SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 RELATE DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Glass and glazing for interior and exterior applications.

B. Related Sections:

1. Division 08 Section "Glazed Insulated Sectional Doors".
2. Division 08 Section "Unit Skylights".
3. Division 08 Section "Mirrors".
4. Division 10 Section "Toilet Accessories" for glass shower doors.

1.3 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials shall provide continuity of building enclosure vapor and air barrier.

1. To utilize the inner pane of multiple pane sealed units for the continuity of air and vapor seal.
2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass thickness indicated is minimum and shown for detailing only. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC Chapter 24, as measured in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/175 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

D. Delegated Design: Design laminated glazing for windscreen, including comprehensive engineering analysis by a qualified professional engineer.

2. Design Wind Pressures: As indicated on Drawings.
   a. Wind Design Data: As indicated on Drawings.
3. 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.
4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
1.4 SUBMITTALS

A. Product Data: Submit manufacturer's Product Data for glass units, including the following:
   1. Structural, physical and environmental characteristics.
   2. Size limitations.
   3. Special handling or installation requirements
   4. Special application requirements for glazing materials.
   5. Available colors of glass and glazing materials with color selections.

B. LEED Submittals:
   1. Credit MRc4.1 and Credit MRc4.2, Recycled Content: Provide list of proposed materials with recycled content. Indicate separate percentages, by weight, of pre-consumer and post-consumer recycled content per unit of product. Also include material costs, excluding cost of installation.
   2. Credit MRc5.1 and Credit MRc5.2, Local/Regional Materials: Provide list of proposed regional materials. Indicate location of manufacturing facility including name, address and distance indicating location where the base materials were extracted, mined, quarried, harvested, etc. and the distance between this location and the project site. Also include material costs, excluding cost of installation.
   3. Credit EQc4.1, Low-Emitting Materials, Adhesives and Sealants: Provide product data and material safety data sheets (MSDS) for adhesives and sealants used inside the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.

C. Samples: Submit samples as follows:
   1. Two samples 12- x 12-inches in size, illustrating glass units, coloration, and design.
   2. Four-inch long bead of glazing sealant, color as selected.

D. Manufacturer’s Certificate: Submit Manufacturer's certification that sealed insulated glass meets or exceeds specified requirements.

E. Delegated-Design Submittal: For laminated glazing 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 QUALITY ASSURANCE

A. Standards:

B. Regulatory Requirements:
   1. Conform to IBC Chapter 24, to local requirements and to State law.


D. Source Limitations: Obtain each type of glass from a single manufacturer using the same type of glass lights and inner layers for each type of glass type or unit specified. Obtain glazing assemblies from one source for each product and/or installation specified and/or required.
E. Installer Qualifications: An experienced installer who has successfully 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 for a minimum of 10 years; and who employs glass installers for this project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to 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.

1. Warranty Period: 10 years from date of Substantial Completion.

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 manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Glass Materials: Furnish products of one of the following Manufacturers, except as otherwise approved by the Architect, subject to compliance with Specification requirements:

1. Guardian Industries: www.guardian.com
2. Oldcastle Glass Group: www.oldcastleglass.com
3. Pilkington LOF: www.pilkington.com
4. PPG Industries: www.ppgideascapes.com
5. Viracon: www.viracon.com

2.2 MATERIALS, GENERAL

A. Regional Materials: Provide materials that have been manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
B. Recycled Content: Provide products with postconsumer recycled and preconsumer recycled content.

C. VOC Content of Interior Sealants: Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
   1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

B. 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.

C. 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. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   3. 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).
   4. 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.
   5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS MATERIALS

A. Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; 1/4-inch thick minimum.

B. Safety Glass: ASTM C1048, Kind FT fully tempered with horizontal tempering Condition A uncoated, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; conforming to ANSI Z97.1; 1/4-inch minimum.
2.5 SEALED INSULATING GLASS MATERIALS

1. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
2. The unit overall thickness tolerance shall be minus 1/16-inch / plus 1/32-inch. Unit constructed with patterned or laminated glass shall be plus or minus 1/16-inch.
5. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone.
   a. The minimum thickness of the secondary seal shall be 1/16-inch.
   b. The target width of the primary seal shall be 5/32-inch.
   c. There shall be no voids or skips in the primary seal.
   d. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16-inch by maximum length of 2-inches with gaps separated by at least 18-inches. Continuous contact between the primary seal and the secondary seal is desired.
   e. Both primary and secondary sealant adhesion shall exhibit continuous, tenacious adhesion to both glass and spacer contact areas.
6. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.
   a. Finish: Mill or clear anodized.
7. Individual panes of insulated glass units shall be Kind HS (heat strengthened) or Kind FT (fully tempered) where required to resist thermal stress in insulating glass units as determined by the manufacturer, or Kind FT (fully tempered) where indicated or required by Code by location.

B. Glass Type GL-1 - Low-E Insulated Glass Units: PPG "Solarban 70XL" Low-E Insulating Glass, or as approved. Units shall comply with ASTM E774 and E773 and as follows:
1. Outdoor Lite: 1/4-inch thick minimum clear glass with Low-E coating on the No. 2 surface.
2. Airspace: 13.2 mm, mill or clear anodized finish, purged dry air.
3. Indoor Lite: 1/4-inch thick minimum, clear glass.
4. Edge Seal: Silicone sealant.
5. Total Unit Thickness: 1-inch.
6. Properties:
   a. Visible Light Transmittance: 64%
   b. U-Value: 0.28 (night)
   c. Shading Coefficient: 0.32
   d. SHGC: 0.27
   e. LSG: 2.37

C. Glass Type GL-2 - Low-E Insulated Glass Units: Guardian "SuperNeutral 68" Low-E Insulating Glass, or as approved. Units shall comply with ASTM E774 and E773 and as follows:
1. Outdoor Lite: 1/4-inch thick minimum clear glass with Low-E coating on the No. 2 surface.
2. Airspace: 13.2 mm, mill or clear anodized finish, purged dry air.
3. Indoor Lite: (2) panes1/8-inch thick minimum, clear glass with 0.060 clear PVB laminating interlayer.
4. Edge Seal: Silicone sealant.
5. Total Unit Thickness: 1-inch nominal.
6. Properties:
   a. Visible Light Transmittance: 64%
   b. U-Value: 0.28 (night)
   c. Shading Coefficient: 0.32
   d. SHGC: 0.27
   e. LSG: 2.37

D. Glass Type GL-3 - Monolithic clear laminated glass (indicated on the drawings as GL-3c):
   1. (2) panes 1/8-inch thick minimum, clear glass with 0.060 clear PVB laminating interlayer.
   2. Total Thickness: 1/4-inch nominal.

E. Glass Type GL-4 (for Glazed Windscreen): Laminated Glass Units:
   1. (3) panes of 1/4-inch thick clear glass laminated with 0.060 clear laminating interlayer.
      Total nominal thickness = 3/4-inch. Final design of glass to be by Engineer of Record in accordance with "Performance Requirements" article, above.

2.6 GLASS SHOWER SIDE PANELS

A. See Division 10 Section "Toilet Accessories" for glass shower doors.

B. Laminated Glass with Colored Film (indicated on drawings as GL-3f):
   1. (2) panes 1/8-inch thick minimum, clear glass with 0.040 PVB laminating interlayer.
   2. Total Thickness: 1/4-inch nominal.
   3. Interlayer Color: "White" as selected by Architect.
   4. Installation: Silicone glazed at the jambs and set in a stainless steel U-channel at the base and head. Base channel shall have drainage holes to shower side.

C. Laminated Glass with Clear Film (indicated on the drawings as GL-3c):
   1. (2) panes 1/8-inch thick minimum, clear glass with 0.040 PVB laminating interlayer.
   2. Total Thickness: 1/4-inch nominal.
   3. Interlayer Color: "Clear" or as selected by Architect.
   4. Installation: Silicone glazed at the jambs and set in a stainless steel U-channel at the base and head. Base channel shall have drainage holes to shower side.
   5. Vinyl band will be provided and installed by the Owner.
2.7 GLAZING ACCESSORIES

A. Windscreen Base Shoe:
1. Basis of Design, Base Shoe: CR Laurence Catalog Number W7B10D. Final selection to be confirmed by Engineer of Record in accordance with "Performance Requirements" article, above.
2. Heavy duty, small profile windscreen base shoes for 3/4-inch glass.
   a. Height: 3-1/2-inches
   b. Width: 1-7/8-inches
   c. Throat Width: 1-inch
   d. Lengths: Manufacturer's standard.
3. Provide with 9/16-inch pre-drilled holes at 12-inches on center. Engineer of Record to confirm size and spacing of holes in accordance with "Performance Requirements" article, above. Provide custom drilled pieces if required.
5. Provide Brushed Stainless Steel Cladding for base shoe. CRL #BWCB5S10
6. Provide matching Stainless Steel End Caps where required. CRL #B5WECBS
7. Provide black roll-in glazing gasket. CRL #RG38100

B. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4-inches, sized per GANA guidelines.

C. Spacers: Neoprene or EPDM blocks of 65±5 Shore A durometer hardness, designed to maintain positioning of glass and prevent shifting of glass in the glazing pocket and tested for compatibility with specified glazing sealant.

D. Glazing Gaskets: Neoprene or EPDM and silicone compatible, non-cellular dense, 75 ±5 Shore A durometer, complying with ASTM C864, option 1 or 2.
   1. Bed all gasket corners, molded or not in elastomeric silicone sealant.

E. Interior Glazing Compound: Polymerized Butyl Rubber and Inert Fillers (pigments), solvent based with minimum 75 percent solids, non-sag consistency, tack-free time of 24 hours or less, paintable non-staining.

F. Exterior Glazing Compound: Conforming to ASTM C920, Type S, Grade NS, Use G. Compound shall be paintable, or colored to match frame.

G. Glazing Tape: Preshimmed 10 percent solids, non-shrinking, butyl rubber tape compatible with sealants. If exposed, tape shall be paintable, or colored to match frame.

2.8 MARKINGS

A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.

C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

A. Comply with combined recommendations of Glass Manufacturer, aluminum frame manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified.

B. Clean the glazing, channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.

C. Do not attempt to cut, seam, nip, or abrade glass which is tempered or heat strengthened.

D. Comply with "Glazing Manual" by GANA, except as shown and specified otherwise by Manufacturers of glass and glazing materials.

E. Inspect each piece of glass immediately before installation, and discard those which have observable edge damage or face imperfections.

F. Install setting blocks of proper size at quarter points or eighth points but at no time closer than 6-inches from the end of the horizontal frame in a bead of clear silicone sealant.

G. Provide spacers inside and out, and of proper size and spacing, for glass sizes larger than 50 united-inches. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width.

H. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

I. Gasket Glazing:
   1. Fabricate gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
   2. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.
   3. Insert gasket between glass and frame or fixed stop, securely in place.
3.3 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Clean contact surfaces with solvent.

B. Cut glazing tape to proper length and set against permanent stops, 3/16-inch below sightline. Weld corners together by butting tape and dabbing with sealant.

C. Apply bed of sealant along exterior void ensuring full contact with glass.

D. Place setting blocks at quarter- points or eighth- points, but at a minimum 6-inches from the near edge of block to edge of glass.

E. Rest glass on setting blocks and push against tape (and heel bead of sealant) with sufficient pressure to ensure full contact and adhesion at perimeter.

F. Install removable stops, spacer strips inserted between glass, and applied stops at 2-foot intervals, 1/4-inch below sightline. Place glazing tape on glass with tape flush with sightline.

G. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 3/8-inch below sightline.

H. Apply cap bead of sealant along exterior void, to uniform and level line, flush with sightline. Tool or wipe cap bead surface with solvent for smooth appearance.

3.4 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Cut glazing tape to proper length and install against permanent stop, projecting 1/16-inch above sightline.

B. Place setting blocks at one-quarter point or eighth- points, but at a minimum of 6-inches from the near edge of block to edge of glass.

C. Rest glass on setting blocks and push against tape with sufficient pressure to ensure full contact and adhesion at perimeter.

D. Install removable stops; spacer strips inserted between glass and applied stops at 2 foot intervals, 1/4-inch below sightline.

E. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.

F. Neatly trim off excess tape to sightline.

3.5 GLASS WINDSCREEN

A. Install base shoe with fasteners of size and spacing as required by delegated design in "Performance Requirements" article, above.

B. Install glass using wet-glazing method as recommended by manufacturer of base shoe.
3.6 ADJUSTING
   A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.7 CLEANING
   A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
   B. Remove labels after Work is completed.

3.8 PROTECTION
   A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.
   B. Do not apply markers of any type to surfaces of glass.

3.9 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT
   A. Manage indoor air quality in accordance with the provisions of Divisions 01 Section "Construction Indoor Air Quality Management" and other sections as applicable.

3.10 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
   A. Manage construction waste in accordance with provisions of Division 01 Section "Construction Waste Management and Disposal."

END OF SECTION 088000