SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Interior vision lites.
3. High performance architectural insulating glass
2. Entrances and other door glazing.
3. Fire Rated Glazing.

B. Related Sections: The following sections contain requirements that relate to this Section.

1. Division 8 Section "Aluminum Storefronts and Entrances" for aluminum framed entrance requirements.
2. Division 8 Section "Hollow Metal Doors and Frames" for interior hollow metal frames for vision lites.
3. Division 8 Section "Glazed Aluminum Curtain Walls" for curtain wall requirements.
4. Division 8 Section "Decorative Glass Glazing" for decorative glass requiremetns.
5. Division 10 Section "Display Cases" - pre-glazed as part of that section.

1.3 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's directions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. 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.

B. Glass Design: Glass thicknesses are not indicated on Drawings. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths to meet or exceed the following criteria:

1. Minimum glass thickness, nominally, of lites in exterior walls is 6.0 mm (0.23 inch).
2. Tinted and heat-absorbing glass thicknesses for each tint indicated are the same throughout Project.
3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:

\ a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 CODE COMPLIANCE

A. Contractors (general contractors, subcontractors, suppliers, installers, et.al.) are responsible for complying with applicable codes and standards with regards to provision and installation of the proper glazing materials. Drawings and specifications may not identify all glass type locations.

1.6 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated in conjunction with a glazing schedule listing glass types and thicknesses for each size opening and location.

C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

E. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

F. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

G. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

H. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.7 QUALITY ASSURANCE

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

1. FGMA Publications: "FGMA Glazing Manual."
2. LSGA Publications: "LSGA Design Guide."
3. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines".

B. Safety Glass: 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 per ASTM E 152, 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 per ASTM E 163, 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 either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:

1. Insulating Glass Certification Council (IGCC).
2. Associated Laboratories, Inc. (ALI).
3. National Certified Testing Laboratories (NCTL).

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

G. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Laminated glass of each (ASTM C 1172) kind indicated.
4. Insulating glass of each construction indicated.

H. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

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

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost,

condensation, or other causes.

1.10 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1. Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

B. Manufacturer's Warranty on Laminated Glass: Submit written warranty signed by insulating glass manufacturer agreeing to furnish replacements for those laminated glass units that deteriorate as defined in the "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following (note additional manufacturers in specific product areas):.

1. Pilkington Group
2. Guardian Industries Corp.
3. PPG Industries, Inc.
4. OldcastleBuildingEnvelope
4. Viracon, Inc.

2.2 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).

4. Class 1 (clear) unless otherwise indicated, all interior windows and interior sheet of insulated exterior windows.
5. Class 2 (tinted, heat-absorbing, and light-reducing) at exterior surface sheets as inidcated.

B. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted glass, coated or uncoated, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.3 HEAT-TREATED FLOAT GLASS

A. Uncoated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition C (uncoated glass), Type I (transparent glass, flat), Class 2 (tinted heat-absorbing and light-reducing), Quality q3 (glazing select), with tint color and performance characteristics for 6.0-mm-thick (0.23-inch-thick) glass matching those indicated for annealed primary tinted float glass; kind as indicated below:

5. Kind FT (fully tempered) where indicated or required.

2.4 CERAMIC-COATED GLASS

A. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one-surface ceramic coated), Type 1 (transparent glass, flat), Quality q3 (glazing select). Color to be chosen from manufacturer's full line of standard colors (line must include black and gray).

2.5 FIRE-RATED GLAZING PRODUCTS

A. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch (8-mm) nominal thickness; polished on both surfaces; weighing 4 lb/sq.ft. (19.5 kg/sq.m); and as follows:

1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Polished on both surfaces, transparent.
3. Product: "FireLite Plus" by Nippon Electric Glass Co., Ltd., and distributed by Technical Glass Products.

2.6 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.

1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.
3. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6.0 mm (0.23 inch) thick and nominal 1/2-inch dehydrated space between lites, unless otherwise indicated.
4. U-values are expressed as Btu/hour x sq.ft. x deg F.

B. Construction Characteristics:

1. Air Space Width: Nominal ½ inch measured perpendicularly from surfaces of glass lites at unit's edge.
2. Gas Filling: Fill air space with argon.
3. Sealing System: Dual seal, primary and secondary sealants: manufacturer's standard sealants.
4. Spacer Specifications: Manufacturer's standard.
5. Desiccant: Either molecular sieve or silica gel or blend of both.
6. Corner Construction: Manufacturer's standard corner construction.
7. Color of Spacer: Color as selected by Architect from manufacturer's standard colors.

C. Insulating Glass Types:

1. Type GL-1 Units: All units except as noted; Each Lite: 6.0 mm (0.23 inch).
   A. Outdoor Lite: Class 2 (tinted, heat-absorbing and light-reducing) float glass with tint color: PPG Azuria is basis of design
   B. Indoor Lite: Class 1 (clear) float glass with Low E coating on #3 surface; PPG Sungate 500
   C. Performance Characteristics:
      a. Visible Light Transmittance: 57%
      b. U-Value Winter: 0.35; U Value: Summer: 0.35
      c. Shading Coefficient: 0.40
      d. Solar Heat Gain Coefficient: 0.34

e. Outdoor Visible Light Reflectance: 12%

2. Type GL-2 Units: At Curtainwall
A. Outdoor Lite: Clear, low reflective equivalent to PPG Solarban 70XL (2)
B. Indoor Lite: Class 1 (clear) float glass
C. Performance Characteristics:
a. Visible Light Transmittance: 64%
b. U-Value Winter: 0.28; U Value: Summer: 0.26
c. Shading Coefficient: 0.32
d. Solar Heat Gain Coefficient: 0.27
e. Outdoor Visible Light Reflectance: 12%

3. Type GL-3 Units: At Curtainwall
A. Outdoor Lite: Clear, low reflective equivalent to PPG Solarban 70XL (2)
B. Indoor Lite: Equivalent to Walker Textures Acid Etched 1 Face Opaque
C. Performance Characteristics:
f. Visible Light Transmittance: 64%
g. U-Value Winter: 0.28; U Value: Summer: 0.26
h. Shading Coefficient: 0.32
i. Solar Heat Gain Coefficient: 0.27
j. Outdoor Visible Light Reflectance: 12%

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4. Performance of Insulated Glass: Performance Values listed are minimum acceptable values for insulated glass.

2.7 LAMINATED SAFETY GLASS

A. Provide Category II safety glazing comprised of laminated Clear Float Glass, annealed and heat strengthened with minimum 0.030 inch thick individual layers.

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

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

2.10 GLAZING TAPES

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

1. AAMA 804.1.

D. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:

a. PTI 303 Glazing Tape (shimless), Protective Treatments, Inc.
b. S-M 5700 Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.

c. Tremco 440 Tape, Tremco Inc.
d. Extru-Seal, Pecora Corp.
e. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.

2.11 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of 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 sealant and glass manufacturer's recommendations for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2.12 GLAZING GASKETS

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

B. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of Preformed Gaskets:

a. D.S. Brown Co.
b. Maloney Precision Products co.
c. Tremco.

2.13 MISCELLANEOUS GLAZING MATERIALS

A. Compatibility: Provide materials with 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 for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing

sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on shop drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Stack individual lites on edge and lean them against sturdy uprights at a slope of 5□ to 7□ from vertical.
2. Cushion the bottom edges with soft, firm pads free of dirt, grit, glass chips or other foreign material.
3. Avoid rotating or "cartwheeling" insulating glass units over their corners. Instead, use a turning device such as a rolling block if units must be rotated.
4. Schedule glass deliveries to coincide with glazing schedules.
5. Unpack the glass from cases according to printed instructions. Never move partially unpacked cases or "end-pick" lites.
6. Check glass surfaces and edges for damage before glazing. Do not install glass with large edge chips. never slide one lite over another.
7. Prevent contact of the glass with markings - typically flags, festoons or tape to identify openings to be glazed; never mark the glass with an "X" or other identity symbol.
8. Protect the glass with screens of plywood or plastic wherever there is welding, cutting, sandblasting, fireproofing, or other potentially damaging work in progress.
9. Begin glazing in concrete openings only after any surface treatments such as sandblasting, grouting and waterproofing have been completed.
10. Insist that workers handling glass wear gloves, safety shoes, hard hats and glazing gauntlets.

3.4 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.

3.5 PROTECTION AND CLEANING

A. Protect exterior glass from breakage 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 including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended 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 build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000