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**Vitro Architectural Glass**

From the aqua-blue sheen of **Azuria™** Glass to the ultra-clear transparency of **Starphire®** Glass, Vitro offers architects an almost limitless array of aesthetic options. ***Solarban 60*** and ***Solarban 80*** Solar Control Low-E Glasses and the new ***Solarban 70*** set the standard for superior solar control along with exceptional levels of visible light transmittance. **Oceans of Color**® Spectrally Selective Tinted Glasses (**Atlantica**™, ***Azuria***, **Caribia**® and **Solexia**™ glasses) have Light-to-Solar Gain (LSG) ratios of up to 1.56 in four ocean-inspired tints, ranging from a subtle light green to a brilliant aqua-blue. For greater solar control, Oceans of Color tints can be combined with **Solarban *60*** in an insulating glass unit to produce LSG ratios of up to 1.74. **Solarban *60*** **Starphire** features the clarity of an ultra-clear glass, along with excellent solar control characteristics. The revolutionary new ***Solarban 70*** offers an astonishing LSG ratio of 2.33, allowing designers to increase areas of vision glass in highly energy-efficient applications.

Vitro Certified™ Network Programs: Vitro Architectural Glass products are available through a network of rigorously audited Vitro Certified™ Network. These select companies offer architects: Vitro high-performance glass products, accelerated lead times, in-stock replacement glass, and regional sourcing. Thanks to the popularity and success of its Certified Fabricator Program, Vitro has expanded the concept to include Certified Commercial Window Fabricator and Certified Laminator programs.

Vitro Ideascapes offers integrated products, services, and people to inspire your design and color vision. We recommend you consult with your regional Vitro architectural representative, who can be contacted through: Vitro Architectural Glass, Cheswick, PA, (888) 774-4332, Email: archservices@vitro.com
<http://www.vitroglazings.com>.

Vitro products appear in the following MasterFormat 2004 Sections:

 Section 05 05 13 – Shop-Applied Coatings for Metal

 Section 08 80 00 – Glazing

 Section 09 91 13 – Exterior Painting

 Section 09 91 23 – Interior Painting

 Section 09 93 00 – Staining and Transparent Finishing

 Section 09 96 00 – High Performance Coatings

 Section 09 96 33 – High Temperature-Resistant Coatings

 Section 09 96 46 – Intumescent Painting

 Section 09 96 53 – Elastomeric Coatings

 Section 09 96 33 – High Temperature-Resistant Coatings

 Section 09 97 26 – Cementitious Coatings

 Section 09 96 33 – High Temperature-Resistant Coatings

Specifier: The specifier may select CSI MasterFormat 95 or MasterFormat 2004 section numbering as required. Some items in the text are bolded for editing convenience; remove bolds from final draft by highlighting document and toggling bolds: CONTROL-A, CONTROL-B.

SECTION 08 80 00 - GLAZING

SECTION 08800 - GLAZING

**PART 1 -GENERAL**

Specifier: Edit paragraphs below to correspond to project scope.

1.1              SECTION INCLUDES

A.         Glass and glazing units for the following products and applications, and glazing requirements referenced by other sections:

1.         Windows.

2.         Doors.

3.         Interior borrowed lites.

4.         Glazed entrances.

5.         Storefront framing.

6.         Glazed curtain walls.

7.         Skylights.

B.         Glazing accessories.

Specifier: Edit paragraphs below to correspond to project scope; retain references to sections specifying work that might otherwise be incorporated in work of this section. Delete Article if not required by project scope.

1.2              RELATED SECTIONS

A.         Division 08 Section 'Decorative Glass Glazing.'

B.         Division 08 Section 'Mirrors.'

C.         Division 08 Section 'Plastic Glazing.'

D.        Division 08 Section 'Security Glazing.'

Specifier: Retain references below remaining in section following editing. For projects of limited scope, delete Article.

1.3              REFERENCES

A.         ASTM International (ASTM):

1.         **ASTM C 509 -** Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

2.         **ASTM C 864** - Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

3.         **ASTM C 920** - Specification for Elastomeric Joint Sealants.

4.         **ASTM C 1036 -** Specification for Flat Glass.

5.         **ASTM C 1048 -** Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

6.         **ASTM C 1087 -** Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

7.         **ASTM C 1115 -** Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

8.         **ASTM C 1172 -** Specification for Laminated Architectural Flat Glass.

9.         **ASTM C 1281 -** Specification for Preformed Tape Sealants for Glazing Applications.

10.      **ASTM C 1330 -** Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

11.      **ASTM C 1376 -** Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.

12.      **ASTM E 774 -** Specification for the Classification of the Durability of Sealed Insulating Glass Units.

13.      **ASTM E 1300 -** Practice for Determining Load Resistance of Glass in Buildings.

14.      **ASTM E**2190 **-** Standard Specification for Insulating Glass Unit Performance and Evaluation.

1. Bird Friendly Glazing:

1. DG01-21 - Best Practices for Bird-Friendly Glazing Design, National Glass Association (NGA)

2. FB35-12 - Bird Friendly Glass Design Strategies, National Glass Association (NGA)

3. Bird Friendly Building Design - American Bird Conservancy (ABC)

C.         Code of Federal Regulations:

1.         16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

D.         Fenestration and Glazing Industry Alliance (FGIA), combination of American Architectural Manufacturers Association (AAMA) and Insulating Glass Manufacturers Alliance (IGMA):

1. AAMA 800 - Voluntary Specifications and Test Methods for Sealants.
2. IGMA TB-3001 - Sloped Glazing Guidelines.
3. IGMA TM-3000 - Glazing Guidelines for Sealed Insulating Glass Units.

E.         Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; Building Technologies Department; Windows & Daylighting Group, [windows.lbl.gov/software](http://windows.lbl.gov/software):

1.         **"LBNL Window 5.0 (or higher) - A PC Program for Analyzing Window Thermal and Optical Performance.**

F.        National Fenestration Rating Council (NFRC):

1.         NFRC 100 - Procedure for Determining Fenestration Product Thermal Properties.

2.         NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.

3.         NFRC 300 - Procedures for Determining Solar Optical Properties of Simple Fenestration Products.

G. National Fire Protection Association (NFPA):

1.         NFPA 80 - Fire Doors and Windows.

2.         NFPA 252 - Fire Tests of Door Assemblies.

3.         NFPA 257 - Fire Test for Window and Glass Block Assemblies.

H. National Glass Association (NGA) incorporates Glass Association of North America (GANA):

1.         Glazing Manual.

2.         Laminated Glass Design Guide.

3.         Engineering Standards Manual.

1.4              DEFINITIONS

A.         Manufacturers of Primary Glass: Firms that produce primary glass, as defined in referenced industry publications.

B.         Manufacturers/Fabricators of Glass Products: Firms that utilize primary glass in the production of glass products that may include coated glass, laminated glass, and insulating glass.

C.         Sealed Insulating Glass Unit Surfaces:

1.         Surface 1: Exterior surface of outer lite.

2.         Surface 2: Interspace-facing surface of outer lite.

3.         Surface 3: Interspace-facing surface of inner lite.

4.         Surface 4: Interior surface of inner lite.

1.5              PERFORMANCE REQUIREMENTS

Specifier: Modify example performance requirements in this Article to suit project and local conditions.

A.         General: Provide glazing systems that will withstand indicated loads and normal thermal movement without failure, including loss or glass breakage resulting from defective manufacture, fabrication, or installation; failure of glazing systems to remain watertight and airtight; or deterioration of glazing materials.

B.         Glass Design: Glass thicknesses indicated are minimums. Select actual glass lite thicknesses by analyzing loads and conditions. Provide glass lites in the thicknesses and in strengths required to meet or exceed the following criteria:

1.         Glass Thicknesses: Comply with ASTM E 1300, as follows:

Specifier: Consult structural engineer. Verify compliance with local codes. Verify structural load information is included in construction documents. Retain option for snow load compliance where required for sloped glazing systems.

a.         Specified Design Wind **[**and Snow**]** Loads: As indicated.

b.         Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set within 15 degrees of vertical and under wind load for a load duration of **[**3**]** seconds.

c.          Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow loads for a duration of **[**30**]** days.

d.         Thickness of Tinted Glass: Provide the same thickness for each tint color for all applications.

C.         Thermal Movements: Allow for thermal movements of glazing components and glass framing members resulting from a temperature change range of 120 deg F ambient and 180 deg F material surfaces.

D.        Thermal and Optical Performance Properties: Provide glass meeting specified performance properties, based on manufacturer's published test data for units of thickness indicated, and the following:

1.         Center-of-Glass Values: Per LBNL Window 5.0 (or higher) analysis, as follows:

a.         U-Factors: NFRC 100 expressed as Btu/sq. ft. x h x deg F.

b.         Solar Heat Gain Coefficient: NFRC 200.

c.          Solar Optical Properties: NFRC 300.

1.6              SUBMITTALS

A.         Product Data: Manufacturer’s data sheets for each glass product and glazing material.

B.         Samples: 12-inch-square, for each type of glass product, other than monolithic clear float glass **[**or clear float glass only set in insulated glass units**]**.

C.         Glazing Schedule: Prepare schedule using designations used on Drawings.

D.        Product Certificates: Signed by manufacturers/fabricators of glass products certifying that products furnished comply with project requirements.

E. Bird Friendly Glazing Product Qualification: Meets one of the criteria below

1. ABC threat factor through testing or proven contrast pattern design.

2. National Standards of Canada CSA A460:19 Bird-friendly building design.

F.         Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer, based on submitted samples or acceptable data from previous testing of current formulations with similar products.

G.         Qualification Information: For Installer firm and Installer’s manufacturer/fabricator-trained field supervisor.

H.        Warranties: Submit sample meeting warranties requirements of this Section.

1.7              QUALITY ASSURANCE

A.         Manufacturer/Source: Obtain each type of glass product from a single primary glass manufacturer and a single manufacturer/fabricator for each glass product type.

Specifier: Retain below when specifying Vitro Solarban 60, 70, or 80 glass or glass of other manufacturers that maintain fabricator certifying program.

1.         For glass sputter-coated with solar-control low-e coatings, obtain glass products in fabricated units from a manufacturer/fabricator certified by the primary glass manufacturer.

B.         Installer Qualifications: Experienced Installer with minimum of 5 successful completed projects of similar materials and scope, approved by glass product manufacturer/fabricator.

C.         Preconstruction Adhesion and Compatibility Testing: Submit glass units, glazing materials, and glass-framing members with applicable finish to elastomeric glazing sealant manufacturer for determination of sealant compatibility, priming, and preparation requirements for optimum adhesion and performance.

Specifier: Retain paragraph below and add proprietary fire-rated glazing products to Part 2 of this section if required for project.

D.        Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.

E.         Safety Glazing Products: Comply with size, glazing type, location, and testing requirements of 16 CFR 1201 for Category I and II glazing products, and requirements of authorities having jurisdiction.

F.         Glazing Industry Publications: Comply with glass product manufacturers’ recommendations and the following:

1.         NGA Publications: GANA Glazing Manual and Laminated Glazing Reference Manual.

2.        FGIA Publication: IGMA TM-3000, 'Glazing Guidelines for Sealed Insulating Glass Units.'

G.        Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council (IGCC) or equivalent on applicable glazing products.

H.        Mockups: Prior to installing glazing, build mockups to demonstrate materials and workmanship. Coordinate with mockup requirements of related sections.

I.          Preinstallation Conference: Conduct conference at Project site in compliance with Division 01 requirements.

1.8              DELIVERY, STORAGE, AND HANDLING

A.         Protect glazing materials during shipping, handling, and storage to prevent breakage, scratching, damage to seals, or other visible damage. Deliver, unload, store, and erect glazing materials without exposing panels to damage from construction operations.

1.         Comply with manufacturers’ venting and sealing recommendations for shipping and handling of insulating glass units exposed to substantial altitude change.

1.9              WARRANTY

Specifier: Warranty terms below are available from Vitro-certified Network of glass products and are issued in conjunction with Vitro’s warranty on the properties of Vitro primary glass products. Verify that other manufacturers/fabricators under consideration furnish warranties meeting requirements below.

1. Warranty for Coated-Glass Products: Manufacturer’s standard form, signed by coated-glass product primary manufacturer or manufacturer/fabricator, as applicable, agreeing to replace coated-glass units that display peeling, cracking, and other deterioration in metallic coating under normal use, within **[**10**]** years of date of manufacture.

B.         Warranty for Laminated Glass: Manufacturer's standard form, signed by laminated-glass product manufacturer/fabricator, agreeing to replace laminated-glass units that display edge separation, delamination, and blemishes exceeding those allowed by ASTM C 1172, within **[**five**]** years of date of manufacture.

C.         Warranty for Insulating Glass: Manufacturer's standard form, signed by insulating-glass product manufacturer/fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surfaces of glass, within **[**10**]** years of date of manufacture.

D.        Installer’s Warranty: Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, within **[**2**]** years of date of manufacture.

PART 2 - PRODUCTS

2.1              MANUFACTURERS

A.         Basis of Design: Glass product selections are based upon the primary glass manufacturer below. Provide basis of design product **[**, or comparable product of a listed manufacturer approved by the Architect prior to bid**]**:

1.         Vitro Architectural Glass, Cheswick, PA, 1-855-887-6457, Email: archservices@vitro.com, [http://www.vitroglazings.com](http://www.vitroglazings.com/).

2.         **[**Specifier: insert names of manufacturers with comparable products to basis of design products, if required.**]**

2.2              GLASS PRODUCTS

A.         Annealed Float Glass, General: ASTM C 1036, Type I, Quality-Q3, class indicated.

Specifier: Retain below if Ultra-Clear glass product required.

B.         Annealed **[**Ultra-Clear (Low Iron) *for Starphire*, Low Iron *for Acuity***]** Float Glass: Class I (clear). *Specifier Notes: Specify the appropriate designation for either Starphire or Acuity glass and then select the proper Basis of Design Product below.*

1.         Basis of Design Product: Vitro Architectural Glass , **[**Starphire®, Acuity™**]**

2.         **[**Specifier: insert manufacturer of comparable product if required**]**

C.         Heat-Treated Float Glass, Heat-Strengthened: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind HS, of class and condition indicated: where indicated, where needed to resist thermal stresses and where required to comply with performance requirements.

D.        Heat-Treated Float Glass, Fully Tempered: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT, of class and condition indicated: where safety glass is indicated. Safety glazing must comply with ANSI Z97.1 and CPSC 16CFR-1201

E.         Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during primary glass product manufacture.

F.         Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process following primary glass product manufacture.

G.        Ceramic-Coated Vision Glass: Float glass with silk-screened ceramic enamel application, per ASTM C 1048, Condition B, Type I, Quality-Q3, and Specification No. 95-1-31 in GANA 'Engineering Standards Manual.'

H.        Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3 and GANA 'Engineering Standards Manual' 66-9-20 Specification for Heat-Strengthened or Fully Tempered Ceramic Enameled Spandrel Glass for Use in Building Window/Curtain Walls and Other Architectural Applications.

I.          Coated Spandrel Float Glass: Float glass complying with ASTM C 1048, GANA 'Engineering Standards Manual' 89-1-6 Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Spandrel Glass with Applied Opacifier and other requirements specified, with manufacturer’s standard opacifier material on coated second surface of lites.

J.          Laminated Glass: ASTM C 1172, with manufacturer’s standard polyvinyl butyral or cured resin interlayer.

K.         Insulating-Glass Units: Factory-assembled units consisting of dual-sealed lites of glass separated by a dehydrated interspace, with manufacturer’s standard spacer material and construction, per ASTM E 2190.

2.3              GLAZING ACCESSORIES

A.         Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B.         Glazing Tape: Butyl-based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation, complying with ASTM C 1281 and AAMA 800 for application.

Specifier: Select above or below, or retain both types as required by project scope. Consult manufacturer for tape recommendations.

C.         Glazing Tape: Closed cell polyvinyl chloride foam, maximum water absorption by volume 2 percent, designed for 25 percent compression percent for air barrier and vapor retarder seal, black color, coiled on release paper over adhesive on two sides; widths required for specified installation, and complying with AAMA 800.

D.        Glazing Gaskets:

1.         Dense Compression Gaskets: ASTM C 864, neoprene or EPDM, or ASTM C 1115, silicone or thermoplastic polyolefin rubber, as recommended by glazing product manufacturer for application, molded or extruded shape to fit glazing channel retaining slot; black color.

2.         Soft Compression Gaskets: ASTM C 509, Type II, black, molded or extruded, neoprene, EPDM, silicone or thermoplastic polyolefin rubber, of profile and hardness required to maintain watertight seal.

E.         Setting Blocks: ASTM C 864, neoprene, 80 to 90 Shore A durometer hardness; length 4 inches, width of glazing rabbet space less 1/16 inch, height required for glazing method, pane weight, and pane area.

F.         Spacer Shims: ASTM C 864, neoprene, 50 to 60 Shore A durometer hardness; length 3 inches, one half height of glazing stop, thickness required for application, one face self-adhesive.

G.        Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

Delete first paragraph below if not applicable in glazing channels.

H.        Glazing Sealants: ASTM C 920, type recommended by glazing product manufacturer for application indicated, complying with requirements of Division 07 Section 'Joint Sealants,' color as selected by Architect.

I.          Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

Specifier: Retain below where required by authorities having jurisdiction. Below typically applies to high-rise construction.

J.          Smoke Removal Unit Targets: Adhesive targets for application to glass, identifying glass units designed for removal for smoke control.

2.4              FABRICATION OF GLAZING UNITS, GENERAL

A.         Fabricate glazing units in dimensions required, with edge and face clearances, edge and surface conditions, and bite in accordance with glazing product manufacturer/fabricator’s instructions and referenced glazing publications.

Specifier: Glass and interlayer units in glazing schedules below are examples only and should be reviewed with respect to project requirements and requirements of authorities having jurisdiction. Drawings should indicate required locations for safety glass. Additional options and combinations of glass products are available. Many options available from Vitro are not published; we recommend you review project requirements with Vitro representative. Recommendations vary significantly by project type and location.

2.5              INSULATING-GLASS UNIT(S)

A.          Double Glazed Clear Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 65 (2) on Clear 6mm (2) | Air 1/2" (12.7mm) | Clear 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 65 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 70 percent minimum.

b. Winter Nighttime U-Factor: 0.29 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.27 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.40 maximum.

e. Solar Heat Gain Coefficient: 0.35 maximum.

f. Outdoor Visible Light Reflectance: 14 percent maximum.

B.          Double Glazed Low-Iron Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 65 (2) on Starphire® 6mm (2) | Air 1/2" (12.7mm) | Starphire® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 65 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 73 percent minimum.

b. Winter Nighttime U-Factor: 0.29 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.27 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.42 maximum.

e. Solar Heat Gain Coefficient: 0.36 maximum.

f. Outdoor Visible Light Reflectance: 15 percent maximum.

C.          Double Glazed Low-Iron Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 65 (2) on Acuity® 6mm (2) | Air 1/2" (12.7mm) | Acuity® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Acuity® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 65 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Acuity® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 72 percent minimum.

b. Winter Nighttime U-Factor: 0.29 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.27 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.42 maximum.

e. Solar Heat Gain Coefficient: 0.36 maximum.

f. Outdoor Visible Light Reflectance: 15 percent maximum.

D.          Double Glazed Clear Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 70 (2) on Clear 6mm (2) | Air 1/2" (12.7mm) | Clear 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 70 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 64 percent minimum.

b. Winter Nighttime U-Factor: 0.28 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.26 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.32 maximum.

e. Solar Heat Gain Coefficient: 0.27 maximum.

f. Outdoor Visible Light Reflectance: 13 percent maximum.

E.          Double Glazed Low-Iron Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 72 (2) on Starphire® 6mm (2) | Air 1/2" (12.7mm) | Starphire® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 72 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 68 percent minimum.

b. Winter Nighttime U-Factor: 0.28 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.26 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.32 maximum.

e. Solar Heat Gain Coefficient: 0.28 maximum.

f. Outdoor Visible Light Reflectance: 13 percent maximum.

F.          Double Glazed Low-Iron Solar Control Insulating Glass Unit [BirdSmart™ (1) Solarban® 72 (2) on Acuity® 6mm (2) | Air 1/2" (12.7mm) | Acuity® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Acuity® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.

e. Coating: Solarban® 72 on Surface # 2

f. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Acuity® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 67 percent minimum.

b. Winter Nighttime U-Factor: 0.28 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.26 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.32 maximum.

e. Solar Heat Gain Coefficient: 0.28 maximum.

f. Outdoor Visible Light Reflectance: 13 percent maximum.

G.          Double Glazed Clear Insulating Glass Unit [BirdSmart™ (1) Clear 6mm | Air 1/2" (12.7mm) | Clear 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Clear float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 79 percent minimum.

b. Winter Nighttime U-Factor: 0.47 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.50 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.81 maximum.

e. Solar Heat Gain Coefficient: 0.70 maximum.

f. Outdoor Visible Light Reflectance: 12 percent maximum.

H.          Double Glazed Low-Iron Insulating Glass Unit [BirdSmart™ (1) Starphire® 6mm | Air 1/2" (12.7mm) | Starphire® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 84 percent minimum.

b. Winter Nighttime U-Factor: 0.47 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.50 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.94 maximum.

e. Solar Heat Gain Coefficient: 0.82 maximum.

f. Outdoor Visible Light Reflectance: 14 percent maximum.

I.          Double Glazed Low-Iron Insulating Glass Unit [BirdSmart™ (1) Acuity® 6mm | Air 1/2" (12.7mm) | Acuity® 6mm ]

1.         Conformance: ASTM E 2190

2.         Outdoor Lite: Acuity® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Glass Thickness: 6mm (1/4")

c. Laser Etch pattern: BirdSmart™ **[**Speck 6 Inline 2x2**]** **[**Speck 6 Shift 2X2**]** **[**Speck 6 Inline 2X4**]** **[**Speck 6 Shift 2x4**]** on Surface #1. *Specifier Notes: Specify the appropriate designation for the BirdSmart pattern that is to be used for this application.*

d. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

3.         Interspace Content: Air 1/2" (12.7mm)

4.         Indoor Lite: Starphire® float glass as manufactured by Vitro Architectural Glass

a. Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.

b. Heat-Treatment: **[**None**]** **[**Heat-strengthened, ASTM C 1048, Kind HS**] [**Tempered; ASTM C 1048, Kind FT; Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201**]***Specifier Notes: Specify the method of heat treatment. Vitro recommends that heat strengthened glass be specified and used, except where tempered glass is mandated for safety or other purposes by code.*

c. Glass Thickness: 6mm (1/4")

5.         Performance Requirements:

a. Visible Light Transmittance: 82 percent minimum.

b. Winter Nighttime U-Factor: 0.47 (Btu/hr\*ft2\*°F) maximum.

c. Summer Daytime U-Factor: 0.50 (Btu/hr\*ft2\*°F) maximum.

d. Shading Coefficient: 0.90 maximum.

e. Solar Heat Gain Coefficient: 0.78 maximum.

f. Outdoor Visible Light Reflectance: 13 percent maximum.

PART 3 - EXECUTION

3.1              EXAMINATION

A.         Verify that glazing channels are clean and ready to accept glazing installation, and that weeps are unobstructed. Confirm that minimum required face and edge clearances will be maintained. Do not proceed with glazing until unsatisfactory conditions have been corrected.

B.         Examine glazing units prior to setting. Reject units that display edge or face damage that may impede performance of unit or that will be visible when installed.

3.2              PREPARATION

A.         Clean glazing channels with recommended solvent and wipe dry. Apply primers to joint surfaces to ensure adhesion of sealants, unless preconstruction sealant-substrate testing indicates no primer is required.

3.3              GLAZING INSTALLATION

A.         General: Install glass and glazing materials in accordance with instructions of manufacturers and requirements of GANA Glazing Manual.

1.         Install setting blocks of size and in location required by glass manufacturer. Set blocks in bed of approved sealant.

2.         Provide spacers for glass lites as recommended, based upon size of glass unit.

3.         Comply with glass manufacturer’s limits on edge pressures.

4.         Ensure that glazing units are set with proper and consistent orientation of glass units toward interior and exterior.

5.         Provide edge blocking where recommended.

6.         Install sealants in accordance with requirements of Division 07 Section 'Joint Sealants.'

Specifier: Select glazing method or methods below that are applicable to project.

B.         Tape Glazing: Place tapes on fixed stops positioned to be flush or protrude slightly when compressed by glass. Install tapes continuously. Form butt joints at corners and where required, and seal tape joints with approved sealant.

1.         Apply heel bead of glazing sealant along intersection of permanent stop and frame for continuity of air and vapor seal.

2.         Set glass lites centered in openings on setting blocks.

3.         Install removable stops, and insert dense compression gaskets at corners, working toward centers of lites, compressing glass against tape on fixed stops.

4.         Apply cap bead of elastomeric sealant over exposed edge of tape or gasket on exterior of glass unit.

C.         Sealant Glazing: Install continuous spacers between glass lites and glazing stops. Install cylindrical sealant backing where recommended, in width and depth recommended to provide proper depth and width of sealant bead. Ensure sealant cannot block weep system.

1.         Install sealant under pressure to completely fill glazing channel without voids, with full bond to glass and channel surfaces.

2.         Tool sealant bead to proper profile providing wash away from glass.

D.        Sealant Glazing for Butt Glazing:

1.         Brace glass in position for duration of glazing process

2.         Mask edges of glass at adjoining glass edges and between glass edges and framing members.

3.         Secure small diameter non-adhering foamed rod on back side of joint.

4.         Apply sealant to open side of joint in continuous operation; completely fill joint without displacing foam rod; tool sealant surface smooth to concave profile.

5.         Allow sealant to cure, then remove foam backer rod.

6.         Apply sealant to opposite side; tool sealant smooth to concave profile.

7.         Remove masking tape.

E.         Gasket Glazing: Fabricate gaskets to fit openings exactly. Allow for stretching of gaskets during installation.

1.         Set soft compression gasket against fixed stop or frame, secure, with bonded miter cut joints at corners.

2.         Set glass lites centered in openings on setting blocks.

3.         Install removable stops, and insert dense compression gaskets at corners, working toward centers of lites, compressing glass against soft compression gaskets and to produce a weathertight seal. Seal joints in gaskets. Allow gaskets to protrude past face of glazing stops.

3.4              CLEANING AND PROTECTION

A.         Protect installed glass from damage. Attach streamers or warning tape to framing members, away from contact with glass. Remove nonpermanent labels.

B.         Protect glass from contact with contaminating substances during construction. Immediately clean glass exposed to contamination using methods recommended by glass manufacturer.

C.         Within 5 working days prior to inspection for Substantial Completion, clean all exposed glass surfaces using methods recommended by manufacturer. Remove glazing compounds from framing surfaces.

D.        Remove and replace broken or damaged glass.

**[**END OF SECTION 08 80 00**]**

**[**END OF SECTION 08800**]**

**Evaluating Submittals and Substitution Requests:** When reviewing submittals or substitution requests for other products for compliance with this specification, Vitro recommends particular attention to the following issues:

·Confirm that all required submittal items have been provided before reviewing submittal.

·Review proposed warranty terms and conditions.

·Confirm manufacturer/fabricator has certified that proposed materials in each installation method are compatible.

·Verify glazing sealant adhesion to specified glazing framing finish.

·Confirm that proposed products meet general performance requirements and specific requirements for each glazing unit type.

·Confirm scheduled availability through qualified manufacturer/fabricator.

**Coordination with Drawings and other sections:** Vitro recommends you coordinate the following:

·Structural loading on glass, including design wind and snow loads.

·Locations of each type of glazing unit; coordinate with unit designations used in this section.

·Locations where safety glazing is required.

·Locations for types of glazing methods, if more than one is used, and details of glazing methods, including profiles of gaskets if used.