS

A. Laminated-Glass Units LG-1 (Interior only):

1. Kind LA, consisting of two lites of annealed float glass, or heat-strengthened float glass if required for specified performance.
2. Outer Lite: Class 1 (clear) float glass.
 - a. Minimum Thickness: 3.0 mm, unless otherwise indicated or required for performance.
3. Plastic Interlayer:
 - a. Thickness: 0.030 inch (0.76 mm), but not less than that required to comply as a Type II safety glass material.
 - b. Interlayer Color: Clear.
4. Inner Lite: Class 1 (clear) float glass.
 - a. Minimum Thickness: 3.0 mm, unless otherwise indicated or required for performance.
5. Visible Light Transmittance: 89 percent minimum.
6. Outdoor Visible Reflectance: 8 percent maximum.

B. Heat-Treated Laminated-Glass Units LG-2 (used as component for sloped insulating glass only):

1. Kind LHS, consisting of two lites of heat-strengthened float glass.
2. Outer Lite: Class 1 (clear) float glass.
 - a. Kind HS (heat strengthened).
 - b. Thickness: 3.0 mm minimum, as required for performance.
3. Inner Lite: Class 1 (clear) float glass.
 - a. Kind HS (heat strengthened).
 - b. Thickness: 3.0 mm minimum, as required for performance.
4. Plastic Interlayer:
 - a. Thickness: 0.030 inch (1.52 mm), but not less than that required to comply as a Type II safety glass material.
 - b. Interlayer Color: Clear.
5. Low-e Coating: As specified under Insulating-Glass Units for Sloped Glazing.
6. Visible Light Transmittance: 89 percent minimum.
7. Outdoor Visible Reflectance: 8 percent maximum.

2.9 INSULATING-GLASS UNITS

A. Passive Solar Low-E Insulating-Glass Units IG-1: For wood windows and doors:

1. Manufacturer's standard insulating glass, based on size of light, with low-e coating on number 2 or 3 surface, argon gas filled, dual seal edge construction and

simulated divided light patterns as indicated.

B. Solar-Control Low-E Insulating-Glass Units IG-2:

1. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm for engineered glazed structure systems, as indicated for windows and doors.
2. Interspace Content: 100% Argon or Krypton.
3. Outdoor Lite: Class 1 (clear) float glass.
 - a. Annealed, unless Kind FT (fully tempered) indicated or required.
4. Indoor Lite: Class 1 (clear) float glass.
 - a. Annealed, unless Kind FT (fully tempered) indicated or required.
5. Low-E Coating: Sputtered on second surface, as specified for High Performance Low-e Glass above (LoE² 272).

6. Visible Light Transmittance: 72 percent minimum.
7. Winter Nighttime U-Factor: 0.25 maximum.
8. Summer Daytime U-Factor: 0.20 maximum.
9. Solar Heat Gain Coefficient: 0.41 maximum.
10. Outdoor Visible Reflectance: 11percent maximum.

2.10 INSULATING-GLASS UNITS FOR SLOPED GLAZING

A. Solar-Control Low-E Insulating-Glass Units for Sloped Glazing IG-4:

1. Thickness of Outdoor Lite: 6 mm.
2. Thickness of Indoor Lite: 6 mm minimum.
3. Overall Unit Thickness: 25 mm minimum.
4. Interspace Content: 100% Argon .
5. Outdoor Lite: Class 1 (clear) float glass.
 - a. Kind FT (fully tempered).
6. Indoor Lite: Complying with requirements specified for heat-treated laminated-glass units LG-2.
7. Low-E Coating: Sputtered on second surface, as specified for High Performance Solar Control Low-e Glass above (LoE³ 366).
8. Visible Light Transmittance: 63 percent minimum.
9. Winter Nighttime U-Factor: 0.25 maximum.
10. Summer Daytime U-Factor: 0.18 maximum.
11. Solar Heat Gain Coefficient: 0.27 maximum.
12. Outdoor Visible Reflectance: 11 percent maximum.

3 PART EXECUTION

3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass,

sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
 2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by Fabricator's standard installation procedures..
 4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening. As per manufacturer's standard procedures.
1. Cover vertical and horizontal framing joints by Fabricator's standard recommended procedures..
 - 2.
 3. Apply heel bead of elastomeric sealant, if required
 4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 5. Apply cap bead of elastomeric sealant over exposed edge of tape, if required by Fabricator's standard installation procedures.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation. As per manufacturer's standard procedures.
- D.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 3. Install gaskets so they protrude past face of glazing stops.
- E. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

- A. Owner to protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.