

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. 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. Storefront.
  - 4. Interior borrowed lites.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
  - 1. Design Wind Pressures: As indicated on Drawings.
  - 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- B. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (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; and other defects in construction.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  - 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.4 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.

- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

#### 1.6 QUALITY ASSURANCE

- A. 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's "Glazing Manual."
  - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. **The Manufacturer is to provide the installer with specifications and installation instructions for each type of glazing sealant, gasket and associated miscellaneous material required. Manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the specific application is also to be provided.**
- F. **The Manufacturer is to provide the installer with Material Data indicating that glazing materials will withstand the forces specified in the design documents which shall include basis for determining wind loading criteria and indicate concurrence with glazing channel dimensions.**
- G. **Glass units shall be handled and stored in accordance with manufacturer's instructions.**

- H. **Specify that all glass installations shall be watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.**
- I. **Specify that glazing channels shall provide for necessary minimum bite on the glass, minimum edge clearance and adequate sealant thicknesses, within allowable tolerances. The installer is responsible for correct glass size for each opening, within the tolerances and necessary dimensions established.**
- J. **Specify that all glass shall be protected from edge at all times during handling, installation and operation of the building. Glass breakage during the warranty period will be considered a form of faulty material or workmanship (resulting from edge damage) unless known to result from vandalism or other causes not related to materials and workmanship.**
- K. **All glass shall bear the manufacturer's label to identify type, thickness and quality.**
- L. **Require that at a minimum all glass installations shall comply with published recommendations of glass product manufacturers and organizations below.**
  - 1. **FGMA Publications: "FGMA Glazing Manual."**
  - 2. **LSGA Publications: "LSGA Design Guide."**
  - 3. **SIGMA Publications: TM-3000 "Vertical Glazing Guidelines"**
- J. **Specify that all glass shall be a minimum 1/4 inch minimum thickness.**
- K. **Specify that all glass panels shall be field measured to fit in provided openings.**
- L. **Specify that the sizes for glass shall be measured and determined from the installed frames, doors and sash.**
- M. **Require that Workmanship shall be in accordance with the Standards of the Flat Glass Marketing Association Glazing Manual.**
- N. **Glass material shall be specified according to the following performance criteria:**
  - 1. **Light Transmittance**
  - 2. **Reflectance**
  - 3. **U Value**
  - 4. **Shading Coefficient**
  - 5. **Solar Heat Gain**

#### 1.7 WARRANTY

- A. **Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.**

1. Warranty Period: 10 years from date of Substantial Completion **provided in writing.**
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to 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.
  1. Warranty Period: 10 years from date of Substantial Completion **provided in writing.**
- C. **All units: Manufacturer's standard warranty that glass units supplied to Project will be free from defects in material and workmanship shall be provided.**

## PART 2 - PRODUCTS

### 2.1 GLASS PRODUCTS, GENERAL

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. **PPG Industries (Basis of Design)**
  2. Old Castle
  3. ACG Flat Glass of North America
  4. Architect Approved Equal prior to bid.
- B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- C. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
  2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
- C. Silicone-Coated Spandrel Glass: ASTM C 1048, Condition C, Type I, Quality-Q3, and complying with other requirements specified.
  - 1. Glass: Clear float.
  - 2. Silicone Coating Color: **As selected by Architect from manufacturer's full range.**

## 2.3 INSULATING GLASS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. **PPG Industries (Basis of Design)**
  - 2. Old Castle
  - 3. ACG Flat Glass of North America
  - 4. Architect Approved Equal prior to bid
- B. **For insulated Glass Units, the following is required:**
  - 1. **All exterior glass shall be insulated glazing, including spandrel glass, full and partial lite glass doors.**
  - 2. **Insulating glass shall consist of two lites of glass with a hermetically and permanently sealed air space, and shall conform to Sealed Insulating Glass Manufacturer's Association (SIGMA) No. 65-7-2, "Sealed Insulating Glass Units."**
  - 3. **Exterior lite shall be 1/4 inch (6.0 mm) thick float glass and fully tempered where applicable.**
  - 4. **Interior glazing use clear glass, single lite and be fully tempered where applicable.**
  - 5. **Interior lite shall be 1/4 inch (6.0 mm) thick float glass and fully tempered where applicable.**
  - 6. **Air space shall be 1/2 inch (120 mm) Type B system.**
  - 7. **Insulated glass must be approved by the County for the intended use and shall meet the minimum requirements of the International Energy Conservation Code, currently adopted edition.**

## 2.4 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
  - 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.

- B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.
- C. Fire-Protection-Rated Tempered Glass: 6-mm thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AGC Glass Company North America, Inc.
    - b. SAFTI FIRST Fire Rated Glazing Solutions.
    - c. Technical Glass Products.
    - d. Vetrotech Saint-Gobain.
    - e. Approved equal prior to bid.
- D. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 5-mm thickness; faced on one surface with a clear glazing film; and complying with 16 CFR 1201, Category II.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AGC Glass Company North America, Inc.
    - b. SAFTI FIRST Fire Rated Glazing Solutions.
    - c. Schott North America, Inc.
    - d. Technical Glass Products.
    - e. Vetrotech Saint-Gobain.
    - f. Approved equal prior to bid.

## 2.5 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
  - 1. Neoprene complying with ASTM C 864.
  - 2. EPDM complying with ASTM C 864.
  - 3. Silicone complying with ASTM C 1115.
  - 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

## 2.6 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Provide 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.
  4. **Glazing Compound: For metal frames, provide conformance with section "Glazing Materials" of the FGMA Glazing Manual. Compound used for glazing aluminum shall be pigmented with aluminum powder to match aluminum unit without staining or discoloring, shall be nonhardening and shall be a type not requiring painting.**
  5. **When flexible vinyl gasket channels are used, provide conformance with ASTM D 2287.**
  6. **Not Permitted: metal sash putty, non-skinning compounds, non-resilient type preformed sealers, and preformed impregnated type gaskets.**
  7. **Provide supplemental accessories to provide a complete installation, including glazing points, clips, shims, angles, heads, setting blocks and spacer strips.**
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

## 2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

## 2.9 MONOLITHIC-GLASS TYPES (all interior locations)

- A. Glass Type: Clear fully tempered float glass.
1. Thickness: 1/4 inch (6.0 mm.)
  2. Provide safety glazing labeling.

- B. Glass Type: Clear float glass.
  - 1. Thickness: 1/4 inch (6.0 mm.)
  - 2. Provide safety glazing labeling.

## 2.10 INSULATING-GLASS TYPES (All exterior windows)

- A. **Glass Type: Solarban 70XL (2) Clear + Clear Insulating Glass Unit**
  - 1. **Overall Unit Thickness: 1 inch (25 mm).**
  - 2. **Thickness of Each Glass Lite: 1/4 inch (6.0 mm.)**
  - 3. **Outdoor Lite: clear float glass, tempered as required per code with Solarban 70XL on second surface.**
  - 4. **Interspace Content: Air.**
  - 5. **Indoor Lite: clear float glass, tempered as required per code.**
  - 6. **VLT = 64%**
  - 7. **Exterior Reflectance = 12%**
  - 8. **Interior Reflectance = 13%**
  - 9. **U-Value Imperial (Winter) Air = 0.28**
  - 10. **SHGC = 0.27**
  - 11. **LSG = 2.37**
  - 12. **Provide safety glazing labeling.**
  - 13. **Note a butt glazed corner is to be provided at all exterior corner conditions.**

## 2.11 TEMPERED GLASS

- A. Tempered Glass shall follow ASTM C 1048, Type 1 (transparent, flat glass), Quality-03, provide kind FT (fully tempered) float glass in place of annealed float glass. Provide tempered glass in interior and exterior "hazardous" locations, which are defined to include, but not limited to (refer to latest code):
  - 1. Any glazing in doors
  - 2. Any glazing within 24" of a door whose bottom edge is less than 60" A.F.F.,
  - 3. Any glazing which meets all of the four following characteristics:
    - a. Greater than 9 sq. ft. in area,
    - b. Bottom edge less than 18" A.F.F.
    - c. Top edge greater than 36" A.F.F.
    - d. Closer than 36" from an adjacent walking surface.

## PART 3 - EXECUTION

### 3.1 GLAZING, GENERAL

- A. 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.

- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. 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.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- H. 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.

### 3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. 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.
- F. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.3 GASKET GLAZING

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

- B. 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.
- C. Installation with Drive-in Wedge Gaskets: 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.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.
- F. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Dow Corning Corporation.
    - b. GE Construction Sealants; Momentive Performance Materials Inc.
    - c. Tremco Incorporated.
  - 2. Sealants shall have a VOC content of 250 g/L or less.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

### 3.4 CLEANING AND PROTECTION

- A. 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.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000