SECTION 08810

GLASS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for interior and exterior glass and glazing.

B. Related Sections:

1. Hollow metal (steel) doors and frames are specified in Section 08110.
2. Interior aluminum doors and frames are specified in Section 08121.
3. Flush wood doors are specified in Section 08212.
4. Aluminum-framed storefronts are specified in Section 08412.
5. Aluminum windows are specified in Section 08520.

1.02 DEFINITIONS

A. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating resulting from seal failure, and any other visual evidence of seal failure or performance.

1.03 REFERENCE STANDARDS

A. Leadership in Energy and Environmental Design (LEED), www.usgbc.org/LEED (United States Green Building Council (USGBC).

1. LEED – NC v2.2 Reference Guide, first edition, dated December 2006.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

B. Normal thermal movement is defined as that resulting from an ambient temperature range of 120-deg. F. and from a consequent temperature range within glass and glass framing members of 180-deg. F.

C. Provide heat strengthened glass lites where recommended by glass manufacturer as determined by glass stress analysis calculations based on glass unit sizes indicated and shading patterns occurring on the glass. Furnish copies of the glass stress analysis calculations and show the location of glass units required to be heat strengthened on the shop drawings.

1.05 SUBMITTALS

A. Refer to Section 01352 – LEED Requirements for LEED related submittal requirements.

B. Product Data: Manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions. Furnish calculations performed to determine if heat strengthened exterior glass is required.

C. Samples: 12-inch square samples of each type of glass indicated and specified except for clear single pane units, and 12-inch long samples of each type of sealant or gasket exposed to view.

1.06 QUALITY ASSURANCE

A. Glazing Standards: Comply with recommendations of the following manufacturer and associations except where more stringent requirements are specified:

1. Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual".

2. Sealed Insulating Glass Manufacturers Association (SIGMA): TM-3000 "Vertical Glazing Guidelines".

B. Safety Glass: Where safety glass is indicated or required, provide products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested in accordance with ASTM E152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested in accordance with ASTM E163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Insulating Glass Certification Program: Provide insulating glass units permanently marked with appropriate Insulating Glass Certification Council (IGCC) certification label.

F. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that required for this Project, with a record of successful in-service performance.

G. Pre-construction Compatibility and Adhesion Testing: Furnish samples of glass, gaskets, glazing accessories, and glass framing members proposed for use in contact with, or proximity of, glazing sealants, to sealant manufacturer for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods.

1. Furnish not less than 9 pieces of each type and finish of glass framing and of each type, class, kind, condition, and form of glass for adhesion testing and one sample of substrates (gaskets, setting blocks, and spacers) for compatibility testing.

2. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.

3. Testing is not required when glazing sealant manufacturer can submit required preparation data that is acceptable to the Architect and is based on previous testing of current sealant products for adhesion to and compatibility with submitted glazing materials.

1.07 ENVIRONMENTAL QUALITY ASSURANCE

A. Applicable LEED Credits – Refer to Section 01352:

1. Credit EQc4.1 – Adhesives and Sealants.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials during delivery, storage, and handling; comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture, temperature changes, direct exposure to sun and from other causes.

1.09 PROJECT CONDITIONS

A. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when glazing channel substrates are wet.

B. Install glazing sealants at ambient and substrate temperatures above 40-deg. F.

1.10 WARRANTY

A. Insulating Glass: Furnish written warranty signed by glass manufacturer, agreeing to furnish replacements for those insulating glass units developing manufacturing defects as defined, within 10-years from date of Substantial Completion.

B. Mirror Glass: Furnish written warranty agreeing to furnish replacement mirrors for those units developing silver spoilage within 15-years from date of Substantial Completion.

C. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

PART 2 - PRODUCTS

2.01 GLASS PRODUCTS

A. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Thickness as indicated, specified, or recommended by glass manufacturer.

B. Manufacture heat-treated glass by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed.

2.02 GLASS TYPES (See Window Schedule for exact locations).

A. Tinted Insulating Glass with Low E Coating: PPG "Solarban 60 (3) Bronze" or approved equal tinted insulating glass with Low E coating comprised of an outside lite of 1/4-inch thick bronze tinted float glass and inside lite of 1/4-inch clear float glass with Low E coating on No. 3 surface; separated by a 1/2-inch thick hermetically sealed air space; nominal 1-inch unit thickness. Provide heat strengthened lites where recommended by glass manufacturer based on glass lite sizes and shading patterns. Provide fully tempered outside and inside lites where indicated or required by Code. Glass shall have the following performance requirements:

1. Transmittance:

a. Ultraviolet %: 8.

b. Visible %: 41.

c. Total Solar Energy %: 20.

2. Exterior Reflectance:

a. Visible Light %: 8.

b. Total Solar Energy %: 17.

3. U-Value:

a. Winter Night-time: 0.29.

b. Summer Day-time: 0.28.

4. Shading Coefficient: 0.37.

5. Solar Heat Gain Coefficient: 0.32.

6. Light to Solar Gain (LSG): 1.35.

B. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3, 1/4-inch thick.

C. Wire Glass: ASTM C1036, Type II, Class 1, Quality q8; complying with ANSI Z97.1; 1/4-inch thick; Form 1, Mesh m1 (grid mesh).

D. Clear Tempered Float Glass: ASTM C1048, Condition A, Type I, Class 1, Quality q3, Kind FT; 1/4-inch thick.

E. Mirror Glass: ASTM C1036, Type I, Class 1, Quality q1 for units under 25-square feet, Quality q2 for units over 25-square feet, silver coated and electrolytically copper plated, with edges protected with clear vinyl tape or other protective coating applied before installation.

1. Provide stainless steel channel or angle frames with maximum ½-inch exposed legs, with No. 4 finish.

2. Mirrors shall be in single piece units for each location unless otherwise indicated.

2.03 ELASTOMERIC GLAZING SEALANTS

A. General: Comply with recommendations of sealant and glass manufacturer's for selection of glazing sealants with performance characteristics suitable for applications indicated and conditions at time of installation.

1. Compatibility: Select sealants with proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Colors: Color of exposed sealant as selected by Architect from manufacturer's standards.

B. Silicone Glazing Sealant: One-part elastomeric silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25, Uses NT, G, A and 0 as applicable; Dow Corning 790, General Electric "Silpruf", Tremco "Spectrum 1" or approved equal.

2.04 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100-percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged in rolls with a release paper backing, complying with AAMA 800.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

2.05 GLAZING GASKETS

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene, EPDM, or silicone gaskets of profile and hardness required to maintain watertight seal; complying with ASTM C864, D.S. Brown Co., Maloney, Tremco or approved equal.

B. Soft Compression Gaskets: Extruded or molded closed cell, integral-skinned neoprene, EPDM, or silicone of profile and hardness required to maintain watertight seal; complying with ASTM C509, Type II, black; D.S. Brown Co., Maloney, Tremco or approved equal.

2.06 MISCELLANEOUS GLAZING MATERIALS

A. Compatibility: Provide materials with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required, 80 to 90 Shore A durometer hardness.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement.

F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-extruding, non-outgassing, strips of closed-cell plastic foam of density, site, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

G. Mirror Mastic: Palmer "Mirro-Mastic" or approved equal.

2.07 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect work for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; presence and functioning of weep system on framing having weeps; existence of minimum required face or edge clearances; and for effective sealing of joinery. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members to receive glass. Remove coatings that are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are to be used.

3.03 GLAZING, GENERAL

A. Comply with printed recommendations of glass, sealants, gaskets, and other glazing materials manufacturers.

B. Coordinate with framing system manufacturers for proper glazing channel dimensions to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thickness, with acceptable tolerances.

C. Protect glass from edge damage during handling and installation.

1. Use a rolling block in rotating glass units to prevent damage to corners. Use suction cups to shift glass units within openings; do not raise of drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge that would occur in vicinity of setting blocks so that these are located at top of opening.

2. Remove and dispose of glass units with edge damage or other imperfections of a kind that would weaken glass when installed and impair performance and appearance.

D. Apply primers to joint surfaces where required for sealant adhesion.

E. Install setting blocks of proper size in sill rabbet, located to comply with referenced glazing standard. Set blocks in thin course of sealant.

F. Provide spacers inside and out, of size and spacing to preserve required face clearances for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking to comply with requirements of referenced glazing standard except where otherwise required by glass unit manufacturer.

H. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 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 in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these 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. Do not remove release paper from tape until just before each lite is installed.

F. Apply heel bead of elastomeric sealant.

G. 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 center of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers 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. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 PROTECTION AND CLEANING

A. Protect glass from breakage. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances. Remove immediately by methods recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction for build-up of dirt, scum, alkali deposits or staining. Remove as recommended by glass manufacturer.

D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged during construction, including natural causes, accidents and vandalism.

E. Wash glass on both faces not more than 4-days prior to date scheduled for inspection for Substantial Completion. Use methods recommended by glass manufacturers.

END OF SECTION