

JE Berkowitz, L.P.
Architectural Glazing Guide Specification

Section 08 81 00 – Glazing-EpitomeVersion

(Note to Specification Writers, the specifications below are offered as desirable inclusions in the glazing specification and are not intended to be complete. An appropriate, qualified design professional must verify the suitability of a specific product for use in a particular application as well as review the final specification. Word and sentences within [___] reflect a choice to be made regarding the inclusion or exclusion of a particular item. Add, delete, or modify items as necessary.)

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Glass including heat-treated glass, insulating glass units, silk-screened glass, spandrel glass and laminated glass.
- B. Related Sections:
 - 1. Drawings, General and Supplementary Conditions of the Contract, Division 1 and the following specifications sections apply to this section.
 - 2. Section 08 40 0 – Entrances, Storefronts and Curtainwalls
 - 3. Section 08 50 00 – Windows
 - 4. Section 08 60 00 –Roof, Windows and Skylights
 - 5. Section 08 44 00 – Curtainwalls and Glazed Assemblies

1.02 REFERENCES

(Delete all reference standards that are not required and add any standards required by local or state standards. The Contracting Requirements or Division 1, Section 01420. References may establish the edition date of standards not otherwise indicated. Division 1 may include full names and addresses of the organization whose standards are referenced.)

- A. United States
 - 1. ANSI Z97.1 – American National Standard for Glazing Materials Used in Buildings – Safety Performance and Methods Test.
 - 2. ASTM C162 – Standard Terminology of Glass and Glass Products.
 - 3. ASTM C1036 – Standard Specification for Flat Glass.
 - 4. ASTM C1048 – Standard Specification for Heat-Treated Glass – Kind HS, Kind FT Coated and Uncoated Glass.
 - 5. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.
 - 6. ASTM C1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
 - 7. ASTM E1300 – Standard Practice for Determining the Minimum Thickness and Type of Glass Required to Resist a Specified Load.
 - 8. ASTM C1279- Standard Test Method for Non-Destructive Photoelastic Measurement of Edge and Surface Stresses in Annealed, Heat-Strengthened, and Full Tempered Flat Glass
 - 9. ASTM C 1651- Standard Test Measurement of Roll Wave Optical Distortion in Heat –Treated Flat Glass.
 - 10. ASTM E2188 – Standard Test Method for Insulating Glass Unit Performance.
 - 11. ASTM E2189 – Standard Method for Testing Resistance to Fogging in Insulating Glass Units.
 - 12. ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.
 - 13. CSPC 16 CFR 1201– Safety Standard for Architectural Glazing Materials.
 - 14. Insulating Glass Manufacturers Alliance (IGMA) – Glazing Guidelines.
 - 15. EN 14179 - 1:2005– European Heat Soaking Standard.
 - 16. GANA Glazing Manual: Glass Association of North America.

17. GANA Sealant Manual: Glass Association of North America.
19. GANA Laminated Glass Design Guide: Glass Association of North America.
20. GANA/GTA 66-9-20 – Specification for Heat-Strengthened or Fully Tempered Ceramic Enameled Spandrel Glass for Use in Building Window/Curtainwalls and Other Architectural Applications
21. GANA ID Guidelines for the Appearance of Insulating Glass Unit Edges in Commercial Applications
22. GANA- Edge Seal Bulletin
23. GANA- Glass Informational Bulletin LD 01-1003- Design Considerations for Laminated Glazing Applications
24. GANA - Glass Informational Bulletin- LD- Weight of laminated Architectural Glass
25. GANA- Glass Informational Bulletin- TD-02-0402- (Reapproved 2008) “Heat-Treated Glass Surfaces Are Different”
26. GANA- Glass Informational Bulletin- TD- 05-188 “Quench {Patterns in Heat Treated Architectural Glass”
27. GANA- DD-DOC 0111- General Guidelines for Screen Printing on Flat Glass
28. GANA- Glass Informational Bulletin- 03-0609- Differences Between Safety Glazing Standards
29. GANA- Glass Informational Bulletin- Edge Seal Bulletin
30. GANA- Glass Informational Bulletin- PGC 05-0212- Screening out UV Radiation with laminated Glass
31. GANA Glass Informational Bulletin- TD 100-06- Standard Test Method for In-Plant Measurement of Roll Wave in Heat-Treated Architectural Glass
32. ISO 9001-2008 Certification.

1.03 DEFINITIONS

- A. Sealed Insulating Glass Unit Surfaces & Coating Orientation (Surfaces 1-4 describe a typical vision IGU Surfaces 5 & 6 describe an inner board laminated insulating unit alternately surfaces 5 and 6 describe a triple glazed insulating unit.)
 1. Surface 1 – Exterior surface of outer pane (surface facing outdoors of outboard lite).
 2. Surface 2 – Interior surface of outer pane (surface facing indoors of outboard lite).
 3. Surface 3 – Exterior surface of inner pane (surface facing outdoors of inboard lite).
 4. Surface 4 – Interior surface of inner pane (surface facing indoors of inboard lite).
 5. [Surface 5 exterior surface of outerpane (surface facing indoors of an outboard lite)].
 6. [Surface 6- Exterior of inner pane (surface facing indoors of inboard lite)]
- B. Performance Characteristics
 1. Center-of-Glass – Performance values that take only the center portion of a glass make-up into account and not the framing members (customarily found in Sweets catalog and used in Section 08 80 00 architectural specifications).
 2. Center-of-Glass thermal and optical performance properties shall be based on data and calculations from the current LBNL Windows 6.3 computer program.
 3. Fenestration Performance - Performance values that take into account the total fenestration (Center-of-Glass and framing members). Normally identified with building energy codes such as ASHRAE-IESNA 90.1 and the IECC. These values can also be tested and certified by the National Fenestration Rating Council (NFRC).

1.04 SYSTEM DESCRIPTION

- A. Design Requirements
 1. Provide glazing systems capable of withstanding normal thermal movements, wind loads and impact loads, without failure, including loss due to ineffective manufacture, fabrication and installation: deterioration of glazing materials; and other defects in construction.
 2. Provide glass thickness and strength (annealed, heat-strengthened, tempered or heat soaked) required to meet or exceed the following criteria based on project loads and in-service conditions per ASTM E1300.

- a) Minimum thickness of annealed or heat-treated glass products is selected, so that worst case probability of failure does not exceed the following:
 - 1) 8 breaks per 1000 for glass installed vertically or not over 15 degrees from the vertical plane and under wind action.
 - 2) 5 breaks per 1000 for glass installed 15 degrees from the vertical plane and under action of snow and/ or wind.

1.05 SUBMITTALS

- A. Submit 12-inch (305mm) square samples of each type of glass indicated and 12-inch (305 mm) long samples of each color required for each type of sealant or gasket exposed to view.
- B. Submit manufacturer's product sheet and glazing instructions.
- C. Submit compatibility and adhesion test reports from sealant manufacturer, indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulating units.
- D. Submit reports from fabricated glass manufacturer indicating that the glass meets the requirements of any security test. Reports specified on the drawings.
- E. Mock-ups – Refer to Division 8 Section “Aluminum Framed Curtain Walls”, “Aluminum Entrances and Storefronts”, “Aluminum Windows” and “All-Glass Entrances and Storefronts” for requirements applicable to mockups. [Include full sized mockups with each glass type]
- F. Submit a minimum of ten completed referenced projects in accordance with Section Manufacturer, line item “C”.
- G. Submit ISO 9001- 2008 Certification certificate.

1.06 QUALITY ASSURANCE

- A. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or referenced standards.
 - 1. GANA Publications
 - 2. AAMA Publications
 - 3. IGM Publications
- B. Safety glass products in the United States comply with CPSC 16 CFR 1201 for Category II materials.
- C. Insulating glass products are to be permanently marked either on spacers or at least one insulating unit component with appropriate label of inspecting and testing agency listed below:
 - 1. United States – Insulating Glass Certification Council (IGCC)
- D. Manufacturer to be ISO 9001-2008

1.07 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's instruction for receiving, handling, storing and protecting glass and glazing materials.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- D. Exercise care to prevent damage to glass and damage/deterioration to coating on glass.

1.08 PROJECT SITE CONDITIONS

- A. Field Measurement: When construction schedule permits, verify field measurements with drawing dimensions prior to fabrication of glass products.

1.09 WARRANTY

- A. Provide a written 10-year limited warranty from date of manufacture for insulating glass. Warranty covers seal failure and/or obstruction of vision due to normal conditions of use and not to handling, installing, protecting and maintaining practices contrary to glass manufacturer's published instructions.
- B. Provide a written 5-year limited warranty from date of manufacture for monolithic ceramic frit silk-screened and monolithic ceramic frit spandrel glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, protecting and maintaining practices contrary to glass manufacturer's published instructions.
- C. Provide a written 5-year limited warranty for monolithic laminated glass. Warranty covers delamination due to normal use and not handling, installing, protecting and maintaining practices contrary to glass manufacturer's published instructions.

PART 2 - GENERAL

2.01 MANUFACTURERS

- A. Manufacture is used in the section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standards.
- B. Fabricator to have a minimum of ten years experience and certification as a fabricator of MSVD coatings
- C. Fabricator to have completed 10+ projects of a monumental stature as defined over 100,000 square feet of MSVD coatings.
- D. Fabricator to have in-house certified and tested fabrication experience and capability in the critical areas of automated cutting, heat treating, laminating, spandrel, silk-screening and insulating.
- E. All glass shall be sourced and fabricated in the United States of America
- F. Acceptable manufacturers include:
 - 1. Basis of Design: JE Berkowitz, L.P. (1-800-257-7827)
 - 2. Requests to use substitute products and or glass fabricator must be submitted in accordance with Section 01 63 00 Product Substitution Procedures.

2.02 MATERIALS

A. TEMPERFECT™ HEAT-TREATED FLOAT GLASS

- 1. Maximum Distortion Tolerances for Roll Wave and Millidiopter Measurement.
 - a. Glass to be heat treated in a plant utilizing convection furnaces and on-line diagnostic tools, Osprey Lite Measurement System or meeting the test criteria of the three contact gauge or flat bottom gauge described in ASTM C1651-1.
 - b. Roll-Wave or Ripple: The deviation from flatness at any peak to valley shall be targeted not exceed .003" as measured per peak to valley for 1/4" (6mm) thick glass. The leading and trailing 10" edges of lite may exceed the targeted .003" and the deviation is allowable up to .008".
 - c. Millidiopter: Surface quality of the lites to 90% surface coverage measured at a Maximum + or - 120 millidiopeters overall.

- e. Documentation of Quality Assurance Procedures will be performed on a regular statistical basis, in accordance with ISO 9001-2008 documents, and available upon request.
2. Bow and Warp Tolerance: Offline Measurement*
 1. Maximum of ½ of ASTM C 1048 Specification.
 2. Every Hour on Vertical Plane with aluminum straight edge / or tight string
 3. Documentation of Quality Assurance Procedures will be performed on a regular statistical basis, in accordance with ISO 9001-2008 documents, and available upon request.
 4. Glass to be heat-treated by horizontal (roller hearth) process with inherent roll-wave distortion parallel to the bottom edge of the glass as installed when specified.
 5. [Optional: Fully tempered glass shall be heat soaked to EN 14179-1:2005 European Heat Soak Standard].

* Certain shapes, unusual aspect ratios and painted glass (Silk-screen, Spandrel etc.) may not conform to the above measurement reading. JE Berkowitz determines acceptable/unacceptable.

B. MONOLITHIC FLOAT GLASS

1. Glass Type:
2. Glass Tint:
3. Nominal Glass Thickness:
4. Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soak Tested]
5. [Reflective] [Low-E] Coating Orientation: [N/A] Surface # []
6. Performance Characteristics (Center-of-Glass):

(Note: Verify that the glass type thickness matches the Performance Characteristics listed below.)

 - a. Visible Transmittance _____ %
 - b. Visible Reflectance _____ %
 - c. Winter U-value: _____
 - d. Solar Heat Gain Coefficient (SHGC): _____
 - e. Light to Solar Gain (LSG) _____
7. United States Requirements
 - a. Annealed float glass shall comply with ASTM C1036 Type I, Class 1 (clear), Class 2 (tinted), Quality Q3.
 - b. Heat-Strengthened (HS) float glass and Tempered (FT) float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3.
8. Glass shall be annealed, heat strengthened or tempered as required by codes and specified on drawings.
9. Unit shall be certified for compliance with seal classification by the Insulating Glass Certification Council (IGCC) or to ASTM E2190.

C. WINDUO® SEALED INSULATING GLASS (IG) UNITS

- A. Insulating Glass Seal / Seal and Desiccant testing
 - a. Perform Butterfly unit adhesion pull test on a 24” x 24” lite of glass every shift or new drum to assure sealant mixture.
 - b. Perform Desiccant temperature. Rise test once per manufacturing shift or new carton.
 - c. [Documentation recorded and available upon request]
- B. Bow/Warp Tolerance: (Concave/Convex) Offline measurement
 - a. Maximum ½ of ASTM Specification
 - b. Measure every Hour on Vertical Plane with aluminum straight edge / or tight string

- c. Measure center air space gap daily with CRL MG 1600 or equal.
- d. [Documentation recorded and available upon request]

C. Sealant Application/Types:

- a. No skips/voids on Primary or Secondary seals
- b. Secondary seal Cleaned/Tooled before packing (No seal smear on surfaces)
- c. Standard Black or Light Gray primary and two-part secondary silicone seals.

D. Coating Edge Deletion: Clean/Remove to Center of Primary Seal or Minimum of 3/8".

1. Insulating Glass Unit Makeup:

- a. Outboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: [Annealed] [Heat-Strengthened,] [Tempered] Project Specific [Heat Soak Tested]
 - 5) [Reflective] [Low-E] [Coating Orientation: [N/A] Surface # []
- b. Airspacer
 - Nominal Thickness:
 - 1) [JEB 3SEAL Warm Edge Spacer]
 - 2) Gas Fill: [Air] [Argon (90% initial fill)]
- c. Inboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: [Annealed] [Heat-Strengthened,] [Tempered] [Heat Soak]
 - 5) [Reflective] [Low-E] Coating Orientation: [N/A][Surface # []

2. Performance Characteristics (Center of Glass):

(Note: Verify that the glass type thickness matches the Performance Characteristics listed below.)

- a. Visible Transmittance _____ %
- b. Visible Reflectance _____ %
- c. Winter U-value: _____
- d. Solar Heat Gain Coefficient (SHGC): _____
- e. Light to Solar Gain (LSG) _____
- 3.
 - a. [Provide hermetically sealed IG units with a thermoset silicone spacer incorporating integral 3A desiccant, a triple seal design consisting of a pre-applied acrylic adhesive for glass bonding, a captive polyisobutylene primary air seal and a two part structural silicone secondary air seal, color [black]
 - b. [Provide hermetically sealed IG units with dehydrated airspace, dual air seal of [black] [grey] polyisobutylene (PIB), and a secondary seal of [black] [grey] silicone].
- 4. United States Requirements
 - a. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E2190.

D. ENVIROSCREEN® MONOLITHIC CERAMIC SILK-SCREENED GLASS

(Note: For ceramic frit silk-screened glass in an Insulating Glass Unit, use the format for Sealed Insulating Glass (IG) Units substituting this section for the lite (outboard and inboard) that is to be silk-screened.)

- 1. Glass Type:
- 2. Glass Tint:
- 3. Nominal Glass Thickness:
- 4. Ceramic Frit Orientation: Surface # [1] [2]
- 5. Silk-Screened Pattern: [Dots] [Lines] [Holes] [Custom]

6. Ceramic Frit Color[s]: [#101 Black] [#102 Green] [#106 White] [#109A Warm Grey] [#100SB Simulated Sand Blast] [#100 AE Simulated Acid Etch] [Custom Acid Etch] [Custom]
7. United States Requirements: Heat-treated glass with ceramic coating applied by the silk-screen process and complying with ASTM C1048, Condition C (other coated glass), Type I (transparent glass, flat), Quality Q3 (glazing select) and with other requirements as specified.

E. WINDUO™ SEALED INSULATING GLASS (IG) UNITS WITH ENVIROSCREEN CERAMIC SILK SCREENED GLASS

1. Insulating Glass Unit Makeup:
 - a. Outboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Ceramic Frit Orientation: Surface # [1] [2]
 - 4) Silk-Screened Pattern: [Dots] [Lines] [Holes] [Custom]
 - 5) Ceramic Frit Color[s]: [#101 Black] [#102 Green] [#106 White] [#109A Warm Grey] [#100SB Simulated Sand Blast] [#100 AE Simulated Acid Etch] [Custom Acid Etch] [Custom]
 - 6) Nominal Glass Thickness:
 - 7) Glass Strength: [Heat-Strengthened] [Tempered] [Heat Soak Tested]
 - 8) [Reflective] [Low-E] Coating Orientation: [N/A] [Surface # []]
 - b. Airspacer
 - 1) Nominal Thickness:
 - 2) *[JEB 3SEAL Warm Edge Spacer]
 - 3) Gas Fill: [Air] [Argon (90% initial fill)]
 - c. Inboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Ceramic Frit Orientation: Surface # [1] [2]
 - 4) Silk-Screened Pattern: [Dots] [Lines] [Holes] [Custom]
 - 5) Ceramic Frit Color[s]: [#101 Black] [#102 Green] [#106 White] [#109A Warm Grey] [#100SB Simulated Sand Blast] [#100 SA Simulated Acid Etch] [Custom Acid Etch] [Custom]
 - 6) Nominal Glass Thickness:
 - 7) Glass Strength: [Heat-Strengthened] [Tempered] [Heat Soak Tested]
 - 8) [Reflective] [Low-E] Coating Orientation: [N/A] Surface # []
2. Performance Characteristics (Center of Glass):

(Note: Verify that the glass type thickness matches the Performance Characteristics listed below.)

 - a. Visible Transmittance _____ %
 - b. Visible Reflectance _____ %
 - c. Winter U-value: _____
 - d. Solar Heat Gain Coefficient (SHGC): _____
 - e. Light to Solar Gain (LSG) _____
3.
 - a. [Provide hermetically sealed IG units with a thermoset silicone spacer incorporating integral 3A desiccant, a triple seal design consisting of a pre-applied acrylic adhesive for glass bonding, a captive polyisobutylene primary air seal and a two part structural silicone secondary air seal, color [black] [grey]].
 - b. [Provide hermetically sealed IG units with dehydrated airspace, dual air seal of [black] [grey] polyisobutylene (PIB), and a secondary seal of [black] [grey] silicone].
4. United States Requirements

- a. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E2190.

F. ENVIROSPAN™ MONOLITHIC CERAMIC SPANDREL GLASS

(Note: For Ceramic Frit Spandrel Glass in an Insulating Glass Unit, use the format for Sealed Insulating Glass (IG) Units substituting this section for the lite (outboard and inboard) that is to have ceramic frit spandrel.)

1. Glass Type:
2. Glass Tint:
3. Nominal Glass Thickness:
4. Ceramic Frit Orientation: Surface# [1] [2]
5. Ceramic Frit Color: [#101 Black] [#102 Green] [#104 Lava Bronze] [#105 Charcoal] [#106 White] [#108 Blue] [#109A Warm Grey] [#109B Subdued Grey] [#100 AE Simulated Acid Etch] [#100 SB Simulated Sandblast] [Satin/Velour/Opaque/Acid Etch] [Custom Color]
6. United States Requirements:
 - a. Heat-treated glass with ceramic coating complying with ASTM C1048, Condition B (spandrel glass, one surface ceramic-coated), Type I (transparent glass, flat), Quality Q3 (Glazing select) with other requirements as specified.
 - b. GANA/GTA 66-9-20, Specification for Heat-Strengthened or Fully Tempered Ceramic Enameled Spandrel Glass used for Building Window/Curtainwalls and Other Applications.

G. WINDUO® SEALED INSULATING GLASS (IG) UNITS WITH ENVIROSPAN™ CERAMIC SPANDREL

1. Insulating Glass Unit Makeup:
 - a. Outboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soak Tested]
 - 5) [Reflective] [Low-E] Coating Orientation: [N/A] Surface #[]
 - b. Airspacer
 - 1) Nominal Thickness:
 - 2) *[JEB 3SEAL Warm Edge Spacer]
Gas Fill: [Air] [Argon (90% initial fill)]
 - c. Inboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: Tempered [Heat Soak Tested]
 - 5) [Reflective] [Low-E] Coating Orientation: [N/A] Surface #[]
2. Performance Characteristics (Center of Glass):

(Note: Verify that the glass type thickness matches the Performance Characteristics listed below.)

 - a. Visible Transmittance _____ %
 - b. Visible Reflectance _____ %
 - c. Winter U-value: _____
 - d. Solar Heat Gain Coefficient (SHGC) _____
 - e. Light to Solar Gain (LSG) _____
3.
 - a. [Provide hermetically sealed IG units with a thermoset silicone spacer incorporating integral 3A desiccant, a triple seal design consisting of a pre-applied acrylic adhesive for glass bonding, a captive polyisobutylene primary air seal and a two part structural silicone secondary air seal, color [black] [grey]].

- b. [Provide hermetically sealed IG units with dehydrated airspace, dual air seal of [black] [grey] polyisobutylene (PIB), and a secondary seal of [black] [grey] silicone].
- 4. United States Requirements
 - a. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E2190.

H. JEB FUSION™ MONOLITHIC TWO-PLY LAMINATED GLASS

(Note: For Two-ply laminated Glass in an Insulating Glass Unit, use the format for Sealed Insulating Glass (IG) Units substituting this section for the lite (outboard or inboard) that is to be multi-ply laminated)

1. Laminated Glass Makeup:

A. Outer-Ply

1. Glass Type:
2. Glass Tint:
3. Nominal Glass Thickness:
4. Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soaked]
5. [Reflective] [Low-E] Coating Orientation: [N/A] Surface # []

B. Interlayer: *(Select appropriate interlayer)*

1. [Polyvinyl Butyral (PVB) Interlayer]

- A. Basis of Design: DuPont™ Butacite® Polyvinyl Butyral (pvb) as manufactured by DuPont Building Innovations. .
- B. Thickness: [0.030] [0.060] [0.090 inch]
- C. Tint: [Clear] [Translucent White-65% VLT]

2. [Ionoplast Interlayer]

- A. Basis of Design: DuPont™ SentryGlas® manufactured by DuPont Building Innovations.
- B. Thickness: [0.035] [0.060] [0.090 inch] [0.100 inch]
- C. Ionoplast Interlayer Physical Properties:
 1. Young's Modulus: 43 kpsi, when tested in accordance with tested ASTM D5026.
 2. Tensile Strength: 5.0 kpsi, when tested in accordance with ASTM D638.
 3. Elongation: 400% when tested in accordance with ASTM D638.
 4. Flex Modulus: 50 kpsi, when tested in accordance with ASTM D790.
 5. Heat Deflection Temperature at 0.46 MPa: 110°F, when tested in accordance with ASTM D648.

D. Inner-Ply

1. Glass Type:
2. Glass Tint: Clear
3. Nominal Glass Thickness:
4. Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soak Tested]
5. [Reflective] [Low-E] coating Orientation: [N/A] [Surface # ___]

I. WINDUO™ SEALED INSULATING GLASS (IG) UNITS WITH JEB FUSION™ LAMINATED GLASS

1. Insulating Glass Unit Makeup:
 - a. Outboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soaked]
 - 5) [Reflective] [Low-E] Coating Orientation:[N/A] Surface # []
 - b. Airspacer
 - 1) Nominal Thickness:
 - 2) *[JEB 3SEAL Warm Edge Spacer]
 - 3) Gas Fill: [Air] [Argon (90% initial fill)]
 - c. Inboard Lite
 - 1) Glass Type:
 - 2) Glass Tint:
 - 3) Nominal Glass Thickness:
 - 4) Glass Strength: [Annealed] [Heat-Strengthened] [Tempered] [Heat Soak]
 - 5) [Reflective] [Low-E] Coating Orientation: [N/A] Surface # []
2. Performance Characteristics (Center of Glass):

(Note: Verify that the glass type thickness matches the Performance Characteristics listed below.)

 - a. Visible Transmittance _____ %
 - b. Visible Reflectance _____ %
 - c. Winter U-value: _____
 - d. Solar Heat Gain Coefficient (SHGC): _____
 - e. Light to Solar Gain (LSG) _____
3.
 - a. [Provide hermetically sealed IG units with a thermoset silicone spacer incorporating integral 3A desiccant, a triple seal design consisting of a pre-applied acrylic adhesive for glass bonding, a captive polyisobutylene primary air seal and a two part structural silicone secondary air seal, color [black] [grey]].
 - b. [Provide hermetically sealed IG units with dehydrated airspace, dual air seal of [black] [grey] polyisobutylene (PIB), and a secondary seal of [black] [grey] silicone.]
4. United States Requirements
 - a. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to ASTM E2190.

PART 3 - EXECUTIONS

3.01 EXAMINATION

- A. Site Verifications and Conditions
 1. Verify that site conditions are acceptable for the installation of the glass.
 2. Verify openings for glazing are correctly sized within tolerance.
 3. Verify that a functioning weep system is present.
 4. Verify that the minimum required face and edge clearances are being followed.
 5. Do not proceed with glazing until satisfactory conditions have been followed.

3.02 PREPARATION

- A. Protection
 1. Handle and store product according to manufacturer's recommendations.

2. Remove coatings and other harmful materials that will prevent glass and glazing installation required to comply with performance criteria specified.

3.03 INSTALLATION

- A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the “GANA Glazing Manual.”
- B. Glass to be protected according to: GANA TD 03-1003 (Reapproved 2008) “Construction Site Protection of Architectural Glass.”
- C. Verify that Insulating Glass (IG) Unit secondary seal is compatible with glazing sealants.
- D. Install glass in prepared glazing channels and other framing members.
- E. Install setting blocks in rabbets as recommended by referenced glazing standards in “GANA Glazing Manual” and “IGMA Glazing Guidelines.”
- F. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by “GANA Glazing Manual.”
- G. Provide weep system as recommended by “GANA Glazing Manual.”
- H. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.
- I. Distribute the weight of glass unit along the edge rather than the corner.
- J. Comply with manufacturers and referenced industry standards on expansion joints and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.
- K. Protect glass edge damage during handling and installation.
- L. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.
- M. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.04 CLEANING

- A. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.
- B. Glass to be cleaned according to:
 1. GANA Glass Informational Bulletin GANA 01-0300 – “Proper Procedure for Cleaning Architectural Glass Products.”
 2. GANA Glass Informational Bulletin GANA TD-02-0402 – “Heat Treated Glass Surfaces are Different.”
 3. GANA Glass Informational Bulletin- GANA DD 01-0608- “Guidelines for Handling and Cleaning Decorative Glass”
- C. Do not use razor blades, scrapers or metal tools to clean glass.

END OF SECTIONS