

SECTION 08810 GLASS

**** NOTE TO SPECIFIER **** AGNORA; glass fabrication.

This section is based on the products of AGNORA, which is located at:

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A leader in oversized, architectural, and custom glass fabrication, AGNORA is able to fabricate the highest quality commercial and residential glass, thanks to leading-edge technology, a highly skilled team, and the largest, premium quality equipment in North America.

PART 1 GENERAL

1.1

SECTION INCLUDES

**** NOTE TO SPECIFIER **** Delete items below not required for project.

A.

Fabrication of oversized, custom or quality architectural glass constructions.

1.2

RELATED SECTIONS

**** NOTE TO SPECIFIER **** Delete any sections below not relevant to this project; add others as required.

A.

Section 08800 - Glazing: Application, installation and installation accessories.

1.3

REFERENCES

**** NOTE TO SPECIFIER **** Delete references from the list below that are not actually required by the text of the edited section.

A.

ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.

B.

ASTM International (ASTM):

1.

ASTM C162 - Standard Terminology of Glass and Glass Products.

2.

ASTM C1036 - Standard Specifications for Flat Glass.

3.

ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

4.

ASTM C1048 - Standard Specification for Heat-Treated Glass - Kind HS, Kind FT, Coated and Uncoated Glass.

5.

ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.

6.

ASTM E1300 - Standard Practice for Determining Minimum Thickness and Type of Glass required to resist a specific load.

7.

ASTM E773 - Standard Test Method for Seal Durability of Sealed Insulating Glass Units.

8.

ASTM E774 - Standard Specification for Sealed Insulating Glass Units.

9.

ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.

10.

ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.

11.

ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

12.

ATSM C1901 – Standard Tet Method for Measuring Optical Retardation in Flat Architectural Glass

C.

Canadian General Standards Board (CAN/CGSB):

1.

CAN/CGSB 12.1 M90 - Tempered or Laminated Safety Glass.

2.

CAN/CGSB 12.2 M90 - Flat, Clear Sheet Glass.

3.

CAN/CGSB 12.3 M90 - Flat, Clear Sheet Glass.

4.

CAN/CGSB 12.4 M90 - Flat, Heat Absorbing Glass.

5.

CAN/CGSB 12.8 M90 - Insulating Glass Units.

6.
CAN/CGSB 12.10 M90 - Light and Heat Reflecting Glass.

D.
CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

1.4 SUBMITTALS

A.
Submit under provisions of Section 01300.

B.
Product Data: For each glass product and glazing material indicated.

C.
Product Certificates: For glass and glazing products, from manufacturer.

D.
Warranties: Sample of special warranties.

**** NOTE TO SPECIFIER ** Delete selection samples if colors have already been selected.**

E.
Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F.
Verification Samples: For each finish product specified, two samples, minimum size 12 inches (305 mm) square representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A.
Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.

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

C.
Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type and technology.

**** NOTE TO SPECIFIER ** Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.**

D.
Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for

materials and execution.

1.

Install glazing in mockups specified in Section 088000 to match glazing systems required for Project, including glazing methods.

1.6

PRE-INSTALLATION MEETINGS

A.

Convene minimum two weeks prior to starting work of this section.

1.7

DELIVERY, STORAGE, AND HANDLING

A.

Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B.

Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

C.

Handling: Handle materials to avoid damage.

1.8

WARRANTY

A.

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.

1.

Warranty Period: Ten years from date of shipment from manufacturer.

B.

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.

1.

Warranty Period: Five years from date of shipment from manufacturer.

C.

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 the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.

Warranty Period: Ten years from date of shipment from manufacturer, except five years from date of shipment for units over 65 square feet or over 96 by 96 inches.

PART 2 PRODUCTS

2.1

MANUFACTURERS

A.

Acceptable Manufacturer: AGNORA, which is located at: 200 Mountain Rd.; Collingwood, ON, Canada L9Y 4V5; Tel: 705-444-6654; Fax: 705-444-6657; Email: request info (sales@agnora.com); Web: www.agnora.com

B.

Web: <http://www.agnora.com>

**** NOTE TO SPECIFIER ** Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.**

C.

Substitutions: Not permitted.

D.

Requests for substitutions will be considered in accordance with provisions of Section 01600.

**** NOTE TO SPECIFIER ** CNC, tempering, laminating and insulating equipment which can process 130 inches (3302 mm) widths and up to 300 inches (7620 mm) lengths provides AGNORA with the ability to fabricate large glass sizes.**

2.2

APPLICATIONS/SCOPE CAPABILITY

**** NOTE TO SPECIFIER ** AGNORA has two of the largest CNC Intermac machines and the largest straight-line edging machine in the world, enabling our craftsmen to apply custom shapes and angles that were once considered impossible in the glass industry. AGNORA's precision machining allow complex systems like point supported hardware for glass facade walls.**

A.

Process: CNC Machining.

1.

Thickness: 2.3 - 25 mm (1/8 inch - 1 inch).

2.

Maximum Size: 3.3 x 7.6 m (130 inches x 300 inches).

**** NOTE TO SPECIFIER **** AGNORA has four of the largest CNC Intermac machines in North America up to 9m (29.5 feet) in length, and the largest straight-line edging machine in the world, enabling our craftsmen to apply custom shapes and angles that were once considered impossible in the glass industry.

B.

Process: Straight Edge Polishing.

1.

Thickness: 2.3 - 100 mm (1/8 inch - 4 inches).

2.

Maximum Size: 3.3 x 7.6 m (130 inches x 300 inches).

**** NOTE TO SPECIFIER **** At AGNORA we use industry leading ceramic digital printing to apply specialty frit and colors. AGNORA has the largest available direct-to-glass digital printer in North America.

C.

Process: Printing.

1.

Thickness: 5 - 19 mm (3/16 inch – 3/4 inch).

2.

Maximum Size: 3.3 x 7.6 m (130 x 300 inches).

D.

Process: Tempering.

1.

Thickness: 5 - 25 mm (3/16 inch - 1 inch).

2.

Maximum Size: 3.3 x 7.0 m (130 x 275 inches).

E.

Process: Heat Strengthening.

1.

Thickness: 5 - 12 mm (3/16 inch -1/2 inch).

2.

Maximum Size: 3.3 x 7.0 m (130 x 275 inches).

**** NOTE TO SPECIFIER **** AGNORA offers heat soak testing for tempered products - including glass up to 130 inches x 283 inches (3302 mm x 7188 mm). Heat soaking is a practical method of reducing the

possible risk of spontaneous breakage due to Nickel Sulfide inclusions (NiS). Heat soaking remains the only practical way to uncover inclusions. AGNORA acquired a gigantic Heat Soak Oven to test its tempered glass. After tempering, we reheat glass to 555 degrees F (290 degrees C) for two hours. Most glass containing NiS will shatter during this stressful procedure, this is why it is called destructive testing. Because there is no North American standard for this procedure, AGNORA uses the European Test Standard EN14179-2. The oven was calibrated by a third party: Gesellschaft für Material-und Bauteilprüfung mbH, a certified German company.

F.

Process: Heat Soak Testing.

1.

Thickness: 5 - 25 mm (3/16 inch - 1 inch).

2.

Maximum Size: 3.3 x 7.0 m (130 x 283 inches).

**** NOTE TO SPECIFIER **** AGNORA has extensive experience working with specialty interlayers producing laminates up to 100mm thick. AGNORA has an autoclave that makes the largest laminated glass in North America.

G.

Process: Laminating.

1.

Thickness: 6 - 100 mm (1/4 inch- 4 inches).

2.

Maximum Size: 3.3 x 7.6 m (130 x 300 inches).

**** NOTE TO SPECIFIER **** AGNORA makes the largest fully automated insulated glass units in North America - up to 130 inches wide x 240 inches high (3302 mm x 6096 mm). Our automated line produces double and triple glazed IG units, with four-sided offsets, steps, true 45 degree miters, and point-fix glazing attachments.

H.

Process: Insulating.

1.

Thickness: 12 - 90 mm (1/2 inch - 3-1/2 inches).

2.

Maximum Size: 3.3 x 6.1 m (130 x 240 inches).

2.3 MATERIALS

A.

Licensed materials for glass fabrications.

**** NOTE TO SPECIFIER **** At the very heart of the Flat Glass Division, Saint-Gobain Glass is the activity of float glass manufacturing and of various other industrial products including magnetron coated glass.

1.

Company: Saint-Gobain Glass.

**** NOTE TO SPECIFIER **** Pilkington North America manufactures and markets glass and glazing products for the building and automotive markets. Its sales are made up of 70 percent automotive products and 30 percent building products.

2.

Company: Pilkington Glass.

**** NOTE TO SPECIFIER **** Produces glass that is fabricated into products primarily for commercial construction and residential markets, as well as the appliance, mirror and transportation industries.

3.

Company: PPG Industries.

**** NOTE TO SPECIFIER **** Vanceva(R) colors by Saflex(R) offer Architects and Designers a dynamic color palette to showcase color in their glazing designs. Producing a broad spectrum of colors and moods that are unachievable using stock selections of glass, Vanceva(R) color by Saflex gives architects and designers more creative freedom with glass than ever before.

4.

Company: Saflex/Vanceva.

**** NOTE TO SPECIFIER **** DuPont offers an industry-leading selection of laminated glass solutions. Each features advanced laminated glass technology that can increase safety, reduce noise, help save energy, add privacy, protect property or expand design and engineering options.

5.

Company: Dupont/SentryGlas.

**** NOTE TO SPECIFIER **** The ICD coating story began over twenty years ago with the invention of OPACI-COAT-300(R) a coating that became a flat glass industry standard for spandrel applications; including exterior curtain wall and interior wall cladding applications.

6.
Company: ICD.

7.
Company: Guardian Glass Industries

2.4 GLASS PRODUCTS

A.
Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B.
Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.

1.
With solar heat gain coefficient of not less than 0.87.

C.
Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

D.
Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1.
Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E.
Heat-Strengthened Float Glass: ASTM C 1048, 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.

1.
Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

F.
Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

G.
Ceramic-Coated Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."

H.
Reflective-Coated Vision Glass: ASTM C 1376.

I.
Ceramic-Coated Spandrel Glass: ASTM C 1048, Type I, Condition B, Quality-Q3.

J.

Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

K.

Reflective-Coated Spandrel Glass: ASTM C 1376, Kind CS.

L.

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

M.

Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1.

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

N.

Insulated Glass Configurations

- A. Type: Solar Control Insulating Glass Units – Clear Low-e Configuration
 - 1. SunGuard® SN 68 (Guardian) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 66 percent
 - b. SHGC 0.37
 - c. Shading coefficient 0.42
 - d. Exterior reflectance 11 percent
 - e. U-value winter 0.244
 - f. U-value summer 0.219
 - 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) SN 68 on Clear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space w/ black warm edge spacer + 3/8 inch (10 mm) Optifloat
- B. Type: Solar Control Insulating Glass Units – Clear Low-e and Low Iron Configuration
 - 1. SunGuard® SNX 62/27 (Guardian) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 63 percent
 - b. SHGC 0.26
 - c. Shading coefficient 0.30
 - d. Exterior reflectance 11 percent
 - e. U-value winter 0.238
 - f. U-value summer 0.209
 - 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) SNX 62/27 on Clear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite
- C. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
 - 1. Cool-lite Xtreme 70-33 II on Diamant (Saint Gobain Glass) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 71 percent

- b. SHGC 0.29
 - c. Shading coefficient 0.34
 - d. Exterior reflectance 11 percent
 - e. U-value winter 0.237
 - f. U-value summer 0.207
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) Cool-lite Xtreme 70-33 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite
- D. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Clear Configuration
 - 1. Cool-lite Xtreme SKN 076 II on Diamant (Saint Gobain Glass) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 69 percent
 - b. SHGC 0.34
 - c. Shading coefficient 0.38
 - d. Exterior reflectance 13 percent
 - e. U-value winter 0.236
 - f. U-value summer 0.206
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) Cool-lite SKN 076 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) Optifloat
- E. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
 - 1. SunGuard® SN 68 on UltraClear (Guardian) + OptiWhite (Pilkington) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 65 percent
 - b. SHGC 0.36
 - c. Shading coefficient 0.41
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.184
 - f. U-value summer 0.180
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) SunGuard® SN 68 on UltraClear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) OptiWhite
- F. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
 - 1. Cool-lite Xtreme 70-33 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 65 percent
 - b. SHGC 0.27
 - c. Shading coefficient 0.31
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.177
 - f. U-value summer 0.170
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) Cool-lite Xtreme 70-33 II on

Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space
Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite + 1/2
inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 3/8 inch
(10mm) OptiWhite

- G. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
1. Cool-lite SKN 076 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington) + OptiWhite (Pilkington)
 2. Performance Values:
 - a. VLT 66 percent
 - b. SHGC 0.31
 - c. Shading coefficient 0.36
 - d. Exterior reflectance 17 percent
 - e. U-value winter 0.178
 - f. U-value summer 0.170
 3. Insulating Glass Unit Construction: 1/4 inch (6mm) Cool-lite SKN 076 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) OptiWhite
- H. Type: Low Iron Insulating Glass Units – Low Iron only Configuration
1. OptiWhite (Pilkington) + OptiWhite (Pilkington)
 2. Performance Values:
 - a. VLT 83 percent
 - b. SHGC 0.83
 - c. Shading coefficient 0.95
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.447
 - f. U-value summer 0.476
 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) OptiWhite
- I. Type: Solar Control & 4th Surface Passive Low-e Insulating Glass Units – Clear Low-e
1. Cool-lite Xtreme 60-28 II on Planiclear (Saint-Gobain) + EnergyAdvantage on Optifloat (Pilkington)
 2. Performance Values:
 - a. VLT 56 percent
 - b. SHGC 0.24
 - c. Shading coefficient 0.27
 - d. Exterior reflectance 16 percent
 - e. U-value winter 0.196
 - f. U-value summer 0.171
 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) Cool-lite Xtreme 60-28 II on Planiclear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) EnergyAdvantage on Optifloat (pyrolytic) on fourth surface (4)
- J. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
1. Cool-lite SKN 076 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington) +

- OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 66 percent
 - b. SHGC 0.31
 - c. Shading coefficient 0.36
 - d. Exterior reflectance 17 percent
 - e. U-value winter 0.178
 - f. U-value summer 0.171
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) Cool-lite SKN 076 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 3/16 inch (5 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 3/16 inch (5mm) OptiWhite
- K. Type: Solar Control Insulating Glass Units – Low-e on Clear and Low Iron Configuration
- 1. SunGuard SN 68 on Clear (Guardian) + OptiWhite (Pilkington) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 64 percent
 - b. SHGC 0.35
 - c. Shading coefficient 0.40
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.184
 - f. U-value summer 0.180
 - 3. Insulating Glass Unit Construction: 1/4 inch (6mm) SunGuard SN 68 on Clear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) OptiWhite
- L. Type: Double Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
- 1. SunGuard SNR 43 on UltraClear (Guardian) + SunGuard Neutral 78/65 on UltraClear (Guardian) + UltraClear (Guardian)
 - 2. Performance Values:
 - a. VLT 40 percent
 - b. SHGC 0.20
 - c. Shading coefficient 0.23
 - d. Exterior reflectance 29 percent
 - e. U-value winter 0.128
 - f. U-value summer 0.130
 - 3. Insulating Glass Unit Construction: 3/8 inch (10 mm) SunGuard SNR 43 on UltraClear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 5/16 inch (8 mm) SunGuard Neutral 78/65 on UltraClear (sputtered) on fourth surface (4) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 5/16 inch (8 mm) UltraClear
- M. Type: Double Solar Control Insulating Glass Units – Low Iron and Clear Low-e and Clear Configuration
- 1. Cool-lite Xtreme 70-33 II on Diamant (Saint-Gobain) + Planitherm XN II on

- 2. Planiclear (Saint-Gobain) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 63 percent
 - b. SHGC 0.26
 - c. Shading coefficient 0.30
 - d. Exterior reflectance 14 percent
 - e. U-value winter 0.121
 - f. U-value summer 0.121
 - 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) Cool-lite Xtreme 70-33 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) Planitherm XN II on Planiclear (sputtered) on fourth surface (4) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 3/16 inch (5 mm) Optifloat

- N. Type: Solar Control Insulating Glass Units – Low-e on Clear and Clear Configuration
 - 1. SunGuard SNX 62/27 on Clear (Guardian) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 61 percent
 - b. SHGC 0.26
 - c. Shading coefficient 0.30
 - d. Exterior reflectance 11 percent
 - e. U-value winter 0.238
 - f. U-value summer 0.209
 - 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) SunGuard SNX 62/27 on Clear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) Optifloat

- O. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
 - 1. Cool-lite Xtreme 70-33 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 65 percent
 - b. SHGC 0.27
 - c. Shading coefficient 0.31
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.178
 - f. U-value summer 0.171
 - 3. Insulating Glass Unit Construction: 3/8 inch (10 mm) Cool-lite Xtreme 70-33 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) OptiWhite + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) OptiWhite

- P. Type: Double Solar Control Insulating Glass Units – Low Iron and Clear Low-e and Clear Configuration
 - 1. Cool-lite SKN 076 II on Diamant (Saint-Gobain) + Planitherm XN II on Planiclear (Saint-Gobain) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 63 percent
 - b. SHGC 0.30

- c. Shading coefficient 0.35
 - d. Exterior reflectance 15 percent
 - e. U-value winter 0.120
 - f. U-value summer 0.121
3. Insulating Glass Unit Construction: 1/4 inch (6 mm) Cool-lite SKN 076 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) Planitherm XN II on Planiclear (sputtered) on fourth surface (4) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4inch (6 mm) Optifloat
- Q. Type: Passive Low-e Insulating Glass Units – Passive Low-e on Clear and Clear Configuration
- 1. EnergyAdvantage on Optifloat (Pilkington) + Optifloat (Pilkington) + Optifloat (Pilkington)
 - 2. Performance Values:
 - a. VLT 65 percent
 - b. SHGC 0.55
 - c. Shading coefficient 0.63
 - d. Exterior reflectance 20 percent
 - e. U-value winter 0.210
 - f. U-value summer 0.222
 - 3. Insulating Glass Unit Construction: 3/8 inch (10 mm) EnergyAdvantage on Optifloat (pyrolytic) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) Optifloat + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6mm) Optifloat
- R. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
- 1. Cool-lite Xtreme 70-33 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 70 percent
 - b. SHGC 0.30
 - c. Shading coefficient 0.34
 - d. Exterior reflectance 11 percent
 - e. U-value winter 0.233
 - f. U-value summer 0.205
 - 3. Insulating Glass Unit Construction: 3/8 inch (10 mm) Cool-lite Xtreme 70-33 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 3/8 inch (10 mm) OptiWhite
- S. Type: Solar Control Insulating Glass Units – Low Iron Low-e and Low Iron Configuration
- 1. Cool-lite SKN 076 II on Diamant (Saint-Gobain) + OptiWhite (Pilkington)
 - 2. Performance Values:
 - a. VLT 71 percent
 - b. SHGC 0.34
 - c. Shading coefficient 0.39
 - d. Exterior reflectance 13 percent
 - e. U-value winter 0.233
 - f. U-value summer 0.204
 - 3. Insulating Glass Unit Construction: 3/8 inch (10 mm) Cool-lite SKN 076 II on Diamant (sputtered) on second surface (2) + 1/2 inch (13 mm) air space

Chromatec Ultra Warm Edge Spacer, Black + 3/8 inch (10 mm) OptiWhite

- T. Type: Solar Control & 4th Surface Passive Low-e Insulating Glass Units – Clear Low-e
1. SunGuard SN 68 on Clear (Guardian) + SunGuard IS 20 on Clear (Guardian)
 2. Performance Values:
 - a. VLT 66 percent
 - b. SHGC 0.36
 - c. Shading coefficient 0.42
 - d. Exterior reflectance 12 percent
 - e. U-value winter 0.203
 - f. U-value summer 0.180
 3. Insulating Glass Unit Construction: 1/4 inch (6 mm) SunGuard SN 68 on Clear (sputtered) on second surface (2) + 1/2 inch (13 mm) air space Chromatec Ultra Warm Edge Spacer, Black + 1/4 inch (6 mm) SunGuard IS 20 on Clear (pyrolytic) on fourth surface (4)

2.5 CNC MACHINING

A. Heat Treated Glass Products - Fabrication Guidelines:

1.
Hole to Glass Edge Location: The minimum distance from the rim of a hole to the nearest edge of the glass shall be 1/4 inch (6 mm) or twice the glass thickness, whichever is greater. Tolerance for location of hole from specified edge is plus or minus 1/16 inch (1.5 mm).
2.
Hole to Hole Location: The minimum distance between the rims of adjacent holes shall be 3/8 inch (9.5 mm) or 2 x glass thickness, whichever is greater. Tolerance for dimension between hole centers is plus or minus 1/16 inch (1.5 mm).
3.
Hole to Corner Location: Holes in the vicinity of a corner shall be positioned so that the nearest edge of the hole is a minimum distance from the corner of 6.5 x the glass thickness.
4.
Minimum Hole Diameter and Notch Radius: Circular holes shall have a diameter no less than 1/4 inch (6 mm) or equal to the glass thickness, whichever is greater.
5.
Notches and cutouts shall have a radius corner greater than the glass thickness. Tolerance of hole diameter is $\pm 1/16$ inch (1.5 mm). Dimensional tolerances of notches and cutouts is $\pm 1/16$ inch (1.5 mm) for glass thicknesses less than 1/2 inch and plus or minus 1/8 inch (3 mm) for glass thicknesses of 1/2 inch (13 mm) or greater.

.6

EDGE POLISHING

A.

Code: BMCNCG.

1.

Name: CNC ground back mitre.

2.

Description: Variable angle ground mitre. Glass is removed on the back surface.

B.

Code: BMCNCP.

1.

Name: CNC high polish back mitre.

2.

Description: Variable angle polish mitre. Glass is removed on the back surface. Use of cerium wheel.

C.

Code: BMCNHP.

1.

Name: CNC high polish back mitre.

2.

Description: Variable angle polish mitre. Glass is removed on the back surface. Use of cerium wheel.

D.

Code: BMDTGR.

1.

Name: Diamond tool ground back mitre.

2.

Description: Variable angle ground mitre. Glass is removed on the back surface.

E.

Code: BMDTHP.

1.

Name: Diamond high polish Back mitre

2.

Description: Variable angle polish mitre. Glass is removed on the back surface. Use of cerium wheel.

F.

Code: FLAKSR.

1.

Name: Belt edge arris.

2.

Description: Diamond belt arrissed.

G.

Code: FLASYM

1.

Name: Asymmetrical chamfer CNC polish.

2.

Description: Used for tempered laminates. Initial CNC polish to size and shape followed by diamond high polish on straight-line single edger.

H.

Code: FLCNCG

1.

Name: CNC flat ground.

2.

Description: Dull edge with a chamfer on each side.

I.

Code: FLCNCP

1.

Name: CNC polish.

2.

Description: Shiny edge with lines parallel to surfaces and chamfers on each side.

J.

Code: FLCNHP.

1.

Name: CNC high polish.

2.

Description: Dull edge with a chamfer on each side.

K.

Code: FLDTHP.

1.

Name: Diamond high polish.

2.

Description: Shiny edge with a chamfer on each side.

L.

Code: FLGKSR.

1.

Name: Belt flat ground.

2.

Description: Diamond Belt flat ground. Some spots remain "as cut".

M.

Code: FMCNCG.

1.

Name: CNC ground front mitre.

2.

Description: Variable angle ground mitre. Glass is removed on the front surface.

N.

Code: FMCNCP.

1.

Name: CNC polish front mitre.

2.

Description: Variable angle polish mitre. Glass is removed on the front surface.

O.

Code: FMCNHP.

1.

Name: CNC high polish front mitre

2.

Description: Variable angle polish mitre. Glass is removed on the front surface. Use of cerium wheel.

P.

Code: FMDTGR.

1.

Name: Diamond tool ground front mitre.

2.

Description: Variable angle ground mitre made on single edger. Glass is removed on the front surface.

Q.

Code: FMDTHP

1.

Name: Diamond high polish mitre.

2.

Description: Variable angle polish mitre made on single edger. Glass is removed on the back surface.

**** NOTE TO SPECIFIER ** Delete type not required.**

2.7

TEMPERING/HEAT STRENGTHENING

A.

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.

**** NOTE TO SPECIFIER ** Delete**

type not required.

2.8

LAMINATED GLASS

A.

Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to

bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1.

Construction: comply with interlayer manufacturer's written instructions.

a.

DuPont SentryGlas Clear.

b.

Eastman (Solutia) Saflex Standard Color.

c.

Eastman (Solutia) Vanceva Foundation Color.

d.

Eastman (Solutia) Vanceva Specialty Color.

e.

Eastman (Solutia) Vanceva White.

f.

Eastman (Solutia) Vanceva Black.

g.

Eastman (Solutia) Vanceva Hurricane Storm.

h.

Eastman (Solutia) Saflex Acoustic Clear.

i.

Southwall XIR 72-41.

j.

Trosifol Clear.

**** NOTE TO SPECIFIER ** Delete type not required.**

2.9

INSULATING GLASS

A.

Manufacturers: Subject to compliance with requirements, provide glass technology as licensed and fabricated by AGNORA with identical performance characteristics: Manufacturers of licensed products shall be as listed below:

**** NOTE TO SPECIFIER ** Glass and coatings manufactured licensed to AGNORA for fabrication.**

1.

Company: Saint-Gobain Glass.

2.

Company: Pilkington Glass.

3.

Company: PPG Industries.

4.

Company: Saflex/Vanceva.

5.

Company: Dupont/SentryGlas.

6.

Company: ICD.

7.

Company: Guardian Glass Industries

B.

Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1.

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

2.

U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

3.

Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

4.

Visible Reflectance: Center-of-glazing values, according to NFRC 300.

C.

Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1.

Sealing System: _____.

2.

Spacer: _____.

**** NOTE TO SPECIFIER ** Insulating glass material ID for drawing coordination with general description.**

D.

Glass Type GL-#: _____.

**** NOTE TO SPECIFIER ** Licensed product identification.**

1.

_____.

E.

Construction:

**** NOTE TO SPECIFIER ** Licensed product construction. Insulating Glass Units can be manufactured using many of the products from the AGNORA's offerings. In line with the project specification, and in order to improve thermal performance, acoustic properties, or solar control, one or more of the following glass types may be used: Clear, tinted, Low Iron, Low E, Performance Low E, Reflective, Tempered, (Silk Screened) Opaci-Coat Spandrel AND Laminated.**

1.

_____.

**** NOTE TO SPECIFIER ** Licensed product performance.**

F.

Performance:

1.

Overall Unit

Thickness: _____

2.

Thickness of Each

Glass Lite:

3.

Outdoor Lite: _____.

4.
Interspace Content: _____.

5.
Indoor Lite: Heat-strengthened float glass.

6.
Low-E Coating: _____.

7.
Reflectance - Visible In: _____percent.

8.
Reflectance - Visible Out: _____percent.

9.
Visible Light Transmittance: _____percent minimum.

10.
Winter Nighttime U-Factor: _____maximum.

11.
Summer Daytime U-Factor: _____maximum.

12.
Solar Heat Gain Coefficient: _____maximum.

13.
Shading Coefficient: _____.

**** NOTE TO SPECIFIER ** Delete type not required.**

2.10 SPANDREL GLASS

A.
Glass Type GL-#: Spandrel Glass

**** NOTE TO SPECIFIER ** Delete type not required**

1.
Ceramic-coated spandrel glass.
2.
Silicone-coated spandrel glass.
3.
Reflective-coated spandrel glass; Pyrolytic process
4.
Reflective-coated spandrel glass; Sputter-coating (vacuum deposition process).

**** NOTE TO SPECIFIER ** Delete strengthening not required.**

5.
Heat-strengthened
6.
Fully tempered float glass.

**** NOTE TO SPECIFIER ** Insert manufacturer's name; product name or designation.**

7.
Basis-of-Design Product: _____.

8.
Glass: _____.

9.
Tint Color: _____.

10.
Coating Color: _____.

11.
Minimum Thickness: _____.

12.
Coating Location: _____.

13.
Winter Nighttime U-Factor: _____.

14.
Summer Daytime U-Factor: _____.

**** NOTE TO SPECIFIER ** Delete if not required.**

15.
Fallout Resistance: Passes fallout-resistance test in ASTM C 1048 for an assembly of glass and adhered reinforcing material.

PART 3 EXECUTION

3.1 EXAMINATION

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

1.
Openings to receive glazing are plumb and square.
2.
Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
- 3.

Minimum required face or edge clearances.

4.
Observable edge damage or face imperfections.

B.
Clean glass, glazing channels and other framing members receiving glass immediately before glazing.

C.
Remove coatings that are not firmly bonded to substrates.

D.
Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

3.2 INSTALLATION, GENERAL

A.
Comply with referenced GANA glazing manual and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B.
Install in proper relationship with adjacent materials.

3.3 CLEANING AND PROTECTION

A.
Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

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