SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass for windows doors interior borrowed lites storefront framing glazed curtain walls.
2. Fire-rated glazing.
3. Glazing films.
4. Glazing sealants and accessories.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
2. Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements.
3. Identify available colors; indicate special precautions required.

B. Insulated Glazing Unit Assembly Designations: Provide complete manufacturer IGU assembly designations for matching in the event of damage and matching from alternate manufacturers.

C. Sustainable Design Submittals: Submit supporting documentation with the completed worksheet.

1. Product Data, Recycled Content: Indicate percentage of postconsumer and preconsumer recycled content and relative dollar value per unit of product.
   a. Indicate percentage of postconsumer and preconsumer recycled content and relative dollar value per unit of product.
   b. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
2. Product Data, Regional Materials: Submit for materials manufactured within 100 miles (160 km) of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.
3. Environmental Product Declaration: Submit data for each product.
4. Health Product Declaration: Submit data for each product.
5. Sourcing of Raw Materials: Submit corporate sustainability report for each manufacturer.

6. Construction Waste Management: Submit tabulating and supporting for salvaged, recycled, and reused building waste materials.

D. Shop Drawings:

1. Sections and details of glass installation at framing members including head, mullions, transoms, jambs and sills.

E. Samples: Submit 12" x 12" samples of each type and thickness of tint, patterned and coated glass.

F. Delegated Design Submittal: Submit 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. Delegated design requirements and criteria extend to the following Sections:

1. 08 12 16 Aluminum Frames.
2. 08 41 13 Aluminum Framed Entrances and Storefronts.
3. 08 44 13 Glazed Aluminum Curtain Walls.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: Submit glass and glazing manufacturer's certifications that materials meet Specification requirements and are compatible with each other.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Regulatory Requirements: Comply with ANSI Z97.1 and CPSC 16 CFR Part 1201 break safe characteristics.

D. Heat-Strengthened and Fully-Tempered Glass:

1. Fabrication Process: By horizontal (roller-hearth) process.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).
4. Fabrication Tolerances:
   a. Optical Distortion Tolerance: Using a LightSentry measurement system or equal, measure each pane of monolithic heat-strengthened glass against the following criteria and reject those that do not comply:
      1) Roller Wave Criteria: Maximum 0.004 inches at center and 0.008 inches at edges from peak to valley.

2) Millidiopter Criteria: Over 90 percent of glass surface, plus or minus 120 A overall, or the highest overall measurement from the approved mock-up that is less than plus or minus 120 A. Whichever is less.

b. Overall Bow and Warp Tolerance: Examine each pane of heat treated glass to detect any lights which exceed half of the maximum bow and warp tolerances in any direction as listed in ASTM C1048, Table 2 and reject those that do not comply.

5. Orientation: Orient roller-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   a. If width of any glass units indicated on Drawings exceeds fabrication limits, roller-wave distortion shall be oriented in a consistent direction for the entire project.

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

F. 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.

G. Insulated Glass (IGU) Selection Mockup: Build stand alone mockups for all insulated glazing units (IGU) to demonstrate aesthetic effects. The IGU Selection Mockup shall set aesthetic standards for IGU materials and requires approval by the Architect.. The IGU Selection Mockup shall not remain as part of the competed Work and shall meet the following minimal requirements:

1. Provide mockups for each IGU glazing Type indicated in this section, Type 8-1 through 8-3.
2. All Insulated Glazing Unit (IGU) panels shall be square and sized at a minimum of 3 feet wide by 3 feet high.
3. Provide additional 2 variations for each IGU Type with reflectivity above and below the basis of design to identify, select and confirm a direct match to the glazing on the existing building.
4. If matches cannot be confirmed with the initial sample sets, provide additional mockup samples.
5. Obtain written approval for all IGU Types from the Architect and Owner.
6. The Insulated Glass (IGU) Selection Mockup shall not remain as part of the complete Work, shall remain on site for comparison for the duration of construction and shall only be removed from the site at the direction of the Architect.
7. Once all Work has been completed and written authorization is obtained from the Architect, the mockup shall be removed from the site.

H. Mock-Ups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 08 41 13, Section 08 44 13 to match glazing systems required, including glazing methods.

2. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed Work provided that the assemblies they are mounted into also remain.

1.5 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.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C1087 to determine whether priming and specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

B. Preconstruction Distortion Tolerance Testing: Test monolithic heat strengthened or coated glass of 6 mm (1/4 inch) thickness or more scheduled for use in mock up construction.

1. Measuring Device: LightSentry measurement system or comparable when approved by Architect.
   a. Roller Wave Criteria: Maximum 0.002 inches at center and 0.008 inches at edges from peak to valley.
   b. Millidiopter Criteria: Over 90 percent of glass surface, plus or minus 120 A overall.
   c. Reject each pane of glass exceeding the maximum distortion criteria.
2. Prepare test and inspection reports.

1.6 COORDINATION

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

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver glass to job in original containers bearing manufacturer's label indicating quality of contents of each package.

B. Store glass under cover at site and protect from edge and surface damage.

C. Do not remove labels until glass has been installed. Keep glass free from contamination by materials capable of staining glass. Do not apply marking materials to either side of glass.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install glazing materials when ambient temperature is less than 50 degrees F. unless recommended by glazing material manufacturer.
2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
3. Do not install glazing materials when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.10 WARRANTY

A. Coated Glass Products: Written warranty signed by manufacturer in which the 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.

B. Laminated Glass: Written warranty signed by manufacturer in which the manufacturer agrees to replace 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.

C. Insulating Glass: Written warranty signed by manufacturer in which the 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AGC Glass Company North America, Inc.
   2. Guardian Industries Corp.
   3. JE Berkowitz, LP.
   4. Oldcastle BuildingEnvelope™.
   5. Pilkington North America.
   6. Saint-Gobain.
   7. Schott North America, Inc.
   8. Viracon, Inc.
   9. Vitro Glass

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
   1. Obtain tinted glass from single source from single manufacturer.
   2. Obtain coated glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 16 "Contractor's Quality Control," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
   1. Wind Loads: Design and size components of glazing systems to withstand loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with SEI/ASCE 7 to establish wind pressure based on the following criteria:
      a. Ultimate Design Wind Speed (Vult): As indicated on the Drawings.
      b. Nominal Design Wind Speed (Vasd): As indicated on the Drawings.
      c. Occupancy Category: II.
      d. Exposure Category: C.
      e. Internal Pressure Coeffiicient (GCPI): ±0.18.

2. Seismic Loads: As indicated on Drawings.
3. Other Design Loads: As indicated on Drawings.
4. Design Snow Loads: As indicated on Drawings.
5. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
6. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
7. 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 (25 mm), whichever is less.
8. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

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

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

2.3 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: "GANA Glazing Manual."
2. GANA: "Laminated Glazing Reference Manual"
3. IGMA TM-3000: "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
4. IGMA TM-3100: "Voluntary Guidelines for the Identification of Visual Obstructions in the Air Space of Insulating Glass Units."

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 that complies with performance requirements and is not less than the thickness indicated.
   1. Minimum Glass Thickness for Exterior Lites: 6 mm.
   2. Minimum Glass Thickness for Interior Lites:
      a. Sizes up to 24 inches wide by 36 inches high: 6mm.
      b. Sizes over 24 inches wide by 36 inches high: 8mm and confirmed by Delegated Design as sufficient thickness against breakage.

E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

F. 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, provide 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.

2.4 GLASS - FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing).

B. Ultraclear Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1, complying with other requirements specified and with low-iron content and visible light transmission not less than 91 percent.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Guardian Industries Corp.; Ultrawhite®.
      b. Pilkington North America; Optiwhite®.
      c. PPG Industries, Inc.; Starphire®.

C. Glass Types:
   1. Type 0A - Clear.
   2. Type 0B Tinted: Not Applicable
   3. Type 0C – Ultraclear

2.5 GLASS - HEAT-STRENGTHENED GLASS

A. Heat-Strengthened Glass: ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind HS (heat-strengthened), Condition A (uncoated).

B. Glass Types:
   1. Type 1A - Clear.
   2. Type 1B Tinted: Not Applicable.
   3. Type 1C – Ultraclear

2.6 GLASS - FULLY TEMPERED

A. Fully Tempered Glass: ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind FT (fully tempered), Condition A (uncoated).

B. Glass Types:
   1. Type 2A - Clear.
   2. Type 2B Tinted: Not Applicable.
   3. Type 2C – Ultraclear

2.7 COATED GLASS - HEAT-STRENGTHENED GLASS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass Solarban® 70 Low-E coating on the #2 (inner) surface of a Vitro Azuria glass outer-lite, that, when paired with an inner-lite of Vitro Acuity™ low-iron ultraclear glass in an insulated unit configuration, results in comparable appearance and performance characteristics as follows:

   1. Visible Light Transmittance (VLT): 50
   2. Visible Light Reflectance:
      a. Exterior: 10 percent
      b. Interior: 13 percent
   3. U Value:
      a. Winter night-time: 0.28
      b. Summer day-time: 0.24
   4. Solar Heat Gain Coefficient: 0.24
   5. LSG Ratio: 1.58

B. Glass Types:
   1. Type 3A - Clear.
   2. Type 3B - Tinted: Azuria
   3. Type 3C - Ultraclear.

2.8 COATED GLASS - FULLY TEMPERED

A. Fully Tempered Glass: ASTM C 1376 and ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind FT (fully tempered), Condition C (other coated glass).

B. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass Solarban® 70 Low-E coating on the #2 (inner) surface of a Vitro Azuria glass outer-lite, that, when paired with an inner-lite of glass in an insulated unit configuration, results in comparable appearance and performance characteristics as follows:

1. Visible Light Transmittance (VLT): 50
2. Visible Light Reflectance:
    a. Exterior: 10 percent
    b. Interior: 13 percent
3. U Value:
    a. Winter night-time: 0.28
    b. Summer day-time: 0.24
4. Solar Heat Gain Coefficient: 0.24
5. LSG Ratio: 1.58

C. Glass Types:

1. Type 4A - Clear.
2. Type 4B - Tinted: Azuria
3. Type 4C - Ultraclear.

2.9 GLASS - CERAMIC-COATED SPANDREL

A. Ceramic-Coated Spandrel Glass: ASTM C 1048, Kind HS (heat-strengthened), Condition B (spandrel glass, one surface ceramic coated), Class 1 (clear), Quality q3 (glazing select) with a ceramic coating as follows:

1. Type 5A-1 - Clear: 100% opaque ceramic coating on #4 surface.
    a. Color: As selected by Architect from manufacturer's full range.
        1) Anticipate a minimum of 2 colors.

2.10 FIRE-RATED GLASS

A. Fire-Protection-Rated Glass – Type 6D:

1. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing in accordance with NFPA 257 or UL 9, including hose-stream test, and shall comply with NFPA 80.

a. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from hose-stream test.

2. 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 glazing has passed hose-stream test; whether glazing meets 450 deg F (250 deg C) temperature-rise limitation; and fire-resistance rating in minutes.

3. Fire-Protection-Rated Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 5-mm thickness; faced on one surface with a clear glazing film; complying with 16 CFR 1201, Category II.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Technical Glass Products; an Allegion brand ; FireLite® NT. or a comparable product by one of the following:

1) McGrory Glass, Inc.
2) SAFTI FIRST Fire Rated Glazing Solutions.
3) Vetrotech Saint-Gobain.

B. Fire-Resistance-Rated Glass – Type 6E:

1. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

2. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

3. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.

4. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with 16 CFR 1201, Category II.

a. Basis-of-Design Product: Subject to compliance with requirements, provide Technical Glass Products; an Allegion brand ; Pilkington Pyrostop®. or a comparable product by one of the following:

1) McGrory Glass, Inc.
2) SAFTI FIRST Fire Rated Glazing Solutions.
3) Vetrotech Saint-Gobain.

2.11 INSULATED GLASS

A. Insulated Glass: Sealed units of glass lites separated by dehydrated air spaces complying with ASTM E 2188, ASTM E 2189, and ASTM E 2190, with the following indicated requirements:

1. For types, classes, kinds, and conditions of each glass lite refer to specified glass types.

2. Sealing System: Dual seal, primary and secondary using manufacturer's standard sealants.
3. Spacer: Aluminum with mill or clear anodized finish.
4. Air / Gas Space Width: Nominal 1/2 inch measured perpendicularly from surfaces of glass lites at unit edge.

B. Glass Types:

1. Type 8-1: Vision Glass at Entry Doors and at Storefront and Curtain Wall Assemblies where ultraclear FT both sides is required as indicated on the Drawings.
   a. Outer Lite: 4C, coated ultraclear FT glass.
   b. Inner Lite: 2C, ultraclear FT glass.
   c. Fill: Air
2. Type 8-2: Vision Glass at Storefront and Curtain Wall Assemblies Coated ultraclear HS Outer Lite and ultraclear HS inner Lite.
   a. Outer Lite: 3C, coated ultraclear HS glass.
   b. Inner Lite: 1C, , ultraclear HS glass.
   c. Fill: Air
1. Type 8-3: Vision Glass at Spandrel Panels; (Type 8-2 with Spandrel Coating) Coated ultraclear HS Outer Lite and ultraclear HS inner Lite and spandrel coating.
   a. Outer Lite: 3C, coated ultraclear HS glass.
   b. Inner Lite: 1C ultraclear HS glass.
   c. Fill: Air
   d. Spandrel Coating: 5A-1 on No. 4 surface.

2.12 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.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; Dow Corning® 790 Silicone Building Sealant.
   b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
   c. Pecora Corporation; 890NST.
   d. Tremco Incorporated; Spectrem 1.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
   b. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf SCS200.
   c. Pecora Corporation; 895NST.
   d. Tremco Incorporated; Spectrem 2.

2.13 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. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.14 GLAZING ACCESSORIES

A. Frosted Glass Film:

1. Non-reflective, matte finish, self-adhering type mylar film designed to replicate the appearance of frosted glass.
   a. Type 1: Fine Crystal (SH2FNCR)
      1) Visible light transmittance: 84 percent.
      2) Shading coefficient: 0.94.
   b. Type 2: Essen (SH2EMES)
      1) Visible light transmittance: 55 percent.
      2) Shading coefficient: 0.67.
   c. Type 3: Chaminox (SH2EMCH)
      1) Visible light transmittance: 47 percent.
      2) Shading coefficient: 0.67.

B. Cloaking Glass Film:
   1. Non-reflective film rendering large LED and LCD displays in glass-fronted rooms opaque when viewed from outside so that content may not be seen.
      a. 100 percent Triacetate content.
      b. Acrylic Pressure sensitive adhesive backing.
      c. Weight: 5.35 ounces per linear foot.
      d. Flammability: Class A per ASTM E 84.
      e. Certification: CA 01350.
      f. Warranty: 5 years
   2. Acceptable Product: PF001 Casper cloaking Film by Desgntex.

C. One-Way Reflective Glass Film:
   1. Silver, reflective finish, self-adhering type mylar film designed to be transparent from the darker secure side of the glass, and reflective from the lighter non-secure side.
      a. Visible light transmittance: 19 percent.
      b. Visible light reflectance (out): 58 percent.
      c. Shading coefficient: 0.26.
   2. Acceptable Product: 3M, Inc.; Scotchshield Ultra 400, S20SIAR400.

D. Reflective Security Film:
   1. One way mirror applications; self-adhering type film designed to be transparent from the darker secure side of the glass, and mirror like reflective from the lighter non-secure side.
      a. Visible Light Transmitted: 7 percent.
      b. Visible Light Reflected Interior: 18 percent.
      c. Visible Light Reflected Exterior: 64 percent.
      d. Thickness: 2 mil.
   2. Acceptable Product: 3M, Inc.; Privacy Series Window Film, Mirror.

2.15 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
      a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.16 SOURCE QUALITY CONTROL

A. Fabricator shall perform the following tests and inspection procedures at fabricator's facilities during insulating glass unit product:
   1. Insulating-Glass Unit Seal and Dessicant Testing:
      a. Butterfly unit primary seal adhesion test:
         1) Test Criteria: Comply with pass/fail requirements of glass manufacturer's published guidelines at a minimum pull-back of 30 degrees horizontal with no significant adhesive failure.
         2) Interval: One test every shift or carton change with a mimimum unit size of 24 inches by 36 inches.
      b. Dessicant temperature rise test:
         1) Test Criteria: Comply with dessicant manufacturer's written recommendations.
         2) Interval: One test every shift or carton change.
   2. Bow/Warp and Air Space Measurement (Concave/Convex):
      a. Measure bow/warp hourly on a vertical plane with an aluminum straight edge.
      b. Measure center air space hourly and measure all units greater than or equal to 35 square feet in size.
   3. Skips and Voids in Seals:
      a. Inspect each insulating-glass unit for skips and voids in the primary and secondary seals:
         1) Inspection criteria: Skips and voids are prohibited. Maximum gap at primary/secondary seal interface is 1 inch in length and 3/32- inch in width.
      b. Tool and clean secondary seals prior to packing in order to avoid smears.

B. Reject all insulating-glass units that do not meet source quality control requirements.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 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 (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

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.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. 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.

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

L. Tempered Safety Glazing:

1. Do not cut, seam, nip or abrade tempered safety glass.
2. Set tempered safety glass with tong marks completely concealed or in as inconspicuous a location as possible.
3. Install tempered safety glass in hazardous locations:
   a. Ingress and egress doors.
   b. Operable or inoperable panels adjacent to a door in building and within same wall plane as door whose nearest vertical edge is within 24" of door in closed position and whose bottom edge is less than 60" above floor or walking surface.
   c. Fixed panels which have glazed area in excess of 9 sq. ft. and lowest edge is less than 18" above finished floor level or walking surface within 36" of such glazing where panels are not protected with horizontal member not less than 1-1/2" in width located between 24" and 36" above walking surface.
   d. Other locations required by building code.

3.4 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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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 right before each glazing unit is installed.

F. 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.

3.5 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.

3.6 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.

3.7 GLASS FILM INSTALLATION

A. Install glass films with adhesive, recommended and applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Fit tight to glass perimeter and trim with razor cut edge.

3.8 SITE SUSTAINABILITY

A. Construction Waste Management: Comply with requirements of Section 01 74 19.

1. Waste Disposal: Dispose of product waste, including accessories and used items, by recycling or reusing waste materials.

3.9 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.

E. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.10 SCHEDULE

A. Provide glazing Types as indicated on the Drawings and confirm in submittals. The applications below are provided for general information only and shall be confirmed by the Contractor.

B. Exterior Aluminum Entrance Doors and Other Exterior Doors: Type 8-1 glazing as indicated on the Drawings with dry gasket system.

C. Exterior Storefronts and Curtain Walls: Types 8-1, 8-2, 8-3, glazing as indicated on the Drawings with dry gasket system.

D. Interior Hollow Metal and Wood Doors: Type 2A glazing with interior wet/dry method with silicone sealant. If door carries a fire rating refer to Types 6-D or 6-E depending on application.

E. Fire Rated Interior Doors and Sidelites:
   1. Fire Protective applications: Type 6-D glazing with interior wet dry method with silicone sealant.
   2. Fire Resistance Rated applications: Type 6-E glazing with interior wet dry method with silicone sealant.

F. Fire Rated Interior Windows and Sidelites:
   1. Fire Protective applications: Type 6-D glazing with interior wet dry method with silicone sealant.
   2. Fire Resistance Rated applications: Type 6-E glazing with interior wet dry method with silicone sealant.

G. Interior Non Fire Rated Windows: Type 2A glazing with interior wet/dry method with silicone sealant.

H. Security Glazing for Security Windows and Framing: As specified in Section 08 88 53 Security Glazing.

END OF SECTION