

**SECTION 08 80 00**  
**GLAZING**

**PART 1      GENERAL**

**1.01      REFERENCES**

A.    The following is a list of standards which may be referenced in this section:

1.    American National Standards Institute (ANSI): Z97.1, Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test.
2.    American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
3.    ASTM International (ASTM):
  - a.    C509, Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
  - b.    C864, Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
  - c.    C920, Standard Specification for Elastomeric Joint Sealants.
  - d.    C1048, Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
  - e.    C1115, Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
  - f.    C1172, Standard Specification for Laminated Architectural Flat Glass.
  - g.    C1193, Standard Guide for Use of Joint Sealants.
  - h.    C1376, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
  - i.    E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
  - j.    E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
  - k.    E1300, Standard Practice for Determining Load Resistance of Glass in Buildings.
  - l.    E1886, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
  - m.    E1996, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
  - n.    E2190, Standard Specification for Insulating Glass Unit Performance and Evaluation.

4. Consumer Product Safety Commission (CPSC) Code of Federal Regulations (CFR): 16 CFR 1201, Safety Standard for Architectural Glazing Materials.
5. Glass Association of North America (GANA):
  - a. Glazing Manual.
  - b. Sealant Manual.
6. National Fenestration Rating Council Incorporated (NFRC):
  - a. 100, Procedure for Determining Fenestration Product U-Factors.
  - b. 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - c. 300, Standard Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
7. National Fire Protection Association (NFPA):
  - a. 80, Safety Standard for Fire Doors and Other Opening Protectives.
  - b. 252, Safety Standard Methods of Fire Tests of Door Assemblies.
  - c. 257, Safety Standard on Fire Test for Window and Glass Block Assemblies.
8. South Coast Air Quality Management District: SCAQMD Rule 1168 - Adhesive and Sealant Applications.
9. UL:
  - a. Building Materials Directory.
  - b. 10C, Standard for Safety for Positive Pressure Fire Tests of Door Assemblies.

## 1.02 SUBMITTALS

### A. Action Submittals:

1. Shop Drawings:
  - a. Complete schedule of glass and glazing material to be used for each purpose.
  - b. Indicate sizes, layout, thicknesses, and loading conditions for glass.
2. Product Data:
  - a. Catalog cuts of glazing materials with inclusion of glass edge cutting procedures.
  - b. Glass: Provide structural, physical, and thermal and solar optical performance characteristics, size limitations, special handling or installation requirements.
  - c. Glazing Sealants, Compounds, and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
  - d. Seismic anchorage and bracing drawings and data sheets, for loads provided in General Structural Notes on the Drawings.

3. Samples:
  - a. Glass: Two samples 12-inch by 12-inch in size, illustrating each glass units, coloration and design.
  - b. Glazing Materials: Submit 3-inch long bead of glazing sealant and gaskets, color as selected.

B. Informational Submittals:

1. Design calculations for glass thicknesses. Signed and sealed by professional engineer registered in state of Project.
2. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing, for loads provided in General Structural Notes on the Drawings.
3. Manufacturer's Certificate of Compliance for each type of glazing, in accordance with Section 01 67 00, Product Requirements.
4. Details and methods of glazing for each type of glazing condition; include manufacturer's recommendations for setting, sealing materials, and installing each type of glazing.
5. Documentation declaring compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants and other glazing materials.
6. Documentation of glazer's previous experience and manufacturer's approval.
7. Sustainable Design: In accordance with Section 01 81 13, Sustainable Design Requirements for Non-LEED™ Projects, document sustainability performance for items listed below.
  - a. Product Data for Low Emitting Materials-Adhesives, and Sealants:
    - 1) A complete list of adhesives and sealants used inside the building envelope during construction.
    - 2) Manufacturer's literature documenting VOC content of each product, and compliance with requirements of South Coast Air Quality Management District (SCAQMD) Rule No. 1168.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing Work of this section with minimum 3 years' experience approved by manufacturer.
- B. Preinstallation Meeting: Convene minimum 1 week prior to commencing work of this section.

## 1.04 DELIVERY, STORAGE, AND HANDLING

### A. Storage:

1. Support cases on both sides when stored vertically.
2. After unpacking, place interleaving protection between lites.
3. Keep glass and interleaving dry by storing inside where temperatures are above dewpoint, or if outside storage is necessary, cover glass interleaving with opaque tarpaulins or plastic and inspect periodically. Wet interleaving can stain glass.
4. Avoid exposing stored glass to direct sunlight.

### B. Handling:

1. Stack individual lites on edge and lean them against sturdy uprights at a slope of 5 degrees to 7 degrees from vertical.
2. Cushion bottom edges with soft, firm pads free of dirt, grit, glass chips, or other foreign material.
3. Do not rotate or cartwheel insulating glass units over their corners. Use turning device such as a rolling block if units must be rotated.

## 1.05 SPECIAL GUARANTEE

- A. Provide manufacturer's extended guarantee or warranty, with beneficiary named in writing, as Special Guarantee. Special Guarantee shall provide for correction, or at option of Contracting Officer, removal and replacement of Work specified in this specification section found defective during a period of 5 years after date of Substantial Completion. Guarantee to cover deterioration because of normal conditions of use and not because of handling installing and cleaning practices performed contrary to glass manufacturer's published instructions. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in General Conditions.

## PART 2 PRODUCTS

### 2.01 GENERAL CHARACTERISTICS

- A. Physical Characteristics: None.
- B. Functional Characteristics: Fabrication processes including Low-E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single fabricator.

C. Performance Characteristics:

1. Design Criteria:

- a. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
  - 1) In conjunction with vapor retarder and air barrier materials.
  - 2) To utilize inner pane of multiple pane sealed units for continuity of air barrier and vapor retarder seal.
  - 3) To maintain continuous air barrier and vapor retarder throughout glazed assembly from glass pane to heel bead of glazing sealant.
- b. Glass Thickness:
  - 1) Select minimum thickness in accordance with ASTM E1300 to resist specified design loads with the following maximum probability of breakage:
    - a) Vertical Glass: Eight lites per 1,000 for wind loads with 60 seconds maximum load duration.
    - b) Minimum Thickness: 1 inch for exterior glass.
  - 2) Structural Design: Design in accordance with applicable code for most critical combination of wind, snow, seismic, and dead loads.

2. Wind Loads: Design and size glass to withstand positive and negative wind loads acting normal to plane of wall, including increased loads at building corners.

- a. Design Wind Load: Design pressure of 30 psf.
- b. Wind-Borne Debris Loads:
  - 1) Design and size glass located less than 60 feet (18.288 m) abovegrade to withstand the following loads:
    - a) Glass Within 30 Feet (9.144 m) of Grade: ASTM E1886 and ASTM E1996; large missile impact test.
- c. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.
- d. Exterior Glass Deflection: Maximum of 1/175 of glass edge length or 3/4 inch (19 mm), whichever is less with full recovery of glazing materials.
- e. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf (730 N/m) force is applied to one panel at any point up to 42 inches (1067 mm) above finished floor less than thickness of glass.
- f. Thermal and Solar Optical Performance:
  - 1) Measured or calculated in accordance with the following:
    - a) U-Values: NFRC 100.
    - b) Solar Heat Gain Coefficients: NFRC 200.
    - c) Solar Optical Properties: NFRC 300.

3. Fire Rated:
  - a. Door Glazing: Tested in accordance with one of the following and complying with NFPA 80.
    - 1) NFPA 252; with neutral pressure level at 40 inches (1015 mm) maximum above sill at 5 minutes into test.
    - 2) UL 10C.
  - b. Apply label from agency approved by authority having jurisdiction to identify each fire rated glass lite.

## 2.02 FLOAT GLASS MATERIALS

### A. Tempered Glass (TG):

1. Physical Characteristics: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
2. Functional Characteristics: None.
3. Performance Characteristics: Conforming to CPSC 16 CFR 1201 Category II at locations where safety glass is required by applicable code.

## 2.03 FLOAT GLASS PRODUCTS

### A. Clear Glass:

1. Physical Characteristics:
  - a. Tempered (TG) float glass as specified; Class 1 clear.
  - b. Minimum Thickness: 1/4 inch (6) mm.
2. Functional Characteristics: None.
3. Performance Characteristics: None.

## 2.04 LAMINATED GLASS PRODUCTS

### A. Clear Laminated Glass (LG):

1. Physical Characteristics:
  - a. Tempered Glass (TG): Kind LT with two lites of tempered glass as specified.
  - b. Minimum Total Thickness: 1/4 inch (6.8 mm).
  - c. Plastic Interlayer: Polyvinyl butyral, minimum 0.030 inch (0.76 mm) thick.
2. Functional Characteristics: None.
3. Performance Characteristics:
  - a. ASTM C1172; with plastic interlayer.
  - b. Safety Glass: Conform to CPSC 16 CFR 1201 Category II.

## 2.05 FIRE RESISTIVE GLASS PRODUCTS

### A. Fire Resistive Glass (FRG):

1. Manufacturers and Products:
  - a. Pilkington; Pryostop.
  - b. Or equal.
2. Physical Characteristics:
  - a. Insulated, multiple layers of low-iron float glass laminated with clear intumescent interlayer(s).
  - b. Transparent polished both surfaces.
  - c. Thickness: Manufacturer's standard for required fire rating.
3. Functional Characteristics: Fire rating as shown on Door and Hardware Schedule on the Drawings.
4. Performance Characteristics:
  - a. Impact Safety Resistance: ANSI Z97.1 and CPSC 16 CFR 1201 (Category I and II).

## 2.06 INSULATING GLASS PRODUCTS

### A. Insulating Glass – Clear (IG-C):

1. Manufacturers and Products:
  - a. Vitro Architectural Glass; Solarban 60.
  - b. Or equal.
2. Physical Characteristics:
  - a. Total Unit Thickness: 1 inch.
  - b. Outer Pane: Glass Type Clear Tempered Glass (TG), with Low E coating on inner surface (No. 2 position).
    - 1) Low E Coating: ASTM C1376; pyrolytic or vacuum deposited.
  - c. Inner Pane: Glass Type Laminated Glass (LG).
  - d. Air-filled space between lites. Provide argon-filled space between lites if Project altitude allows.
  - e. Provide capillary breather tubes as required for altitude.
3. Functional Characteristics: None.
4. Performance Characteristics:
  - a. Insulating Glass (General): ASTM E2190 certified by Insulating Glass Certification Council and Insulating Glass Manufacturers Alliance.
  - b. Visible Light Transmittance: 50 percent minimum.
  - c. Solar Heat Gain Coefficient: 0.32 maximum.
  - d. U-Factor Winter: 0.24 maximum.

B. Insulating Glass – Bird (IG-B):

1. Manufacturers and Products:
  - a. Vitro Architectural Glass; Solarban 60.
  - b. Or equal.
2. Physical Characteristics:
  - a. Total Unit Thickness: 1 inch.
  - b. Outer Pane: Glass Type Clear Tempered Glass (TG), Acid Etched Pattern, with Low E coating on inner surface (No. 2 position).
    - 1) Acid Etched Pattern: 2-inch by 2-inch dot pattern.
    - 2) Low E Coating: ASTM C1376; pyrolytic or vacuum deposited.
  - c. Inner Pane: Glass Type Laminated Glass (LG).
  - d. Air-filled space between lites. Provide argon-filled space between lites if Project altitude allows.
  - e. Provide capillary breather tubes as required for altitude.
3. Functional Characteristics: None.
4. Performance Characteristics:
  - a. Insulating Glass (General): ASTM E2190 certified by Insulating Glass Certification Council and Insulating Glass Manufacturers Alliance.
  - b. Visible Light Transmittance: 50 percent minimum.
  - c. Solar Heat Gain Coefficient: 0.32 maximum.
  - d. U-Factor Winter: 0.24 maximum.

2.07 GLAZING MATERIAL

A. Sealants:

1. Physical Characteristics:
  - a. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, laminated glass core, insulating glass seals, and glazing channels.
  - b. Silicone Glazing Sealant:
    - 1) ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; chemical curing; capable of water immersion without loss of properties; nonbleeding, nonstaining, cured Shore A Hardness Range 15 to 25.
    - 2) Structural Silicone: Furnish high-modulus structural silicone glazing materials where sealant bonds glass to substrate.
    - 3) Color: As selected by Contracting Officer.
2. Functional Characteristics: None.

3. Performance Characteristics:
  - a. Sealants and Sealant Primers:
    - 1) Meet following requirements:
      - a) Volatile Organic Compound (VOC) Content: Comply with the following limits for VOC content when calculated according to South Coast Air Quality Management District Rule 1168.
        - (1) Sealants:
          - (a) Architectural: 250 g/L.
          - (b) Other: 420g/L.
        - (2) Sealant Primers:
          - (a) Architectural – Nonporous: 250 g/L.
          - (b) Architectural – Porous: 775 g/L.
          - (c) Modified Bituminous: 500 g/L.
          - (d) Other: 750 g/L.

B. Gaskets:

1. Physical Characteristics:
  - a. Dense Gaskets:
    - 1) Resilient extruded shape to suit glazing channel retaining slot; black color.
    - 2) Polychloroprene: ASTM C864.
    - 3) EPDM: ASTM C864.
    - 4) Silicone: ASTM C1115.
  - b. Soft Gaskets:
    - 1) ASTM C509 Type II; resilient extruded shape to suit glazing channel retaining slot; black color.
    - 2) Polychloroprene.
    - 3) EPDM.
    - 4) Silicone.
2. Functional Characteristics: None.
3. Performance Characteristics: None.

C. Preformed Glazing Tape:

1. Physical Characteristics:
  - a. Size to suit application.
  - b. Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
  - c. Butyl Corner Sealant: ASTM C920 single component nonskinning butyl compatible with glazing tape; color to match tape.
  - d. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water

absorption by volume of 2 percent, designed for compression of 25 percent to affect air barrier and vapor retarder seal.

2. Functional Characteristics: None.
3. Performance Characteristics:
  - a. Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  - b. Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

## 2.08 GLAZING ACCESSORIES

### A. Physical Characteristics:

1. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
2. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness, minimum 3-inch (75-mm) long by one half the height of glazing stop by thickness to suit application, self-adhesive on one face.
3. Glazing Clips: Manufacturer's standard type.

### B. Functional Characteristics: None.

### C. Performance Characteristics: None.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify openings for glazing are correctly sized and within acceptable tolerance.
- B. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement, weeps are clear and ready to receive glazing.

### 3.02 PREPARATION

- A. Do not perform glazing work in damp, foggy, or rainy weather, or when temperatures are not within range recommended by GANA "Glazing Manual".

- B. Surfaces:
  - 1. Smooth, even, sound, dry, and clean.
  - 2. Clean contact surfaces with solvent and wipe dry.
- C. Priming:
  - 1. Complete and cured.
  - 2. Prime surfaces scheduled to receive sealant.
- D. Measure size of frames to receive glass and compute actual glass size allowing for edge clearances.
- E. Use fire rated glass in glazed openings in labeled fire doors.
- F. Verify functioning weep system is present.
- G. Do not proceed with glazing until unsatisfactory conditions have been corrected.

### 3.03 GLAZING INSTALLATION

- A. General:
  - 1. Follow recommendations of glass manufacturer GANA “Sealant Manual,” GANA “Glazing Manual” and the following:
    - a. Glazing Sealants: Comply with ASTM C1193.
    - b. Fire Rated Openings: Comply with NFPA 80.
- B. Exterior Dry Method (Gasket Glazing):
  - 1. Cut glazing gasket to length; install on glazing pane. Seal corners by butting tape and sealing junctions with compatible butyl sealant.
  - 2. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
  - 3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
  - 4. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- C. Exterior Wet/Dry Method (Preformed Tape and Sealant) Installation:
  - 1. Cut glazing tape to length and set against permanent stops, 3/16 inch (5 mm) below sight line. Seal corners by butting tape and dabbing with compatible butyl sealant.
  - 2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapor seal.

3. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
4. Rest glazing on setting blocks and push against tape with sufficient pressure to attain full contact at perimeter of pane or glass unit.
5. Fill gap between glazing and stop with elastomeric glazing sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch (9 mm) below sight line.
6. Apply cap bead of elastomeric glazing sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

D. Interior Wet/Dry Method (Tape and Sealant) Installation:

1. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
2. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.
3. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
4. Install removable stops, spacer shims inserted between glazing and applied stops at 24-inch (600-mm) intervals, 1/4 inch (6 mm) below sight line.
5. Fill gaps between pane and applied stop with elastomeric glazing sealant to depth equal to bite on glazing, to uniform and level line.
6. Trim protruding tape edge.

### 3.04 FIELD QUALITY CONTROL

A. Hose Test:

1. Use 3/4-inch minimum hose without nozzle. With full stream, flood glazing from bottom to top.
2. Correct leaks disclosed by hose test by reglazing and retesting until eliminated.

### 3.05 CLEANING

- A. Leave glass and glazing in undamaged condition and ready for final cleaning.
- B. Remove excess glazing compound from installed glass.
- C. Remove labels from glass surface at time of final cleaning.
- D. Wash and polish both faces of glass.
- E. Clean adjacent surfaces of glass.

### 3.06 PROTECTION OF COMPLETED WORK

#### A. Protection:

1. Keep glass free from contamination by materials capable of staining glass.
2. Install tape across lights secured to frames or structure.
3. No tape or marking allowed on glass.

#### B. Replacements and Repairs: Prior to Substantial Completion, replace broken, defective, or scratched glass and repair damaged compounds.

### 3.07 SCHEDULE

#### A. For tabulation of glass requirements refer to Window Schedule, and Door and Hardware Schedules as shown on the Drawings.

**END OF SECTION**

