SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The Specification Sections "General Conditions of Contract", "Special Conditions" and "Division 01 – General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section includes:
   1. Glass for windows, doors, interior borrowed lites, storefront framing, and glazed curtain walls.
   2. Glazing sealants and accessories.
   3. Bi-parting sliding glass door hardware.
   4. Ticket window accessories.

B. Related Requirements:
   1. Section 057313 – Glazed Decorative Metal Railings.
   2. Section 081113 – Hollow-Metal Doors and Frames.
   3. Section 081416 – Flush Wood Doors.
   4. Section 084413 – Glazed Aluminum Curtain Walls.
   5. Section 084420 – Point Supported Glazing.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For field-applied glazing sealants, documentation including printed statement of VOC content.

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. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

B. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: 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.

B. 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.

C. Manufacturer's Special Warranty for 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.

D. Warranty Periods: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design glazing.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Design Snow Loads: As indicated on Drawings.
3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

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.
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, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
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, "Guidelines for Sloped Glazing."

4. 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 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. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass in thicknesses that comply with performance requirements and is not less than the thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provides heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.

D. Ceramic-Coated Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear), Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."

E. Decorative Glass: Acid-etched glass with decorative pattern evenly etched into glass.

F. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

G. Fire-Protection-Rated Tempered Glass: Fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.

1. 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.
2. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
3. 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 temperature-rise limitation; and the fire-resistance rating in minutes.

H. Translucent Laminated Glass:

1. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   a. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
   b. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   c. Interlayer Color: White unless otherwise indicated.

I. Polycarbonate Security Glazing

1. Polycarbonate Sheet: ASTM C 1349, Appendix X1, Type II, coated, mar-resistant, UV stabilized polycarbonate with coating on exposed surfaces and Type I, standard, UV-stabilized polycarbonate where no surfaces are exposed.
2. Laminated Polycarbonate: Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C 1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation. Provide laminated units that comply with requirements of ASTM C 1349 for maximum allowable laminating process blemishes and haze.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
   1. Sealing System: Dual seals.
   2. Spacer: Non-metallic warm-edge spacer.

2.5 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they 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. Field-applied sealants shall have a VOC content of not more than 250 g/L.
   4. Colors of Exposed Glazing Sealants: As selected by Professional from manufacturer's full range.

2.6 TICKET WINDOW ACCESSORIES

A. Talk Through: Creative Industries, SC-100, 115v operation.
B. Recessed, Non-ricochet Deal Trays: Creative Industries, formed from stainless steel; fabricated with recessed bullet trap to ricochet bullets away from secure side, with exposed flanges for recessed installation into horizontal surface, and with sliding stainless-steel cover.
   1. Deal tray size: 11 inches wide by 8-1/4 inches deep by 1-1/2 inches high

2.7 TOP HUNG SLIDING GLASS DOOR HARDWARE

A. Top Hung Sliding Glass Doors:
   1. Sliding Mechanism:
      a. CRL Laguna Series Sliding Glass Door System (Cat. No. L-SWM3BS) is basis for design.
      b. Calusa Barn Door Hardware: Century.
   2. Locking Mechanism:
      a. C R Laurence Brushed Satin Anodized Adjustable Bottom Guide for Sliding Glass Doors with keyed deadbolt.
B. Assemblies:
   1. Assemblies consisting of frameless glass panels fastened with top clamps and roller assemblies in straight configuration as indicated on the drawings.
      a. Prepared for all specified hardware whether specified in this section or not.
      b. Factory assembled to greatest extent practicable; may be disassembled to accommodate shipping constraints
C. Overhead Track
   1. Overhead Track Assembly: Extruded alloy aluminum 6063-T6 pre-fabricated in straight configuration for supporting glass panels hung from Roller Assemblies.

a. Track size: Per architect's drawings and specifications.
b. Mounting Type: Wall.
c. Finish: Satin Anodized.

2. Roller Assembly: Rollers provide smooth, silent movement of glass panels. Two (2) rollers assemblies per panel.
   a. Each pair of Roller Assemblies has a carrying capacity of: 176 lbs (80 kg).
   b. Each Roller Assembly has a height adjustment of 1/4" (6 mm).
3. Track - standard: Extruded aluminum available up to lengths indicated on drawings.
4. Softbrake" Braking System: "Softbrake" cushions the opening and closing of the doors gently and quietly. Completely concealed in the top track and engages during the final 4" (102 mm) of travel preventing the glass from impacting the frame or adjacent glass panel.

D. Door Hardware
   1. Thru Glass Door Pull Cat. No. FP214BS.

E. Materials
   1. Glass: Tempered float glass meeting requirements of ASTM C 1036, Type I, Quality Q3, fully tempered in accordance with ASTM C 1048, Kind FT, and as follows:
      a. Thickness: 1.2-inch.
      b. Color: Clear, Class 1.
      c. Prepare glazing panels for indicated fittings and hardware before tempering.
      d. Polish edges that will be exposed in finished work to bright flat polish.
      e. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.
      f. Extruded Aluminum Components: Conforming to ASTM B 221, Alloy 6063-T6.
      g. Aluminum sheet: ASTM B209, Alloy 5052-H32 (used for non-structural cladding applied to overhead track assembly when required by design).
      h. Aluminum bars, and plate: ASTM B221, Alloy 6061-T6.
      i. Steel plate: ASTM A36.
      j. Stainless Steel Components: Conforming to ASTM A 666, Type 304 [316].

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).

E. 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.

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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
D. 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.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Provide spacers for glass lites where length plus width is larger than 50 inches.
G. 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 GASKET GLAZING (DRY)

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.

3.3 SEALANT GLAZING (WET)

A. 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.
B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.4 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. 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.
C. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
D. Remove and replace glass that is damaged during construction period.

3.5 INSULATING GLAZING (IG) SCHEDULE

A. Glass Type **IG-1**: Clear Low E Insulated Vision.
   1. Basis-of-Design: Viracon VE 1-2M.

2. Comparable Products:
   a. Guardian SN 68.
   b. PPG Solarban 60.
3. Exterior Lite: 1/4 inch clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
4. Coating: Low E on No. 2 surface.
5. Airspace: Argon-filled.
6. Silicone: Black.
7. Interior Lite: 1/4 inch thick, clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
8. U-Value: .25 winter, .21 summer.
9. SHGC: .37
10. VLT: 70 percent.

B. Glass Type **IG-2**: White Hole-Pattern Frit.
1. Basis-of-Design: Viracon VE 24-2M.
2. Comparable Products:
   a. Guardian SN 68 Ultrawhite.
   b. PPG Solarban Starfire.
3. Exterior Lite: 1/4 inch low-iron clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
4. Coating: Low E on No. 2 surface.
5. Airspace: Argon-filled.
6. Silicone: Black.
7. Interior Lite: 1/4 inch thick, low-iron clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
8. Ceramic Frit: 60 percent white hole pattern on No. 3 surface.
9. U-Value: .25 winter, .21 summer.
10. SHGC: .29
11. VLT: 40 percent.

C. Glass Type **IG-3**: Opaque Spandrel.
1. Basis-of-Design: Viracon VE 1-2M.
2. Comparable Products:
   a. Guardian SN 68.
   b. PPG Solarban 60.
3. Exterior Lite: 1/4 inch clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
4. Coating: Low E on No. 2 surface.
5. Airspace: Argon-filled.
6. Silicone: Black.
7. Interior Lite: 1/4 inch thick, clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
8. Ceramic Frit: Opaque white full cover roll coat on No. 4 surface.
9. U-Value: .25 winter, .21 summer.

D. Glass Type **IG-4**: Grey Line-Pattern Frit.
1. Basis-of-Design: Viracon VE 1-2M.
2. Comparable Products:
   a. Guardian SN 68.
   b. PPG Solarban 60.
3. Exterior Lite: 1/4 inch clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
4. Coating: Low E on No. 2 surface.

5. Airspace: Argon-filled.
6. Silicone: Black.
7. Interior Lite: 1/4 inch thick, clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
8. Ceramic Frit: 1 inch grey horizontal lines at 1 inch spacing on No. 3 surface.
9. Orientation: Horizontal lines, starting at bottom with a line.
10. U-Value: .25 winter, .21summer.
11. SHGC: .35
12. VLT: 35 percent.

E. Glass Type **IG-5:**
1. Basis-of-Design : Schott Okalux Type 37/39 (401 487 2824).
2. Comparable Products:
   a. Advanced Glazings, Solera L.
   b. McGrory Decorative Laminated Glass, matching basis-of-design product (800-220-3749).
3. Exterior Lite: 1/4 inch clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
4. Airspace: Argon-filled with light diffusing veil.
5. Silicone: Black.
6. Interior Lite: 1/4 inch thick, clear monolithic, provide fully tempered units in locations indicated or where safety glazing is required by authorities having jurisdiction.
7. U-Value: .25 winter, .21 summer.
8. SHGC 39 (direct), 32 (indirect).

3.6 MONOLITHIC GLAZING (GL) SCHEDULE

A. Glass Type **GL-5**: Clear Glass with Opaque Acid Etching.
1. Basis-of-Design: Walker Glass Co. Starphire Ultra-clear acid etched (609-915-7007).
2. Comparable Products:
   a. Bendheim Clear Etch 6.0 mm thickness with acid-etched surface (617-694-8008).
   b. Cavart 01 Core, 01 Pure with Translucent 3 (617-515-2368).

B. Glass Type **GL-6**: Obscure Mirror.
1. Basis-of-Design: Walker Glass Co. 6.0 mm Miroir Clair Opaque 1 Face with 6.0 mm Clear Mirror Opaque 1 Face - Clear Substrate (609-915-7007).
2. Comparable Products:
   a. Bendheim Etched Mirror GRGU-268 6mm thickness with acid-etched surface No. 1 and mirror on surface No. 2 (617-694-8008).
   b. Cavart 01 Core, 01 Pure with S1 Shimmer (617-515-2368).

C. Glass Type **GL-7**: Obscure Frosted.
1. Basis-of-Design : Imaging Sciences, LLC #01243 "White Density 15" (440-975-9640).
2. Comparable Products:
   a. Bendheim Luminous White Laminated Glass GRGU-391 (617-694-8008).
   b. McGrory Decorative Laminated Glass, matching basis-of-design product (800-220-3749).
3. Glass Type: Acid-etched one side, fully-tempered, with scratch-resistant coating both sides.
4. Glass Thickness: 6.0 mm, unless otherwise required to meet the performance requirements based on size of glazing units.
5. Comply with requirements for safety glazing.

D. Glass Type **GL-8**: Clear fully tempered monolithic units.
1. Thickness: Minimum 12.0 mm unless otherwise required to meet the performance requirements based on size and operation of glazing units.

2. Provide safety glazing labeling.

E. Glass Type **GL-9**: Laminated units, as indicated in Section 057313 – Glazed Decorative Metal Railings.

F. Glass Type **GL-10**: Fire protection rated laminated ceramic units.
   1. 90-minute fire resistant glass.
   2. Provide safety glazing labeling.

END OF SECTION 088000