SECTION 088000 - GLAZING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

Retain or delete this article in all Sections of Project Manual.

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

* + - 1. SUMMARY
         1. Section Includes:

Glass products.

Laminated glass.

Insulating glass.

Glazing sealants.

Glazing tapes.

Miscellaneous glazing materials.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other SectionsRefer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and to remain as Editor’s Notes. Remove referenced sections within the body of the specification if not applicable to the project.

Section 084126 "All-Glass Entrances and Storefronts."

Section 084233 "Revolving Door Entrances" for glass in revolving door entrances.

Section 084423 "Structural-Sealant-Glazed Curtain Walls" for glazing sealants used in structural-sealant-glazed curtain walls.

Section 088113 "Decorative Glass Glazing."

Section 088300 "Mirrors."

Section 088813 "Fire-Rated Glazing."

Section 088853 "Security Glazing."

* + - 1. DEFINITIONS

1. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

ASTM C1036 also includes traditional thickness designations in IP units, but actual thickness is based on equivalent IP designation in millimeters.

1. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.
2. IBC: International Building Code the Uniform Code.

Design Consultant to review code references and verify that referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Interspace: Space between lites of an insulating-glass unit.
      1. COORDINATION
         1. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
      2. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraphparagraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.
   * + 1. ACTION SUBMITTALS
          1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
          2. Manufacturer’s installation instructions shall be provided along with product data.
          3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
          4. Product Data: For each type of product.

Include manufacturer’

USE PARAGRAPH BELOW WITH EPD REQUIREMENT WHEN PROJECT ESTIMATE IS $1M OR MORE.

* + - * 1. Submit an Environmental Product Declaration (EPD) from the manufacturer for glass within this specification section, if available. A statement of the contractor’s good faith effort to obtain the EPD shall be provided if not available.

Manufacturer-provided EPDs must be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 *Environmental labels and declarations*, ISO 14044 *Environmental management – Life cycle assessment*, and ISO 21930 *Core rules for environmental product declarations of construction products and services.*

* + - * 1. Glass Samples: For each type of [**glass product other than clear monolithic vision glass**] [**the following products**]; 12 inches (300 mm) square.

Tinted glass.

Coated glass.

Laminated glass.

Insulating glass.

Spandrel glass.

* + - * 1. Glazing Accessory Samples: For [**sealants**] [**and**] [**colored spacers**], in 12-inch (300-mm) lengths.[**Install sealant Samples between two strips of material representative in color of adjoining framing system.**]
        2. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

Retain "Delegated-Design Submittal" Paragraphparagraph below if design services have been delegated to Contractor.

* + - * 1. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
        2. Quality Control Submittals:

Retain "Product Certificates" paragraph below to require submittal of product certificates from manufacturers.

Product Certificates: For glass.

Product Test Reports: For [**fabricated glass**] [**and**] [**glazing sealants**], for tests performed by a qualified testing agency.

For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

Preconstruction adhesion and compatibility test report.

Sample Warranties: For special warranties.

* + - 1. QUALITY ASSURANCE

Retain option in "Fabricated-Glass Manufacturer Qualifications" Paragraphparagraph below only if products listed in Part 2 for low-E-coated or reflective-coated, insulating-glass units are those of manufacturer with a certified fabricator program. Verify availability of qualified fabricator programs with manufacturers.

* + - * 1. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved[**and certified**] by primary glass manufacturer.

If retaining "Installer Qualifications" Paragraphparagraph below, verify, with prospective installers, that they can comply with certification requirements referenced.

* + - * 1. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors[**and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program**].

Retain "Glass Testing Agency Qualifications" Paragraphparagraph below if retaining "Product Test Reports" Paragraphparagraph in "Informational Submittals" Article and it is known that glass products specified have been tested by NFRC-accredited testing agencies.

* + - * 1. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
        2. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
        3. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in [**Section 084113 "Aluminum-Framed Entrances and Storefronts"**] [**Section 085113 "Aluminum Windows"**] [**Section 084413 "Glazed Aluminum Curtain Walls"**] <**Insert Section number and title**> to match glazing systems required for Project, including glazing methods.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
   * + 1. PRECONSTRUCTION TESTING

Retain this article for preconstruction testing if insulating or laminated glass is installed with glazing sealants. Adhesion and compatibility testing is essential for insulating and laminated glass and is usually done by sealant manufacturer. Tests require large number of Samples, and some tests require four weeks to complete.

* + - * 1. 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 other 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**] <**Insert number**> 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 use of specially formulated primers.
   * + 1. DELIVERY, STORAGE, AND HANDLING
          1. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

Retain paragraph below if there is a reasonable possibility that insulating glass might be air freighted to Project site or will otherwise be exposed to substantial altitude changes.

* + - * 1. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
      1. FIELD CONDITIONS
         1. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

Retain subparagraph below if sealants are required. Revise if another temperature range is required.

Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

* + - 1. WARRANTY

1. 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.

Verify available warranties and warranty periods with manufacturers listed in Part 2 Aarticles. Revise "Warranty Period" Subparagraphsubparagraph below if glass manufacturers insist on warranty beginning on date of manufacture. See the Evaluations.

Warranty Period: [**10**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. 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.

Verify available warranties and warranty periods with manufacturers listed in Part 2 Aarticles. Revise "Warranty Period" Subparagraphsubparagraph below if glass manufacturers insist on warranty beginning on date of manufacture. See the Evaluations.

Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. 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 obstruction of vision by dust, moisture, or film on interior surfaces of glass.

Verify available warranties and warranty periods with manufacturers listed in Part 2 Articles. Revise "Warranty Period" Subparagraphsubparagraph below if glass manufacturers insist on warranty beginning on date of manufacture. See the Evaluations.

Warranty Period: [**10**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

Verify available warranties and warranty periods with manufacturers listed in Part 2 Aarticles. Revise "Warranty Period" Subparagraphsubparagraph below if glass manufacturers insist on warranty beginning on date of manufacture. See the Evaluations.

Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

Possibly insert glazier's warranty covering labor to replace insulating-glass units or, as an alternative, a maintenance contract that incorporates unit prices for replacement labor.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

* + - 1. MANUFACTURERS
         1. Source Limitations for Glass: Obtain [**tinted**] [**and**] [**coated**] glass from single source from single manufacturer.
         2. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.
      2. PERFORMANCE REQUIREMENTS
         1. 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 defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

Retain "Delegated Design" Paragraphparagraph below if Contractor is required to assume responsibility for design.

* + - * 1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
        2. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

Retain one of two options in "Design Wind Pressures" Subparagraphsubparagraph below, usually first. The IBC requires that design wind pressures used for design of exterior components and cladding not designed by the registered design professional be indicated on the Construction Documents.

Design Wind Pressures: [**As indicated on Drawings**] [**Determine design wind pressures applicable to Project in accordance with ASCE/SEI 7, based on heights above grade indicated on Drawings**].

Wind Design Data: As indicated on Drawings.

Retain "Wind Design Data" Subparagraphsubparagraph above or "Basic Wind Speed," "Importance Factor," and "Exposure Category" subparagraphs below; insert other design data if required. The IBC requires that data below be indicated on the Construction Documents.

Basic Wind Speed: [**85 mph (38 m/s)**] [**90 mph (40 m/s)**] [**100 mph (44 m/s)**] [**110 mph (49 m/s)**] <**Insert value**>.

Importance Factor: [**1.0**] <**Insert factor**>.

Exposure Category: [**B**] [**C**] [**D**].

Retain "Design Snow Loads" Subparagraphsubparagraph below if sloped glazing is exposed to snow loads. The IBC requires that flat-roof snow load be indicated on the Construction Documents if ground snow load exceeds 10 lbf/sq. ft. (0.479 kN/sq. m).

Design Snow Loads: <**Insert design snow load**> [**As indicated on Drawings**].

"Probability of Breakage for Sloped Glazing" Subparagraphsubparagraph below is an example only and is more conservative than ASTM E1300 and the IBC, which are based on a probability of breakage of 0.008.

Probability of Breakage for Sloped Glazing: For glass sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.

Deflection requirements in "Maximum Lateral Deflection" Subparagraphsubparagraph below are examples only and apply only to glass supported on all four edges. The IBC does not contain any deflection limits for glass. ASTM E1300 only requires that deflection not result in loss of edge support. Revise to suit Project.

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.

"Differential ShadingThermal Loads" Subparagraphsubparagraph below applies primarily to tinted and spandrel glass because of its heat-absorbing property. ASTM E1300 and the IBC do not address this concern.

Differential ShadingThermal Loads: Design glazingss to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units. es induced by differential shading within individual glass lites.

Retain "Windborne-Debris-Impact Resistance" Paragraphparagraph below to suit Project. The IBC establishes criteria for buildings in hurricane-prone locations. In paragraph, "enhanced" option applies to essential facilities and has additional requirements. Verify requirements of authorities having jurisdiction. Verify which manufacturers have tested products and can demonstrate compliance.

* + - * 1. Windborne-Debris-Impact Resistance: Exterior glazing shall pass ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [**1**] [**2**] [**3**] [**4**] for [**basic**] [**enhanced**] protection.

Insert increased heights if different from those in "Large-Missile Test" and "Small-Missile Test" subparagraphs below. For enhanced protection, delete "Small-Missile Test" Subparagraphsubparagraph.

Large-Missile Test: For glazing located within [**30 feet (9.1 m)**] <**Insert dimension**> of grade.

Small-Missile Test: For glazing located between 30 feet (9.1 m) and [**60 feet (18.3 m)**] <**Insert dimension**> above grade.

* + - * 1. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
        2. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

Retain subparagraphs below that apply to types of glass for which thermal and optical performance properties are specified.

For monolithic-glass lites, properties are based on units with lites [**6 mm thick**] [**of thickness indicated**].

For laminated-glass lites, properties are based on products of construction indicated.

For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).

SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on LBL's WINDOW 7 computer program.

Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

Retain “Acoustic Performance” Paragraph below to suit Project.

* + - * 1. Acoustic Performance:

1. Exterior Glazing: [**28**] [**33**] [**35**] <**Insert number**> OITC.
2. Interior Glazing: [] [**37**] [**41**] <**Insert number**> STC.
   * + 1. GLASS PRODUCTS, GENERAL
          1. 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.

Retain "NGA Publications," "AAMA Publications," "IGMA Publication for Sloped Glazing," and "IGMA Publication for Insulating Glass" subparagraphs below that apply to glass products specified.

NGA Publications: [**"Laminated Glazing Reference Manual" and**]"Glazing Manual."

AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."

IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

Retain "Safety Glazing Labeling" Paragraphparagraph below if applicable and if labeling is required. Not all manufacturers participate in third-party testing programs.

* + - * 1. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of [**the SGCC**] [**the SGCC or another certification agency acceptable to authorities having jurisdiction**] [**or**] [**manufacturer**]. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

Delete "Insulating-Glass Certification Program" Paragraphparagraph below if no insulating glass. Not all manufacturers participate in program; see the IGCC directory for participants. Verify that types of units required are certified.

* + - * 1. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
        2. Thickness: Where glass thickness is indicated, it is a minimum. [**Provide glass that complies with performance requirements and is not less than thickness indicated.**]

Delete "Minimum Glass Thickness for Exterior Lites" Subparagraphsubparagraph below if glass thickness for each kind of glass is indicated on Drawings or in Part 2 articles where glass units are specified.

Minimum Glass Thickness for Exterior Lites: [**6 mm**] <**Insert thickness designation**>.

Revise "Thickness of Tinted Glass" Subparagraphsubparagraph below if different thicknesses of tinted glass are required for specific locations. Different thicknesses of tinted glass have different appearances.

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

* + - * 1. 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.
      1. GLASS PRODUCTS

Retain paragraphs in this article that apply to monolithic-, laminated-, and insulating-glass types specified.

* + - * 1. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

Retain option in "Ultraclear Annealed Float Glass" paragraph below if required for passive solar design.

* + - * 1. Tinted (Light Reducing) Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
        2. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

Retain "Fabrication Process" subparagraph below if orientation of glass is important. See the Evaluations. Verify that glass sizes indicated can be manufactured with roll wave parallel to bottom edge.

Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

If heat soaking of fully tempered glass is needed, insert requirements here.

Retain "Heat-Strengthened Float Glass" paragraph below even if plain, heat-strengthened float glass is not required but other paragraphs in this article and glass types articles depend on below for definition of "heat-strengthened float glass." Always retain paragraph if Contractor is responsible for determining glass thickness and strength.

* + - * 1. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

Retain "Fabrication Process" subparagraph below if orientation of glass is important. See the Evaluations. Verify that glass sizes indicated can be manufactured with roll wave parallel to bottom edge.

Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

Coating in "Pyrolytic-Coated, Low-Maintenance Glass" paragraph below is applied pyrolytically on the float line. Consequently, if a reflective or low-E coating is required (which would be on second surface that was exposed to the molten tin bath on the float line), it must be a sputtered coating.

* + - * 1. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.
        2. Ceramic-Coated Vision Glass: ASTM C1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in NGA's "Engineering Standards Manual."
        3. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3.
      1. LAMINATED GLASS
         1. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

Construction: Laminate glass with [polyvinyl butyral interlayer] [ionomeric polymer interlayer] [or] [cast-in-place and cured-transparent-resin interlayer] to comply with interlayer manufacturer's written instructions.

Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

Interlayer Color: Clear unless otherwise indicated.

Retain "Windborne-Debris-Impact-Resistant Laminated Glass" Paragraphparagraph below if retaining "Windborne-Debris-Impact Resistance" Paragraphparagraph in "Performance Requirements" Article.

* + - * 1. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with[**one of**] the following to comply with interlayer manufacturer's written instructions:

Construction: Laminate glass with [polyvinyl butyral interlayer reinforced with polyethylene terephthalate film] [ionomeric polymer interlayer] [or] [cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film] to comply with interlayer manufacturer's written instructions.

Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

Interlayer Color: Clear unless otherwise indicated.

* + - 1. INSULATING GLASS
         1. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

Retain one of five options in "Sealing System" Subparagraphsubparagraph below or insert other combinations; coordinate with manufacturers and products.

Sealing System: Dual seal, with [**manufacturer's standard**] [**polyisobutylene and polysulfide**] [**polyisobutylene and silicone**] [**polyisobutylene and hot-melt butyl**] [**polyisobutylene and polyurethane**] <**Insert description**> primary and secondary sealants.

If retaining a specific spacer material, coordinate options in "Perimeter Spacer" Subparagraphsubparagraph below with manufacturers and products.

Perimeter Spacer: [**Manufacturer's standard spacer material and construction**] [**Aluminum with mill or clear anodic finish**] [**Aluminum with black, color anodic finish**] [**Aluminum with bronze, color anodic finish**] [**Aluminum with powdered metal paint finish in color selected by Architect**] [**Galvanized steel**] [**Stainless steel**] [**Polypropylene-covered stainless steel in color selected by Architect**] [**Thermally broken aluminum**] [**Nonmetallic laminate**] [**Nonmetallic tube**] [**Silicone with integral desiccant and vapor barrier**] <**Insert material**>.

Revise "Desiccant" Subparagraphsubparagraph below if a specific type of desiccant is required.

Desiccant: Molecular sieve or silica gel, or a blend of both.

* + - 1. GLAZING SEALANTS
         1. General:

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.

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.

Colors of Exposed Glazing Sealants: [**As indicated by manufacturer's designations**] [**Match Architect's samples**] [**As selected by Architect from manufacturer's full range of industry colors**].

Retain one or more of "Neutral-Curing Silicone Glazing Sealant, Class 100/50"; "Neutral-Curing Silicone Glazing Sealant, Class 50"; "Neutral-Curing Silicone Glazing Sealant, Class 25"; and "Acid-Curing Silicone Glazing Sealant, Class 25" paragraphs below. If retaining more than one, retain "Applications" subparagraphs.

* + - * 1. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.

Applications: <Describe types of glazing applications where sealant is required>.

* + - * 1. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.

Applications: <Describe types of glazing applications where sealant is required>.

* + - * 1. Neutral-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.

Applications: <Describe types of glazing applications where sealant is required>.

* + - * 1. Acid-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.

Applications: <Describe types of glazing applications where sealant is required>.

* + - 1. GLAZING TAPES
         1. 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 C1281 and AAMA 800 for products indicated below:

Retain one or more back-bedding tapes from three subparagraphs below. AAMA 804.3 tape is for less-severe back-bedding and drop-in, residential, and light-commercial glazing applications. AAMA 806.3 tape is for high-performance commercial glazing applications involving continuous pressure from gaskets or pressure-generating stop designs. AAMA 807.3 tape is for commercial glazing applications not involving continuous pressure from gaskets and stop designs.

AAMA 804.3 tape, where indicated.

AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

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

* + - * 1. 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:

AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.

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

* + - 1. MISCELLANEOUS GLAZING MATERIALS
         1. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
         2. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
         3. Setting Blocks:

[**EPDM**] [**Silicone**] [**Neoprene]** [**Santoprene**] <**Insert type**> with Shore A durometer hardness of 85, plus or minus 5.

Type recommended in writing by sealant or glass manufacturer.

* + - * 1. Spacers:

[**Neoprene**] <**Insert type**> blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

Type recommended in writing by sealant or glass manufacturer.

* + - * 1. Edge Blocks:

[**EPDM**] [**Silicone**] [**Neoprene**] [**Santoprene**] <**Insert type**> with Shore A durometer hardness per manufacturer's written instructions.

Type recommended in writing by sealant or glass manufacturer.

Retain "Cylindrical Glazing Sealant Backing" Paragraph below if applicable for glazing channels.

* + - * 1. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
      1. FABRICATION OF GLAZING UNITS
         1. 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.

Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

Differential values in "Temperature Change" Subparagraphsubparagraph below (for aluminum in particular) are suitable for most of the United States.

Temperature Change: [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**] <**Insert temperature change**>.

Retain first paragraph below for butt-glazed lites.

* + - * 1. 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.

Retain paragraph below if any exposed edges or corners are required.

* + - * 1. Grind smooth and polish exposed glass edges and corners.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

Presence and functioning of weep systems.

Minimum required face and edge clearances.

Effective sealing between joints of glass-framing members.

* + - * 1. Proceed with installation only after unsatisfactory conditions have been corrected.
      1. PREPARATION
         1. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
         2. 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.
      2. GLAZING, GENERAL
         1. 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.
         2. 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.
         3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
         4. 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.
         5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
         6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

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.

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.

* + - * 1. 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 in accordance with requirements in referenced glazing publications.
        2. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
        3. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

Retain both paragraphs below if glazing with wedge-shaped gaskets is required for Project.

* + - * 1. 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.
        2. 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 in writing by gasket manufacturer.
      1. TAPE GLAZING
         1. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
         2. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
         3. 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.
         4. 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.
         5. Do not remove release paper from tape until right before each glazing unit is installed.

Delete first paragraph below if not required, or qualify by adding "where indicated" and indicate locations on Drawings.

* + - * 1. Apply heel bead of elastomeric sealant.
        2. 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.

Delete paragraph below if not applicable or revise to suit Project; below assumes fixed stop is located on exterior.

* + - * 1. Apply cap bead of elastomeric sealant over exposed edge of tape.
      1. GASKET GLAZING (DRY)
         1. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
         2. 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.
         3. 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 in writing by gasket manufacturer.
         4. 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 in writing by gasket manufacturer.
         5. Install gaskets so they protrude past face of glazing stops.
      2. SEALANT GLAZING (WET)
         1. 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.
         2. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
         3. Tool exposed surfaces of sealants to provide a substantial wash away from glass.
      3. CLEANING AND PROTECTION
         1. Immediately after installation, remove nonpermanent labels and clean surfaces.
         2. 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.

If, despite such protection, contaminating substances do 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.

* + - * 1. Remove and replace glass that is damaged during construction period.

Retain paragraph below to suit Project. Delete if covered in Section 017700 "Closeout Procedures."

* + - * 1. 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.
      1. MONOLITHIC GLASS SCHEDULE

Monolithic glass refers to glass that is made in a single sheet without being laminated.

Copy paragraphs below and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

If thickness designations are indicated on Drawings or are determined solely by compliance with "Performance Requirements" Article, delete "Minimum Thickness" subparagraphs below.

* + - * 1. Clear Glass Type A <**Insert drawing designation**>: **Annealed** float glass.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Retain subparagraph below if required; "Fully tempered" option must be retained in paragraph above if safety glazing is required.

Safety glazing required.

* + - * 1. Tinted Glass Type <**Insert drawing designation**>: [**Annealed**] [**Heat-strengthened**] [**Fully tempered**] float glass.

Retain "Basis-of-Design Product" subparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Retain “tint Color” in accordance with International Commission of Illumination (ICI) “C” transmittance between 40 and 45 percent for 6 mm thick glass for gray tint, or bronze tint for 47 and 52 percent transmittance. Dark Gray is also an option, discuss with manufacturer for availability and light transmittance values.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SHGC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SHGC: <**Insert value**> maximum.

Retain subparagraph below if required; "Fully tempered" option must be retained in last paragraph above if safety glazing is required.

Safety glazing required.

* + - * 1. Clear Glass Type D: Fully tempered float glass.

Minimum Thickness: [**6 mm**] [**5mm**].

Safety glazing required.

* + - * 1. Tinted Glass Type D1: Fully tempered float glass.

Retain "Basis-of-Design Product" subparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Retain “tint Color” in accordance with International Commission of Illumination (ICI) “C” transmittance between 40 and 45 percent for 6 mm thick glass for gray tint, or bronze tint for 47 and 52 percent transmittance. Dark Gray is also an option, discuss with manufacturer for availability and light transmittance values.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SHGC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SHGC: <**Insert value**> maximum.

Retain subparagraph below if required; "Fully tempered" option must be retained in last paragraph above if safety glazing is required.

Safety glazing required.

* + - * 1. Ceramic-Coated Vision Glass Type <**Insert drawing designation**>: **Fully tempered** float glass.

Retain "Basis-of-Design Product" subparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Glass: Clear float glass.

Ceramic Coating Color and Pattern: [as selected by Director’s Representative from manufacturer’s full range] [Match Director’s Representative’s samples] <Insert one manufacturer’s color and pattern designation if matching is required> <Insert manufacturer’s name; color and pattern designation>.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Coating Location: **Second** surface.

Insert performance properties, if required, in "Outdoor Visible Reflectance," "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SHGC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SHGC: <**Insert value**> maximum.

Safety glazing required.

* + - * 1. Ceramic-Coated Spandrel Glass Type <**Insert drawing designation**>: [**Heat-strengthened**] [**Fully tempered**] float glass.

Retain "Basis-of-Design Product" subparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Glass: [**Clear**] [**Ultraclear**] [**Tinted**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Coating Color: [**As selected by Architect from manufacturer's full range**] [**Match Architect's samples**] <**Insert one manufacturer's color designation if matching is required**> <**Insert manufacturer's name; color designation**>.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Coating Location: Second surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor" and "Summer Daytime U-Factor" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Requirement in "Fallout Resistance" subparagraph below is optional test in ASTM C1048 and is not required by the IBC.

Fallout Resistance: Passes fallout-resistance test in ASTM C1048 for an assembly of glass and adhered reinforcing material.

* + - * 1. Tinted Glass Type H: Heat strengthened float glass.

Retain "Basis-of-Design Product" subparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Retain “tint Color” in accordance with International Commission of Illumination (ICI) “C” transmittance value of 75 percent. This tint is the maximum heat absorption for minimum light reduction.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Minimum Thickness: [**6 mm**] <**Insert thickness**>.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SHGC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SHGC: <**Insert value**> maximum.

* + - 1. LAMINATED GLASS SCHEDULE

Copy paragraphs below and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

If thickness designations are indicated on Drawings or are determined solely by compliance with "Performance Requirements" Article, delete "Minimum Thickness of Each Glass Ply" subparagraphs below.

* + - * 1. Clear Laminated Glass Type <**Insert drawing designation**>: Two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] [**ultraclear annealed**] [**ultraclear heat-strengthened**] [**ultraclear fully tempered**] float glass.

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

* + - * 1. Clear, Noise-Reducing Laminated Glass Type J: One ply of [**annealed**] [**tinted annealed**] [**heat strengthened**] and [**annealed**] [**tinted annealed**]

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: 0.045 inch (1.14 mm).

Select choices as required by project. Drawings must indicate STC rating, total glass thickness, and (when applicable) light transmittance. Consult product data for glass combinations available. Other laminated glass type available, consult with manufacturers for product data and update below.

* + - 1. INSULATING GLASS SCHEDULE

Copy paragraphs below and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

If thickness designations are indicated on Drawings or are determined solely by compliance with "Performance Requirements" Article, delete "Minimum Thickness of Each Glass Lite" subparagraphs below.

* + - * 1. Clear Insulating Glass Type M <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] [**5/8 inch (16 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: [**Annealed**] [**Heat-strengthened**] [**Fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: [**Annealed**] [**Heat-strengthened**] [**Fully tempered**] float glass.

Insert performance properties, if required, in "Winter Nighttime U-Factor" and "Summer Daytime U-Factor" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Retain subparagraph below if required; "Fully tempered" option must be retained in "Outdoor Lite" and "Indoor Lite" subparagraphs if safety glazing is required.

Safety glazing required.

* + - * 1. Low-E-Coated, Clear Insulating Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] [**5/8 inch (16 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: [**Annealed**] [**Heat-strengthened**] [**Fully tempered**] [**Ultraclear annealed**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: [**Annealed**] [**Heat-strengthened**] [**Fully tempered**] [**Ultraclear annealed**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Low-E Coating: [**Pyrolytic on second**] [**Pyrolytic on third**] [**Sputtered on second**] [**Sputtered on third**] [**Pyrolytic or sputtered on second or third**] surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required; "Fully tempered" or "Ultraclear fully tempered" option must be retained in "Outdoor Lite" and "Indoor Lite" subparagraphs if safety glazing is required.

Safety glazing required.

* + - * 1. Tinted Insulating Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] [**5/8 inch (16 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Tinted [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required; "fully tempered" option must be retained in "Outdoor Lite" and "Indoor Lite" subparagraphs if safety glazing is required.

Safety glazing required.

* + - * 1. Low-E-Coated, Tinted Insulating Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] [**5/8 inch (16 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Tinted [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Low-E Coating: [**Pyrolytic on second**] [**Pyrolytic on third**] [**Sputtered on second**] [**Sputtered on third**] [**Pyrolytic or sputtered on second or third**] surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required; "fully tempered" option must be retained in "Outdoor Lite" and "Indoor Lite" subparagraphs if safety glazing is required.

Safety glazing required.

* + - * 1. Ceramic-Coated, Insulating Vision Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Ceramic Coating Color and Pattern: [**As selected by Architect from manufacturer's full range**] [**Match Architect's samples**] <**Insert one manufacturer's color and pattern designation if matching is required**> <**Insert manufacturer's name; color and pattern designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] [**5/8 inch (16 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] [**Tinted heat-strengthened**] [**Tinted fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear annealed**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Coating Location: [**Second**] [**Third**] [**Fourth**] surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required; "Clear fully tempered," "Ultraclear fully tempered," or "Tinted fully tempered" option must be retained in "Outdoor Lite" and "Clear fully tempered" or "Ultraclear fully tempered" option must be retained in "Indoor Lite" Subparagraphsubparagraph if safety glazing is required.

Safety glazing required.

* + - * 1. **Ceramic**-Coated, Insulating Spandrel Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Coating Color: [**As selected by Architect from manufacturer's full range**] [**Match Architect's samples**] <**Insert one manufacturer's color designation if matching is required**> <**Insert manufacturer's name; color designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**5 mm**] [**6 mm**] <**Insert thickness**>.

In "Outdoor Lite" Subparagraphsubparagraph below, retain one of six options for glass color and strength.

Outdoor Lite: [**Clear annealed**] [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear annealed**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Retain "Clear heat-strengthened," "Ultraclear heat-strengthened," "Clear fully tempered," or "Ultraclear fully tempered" option in "Indoor Lite" Subparagraphsubparagraph below for ceramic-coated, insulating spandrel glass.

Indoor Lite: [**Clear annealed**] [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear annealed**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Coating Location: Fourth surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor" and "Summer Daytime U-Factor" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

* + - * 1. **Ceramic**-Coated, Low-E, Insulating Spandrel Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Coating Color: [**As selected by Architect from manufacturer's full range**] [**Match Architect's samples**] <**Insert one manufacturer's color designation if matching is required**> <**Insert manufacturer's name; color designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: [**Clear heat-strengthened**] [**Clear fully tempered**] [**Ultraclear heat-strengthened**] [**Ultraclear fully tempered**] float glass.

Low-E Coating: [**Pyrolytic on second**] [**Pyrolytic on third**] [**Sputtered on second**] [**Sputtered on third**] [**Pyrolytic or sputtered on second or third**] surface.

Opaque Coating Location: Fourth surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor" and "Summer Daytime U-Factor" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

* + - * 1. **Ceramic**-Coated, Tinted, Insulating Spandrel Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Coating Color: [**As selected by Architect from manufacturer's full range**] [**Match Architect's samples**] <**Insert one manufacturer's color designation if matching is required**> <**Insert manufacturer's name; color designation**>.

Overall Unit Thickness: [**1 inch (25 mm)**] <**Insert dimension**>.

Minimum Thickness of Each Glass Lite: [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Tinted [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Retain "heat-strengthened" or "fully tempered" option in "Indoor Lite" Subparagraphsubparagraph below for ceramic-coated, tinted, insulating spandrel glass.

Indoor Lite: Clear [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Coating Location: Fourth surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor" and "Summer Daytime U-Factor" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

* + - 1. INSULATING-LAMINATED-GLASS SCHEDULE

Glass types in this article are primarily for sloped glazing and glazing that is required to be windborne-debris-impact resistant.

Copy paragraphs below and re-edit for each product.

Insert drawing designation. Use these designations on Drawings to identify each product.

If thickness designations are indicated on Drawings or are determined solely by compliance with "Performance Requirements" Article, delete "Minimum Thickness of Outdoor Lite" and "Minimum Thickness of Each Glass Ply" subparagraphs below.

* + - * 1. Clear Insulating, Laminated Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1-3/16 inch (30 mm)**] [**1 inch (25 mm)**] [**3/4 inch (19 mm)**] <**Insert dimension**>.

Minimum Thickness of Outdoor Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Clear [**heat-strengthened**] [**fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear laminated glass with two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required.

Safety glazing required.

* + - * 1. Low-E-Coated, Clear Insulating Laminated Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1-3/16 inch (30 mm)**] [**1 inch (25 mm)**] [**3/4 inch (19 mm)**] <**Insert dimension**>.

Minimum Thickness of Outdoor Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Clear [**heat-strengthened**] [**fully tempered**] float glass.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear laminated glass with two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

Low-E Coating: [**Pyrolytic on second**] [**Pyrolytic on third**] [**Sputtered on second**] [**Sputtered on third**] [**Pyrolytic or sputtered on second or third**] surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required.

Safety glazing required.

* + - * 1. Tinted, Insulating Laminated Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1-3/16 inch (30 mm)**] [**1 inch (25 mm)**] [**3/4 inch (19 mm)**] <**Insert dimension**>.

Minimum Thickness of Outdoor Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Tinted [**heat-strengthened**] [**fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear laminated glass with two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required.

Safety glazing required.

* + - * 1. Low-E-Coated, Tinted, Insulating Laminated Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Overall Unit Thickness: [**1-3/16 inch (30 mm)**] [**1 inch (25 mm)**] [**3/4 inch (19 mm)**] <**Insert dimension**>.

Minimum Thickness of Outdoor Lite: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] <**Insert thickness**>.

Outdoor Lite: Tinted [**heat-strengthened**] [**fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear laminated glass with two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

Low-E Coating: [**Pyrolytic on second**] [**Pyrolytic on third**] [**Sputtered on second**] [**Sputtered on third**] [**Pyrolytic or sputtered on second or third**] surface.

Insert performance properties, if required, in "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain subparagraph below if required.

Safety glazing required.

* + - * 1. Reflective-Coated, Insulating Laminated Glass Type <**Insert drawing designation**>:

Retain "Basis-of-Design Product" Subparagraphsubparagraph below to require a specific product.

Basis-of-Design Product: <**Insert manufacturer's name; product name or designation**>.

Consider retaining option in first subparagraph below if applicable; option is based on ASTM C1376.

Kind CV (coated vision glass)[**, except that Kind CO (coated overhead glass) may be used where lower edge of glass is more than 6 feet (1.8 m) above the adjacent floor level or cannot be approached closer than 10 feet (3.0 m)**].

Pyrolytic coatings may be used on first, second, or third surface of insulating laminated glass. Sputtered coatings are only used on second or third surface of insulating laminated glass.

Coating Type: [**Pyrolytic**] [**Sputter-coating (vacuum deposition process)**].

Retain one color from options in "Coating Color" Subparagraphsubparagraph below. Not all sputtered-coating colors are suitable for monolithic applications and must be on second surface for monolithic applications.

Coating Color: [**Gold**] [**Pewter**] [**Silver**] <**Insert color**>.

Overall Unit Thickness: [**1-3/16 inch (30 mm)**] [**1 inch (25 mm)**] <**Insert dimension**>.

Minimum Thickness of Outdoor Lite: [**6 mm**] <**Insert thickness**>.

Outdoor Lite: [**Clear heat-strengthened**] [**Clear fully tempered**] [**Tinted heat-strengthened**] [**Tinted fully tempered**] float glass.

Tint Color: [**Blue**] [**Blue-green**] [**Bronze**] [**Green**] [**Gray**] <**Insert color**>.

Interspace Content: [**Air**] [**Argon**].

Indoor Lite: Clear laminated glass with two plies of [**annealed**] [**heat-strengthened**] [**fully tempered**] float glass.

Minimum Thickness of Each Glass Ply: [**3 mm**] [**4 mm**] [**5 mm**] [**6 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.29 mm)**].

Coating Location: [**First**] [**Second**] [**Third**] surface.

Insert performance properties, if required, in "Outdoor Visible Reflectance," "Winter Nighttime U-Factor," "Summer Daytime U-Factor," "Visible Light Transmittance," and "SGHC" subparagraphs below to suit product(s).

Outdoor Visible Reflectance: <**Insert number**> percent maximum.

Winter Nighttime U-Factor: <**Insert value**> maximum.

Summer Daytime U-Factor: <**Insert value**> maximum.

Visible Light Transmittance: <**Insert number**> percent minimum.

SGHC: <**Insert value**> maximum.

Retain "Low-Maintenance Coating" Subparagraphsubparagraph below only with sputter-coated clear float glass and only after verifying availability.

Low-Maintenance Coating: Pyrolytic coating on first surface.

Retain subparagraph below if required.

Safety glazing required.

END OF SECTION 088000