

**SECTION 08 80 00**  
**GLAZING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

A. This section specifies the following:

1. Glass.
2. Glazing materials and accessories for both factory and field glazed assemblies.

**1.2 RELATED WORK:**

A. Sustainable Design Requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Factory glazed by manufacturer in following units:

1. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
2. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
3. Lead glass: Section 13 49 00, RADIATION PROTECTION.
4. Glazed Curtain Walls: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
5. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: as indicated on drawings.

**1.3 LABELS:**

A. Temporary labels:

1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness. Identify coated side of glass units.
2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
3. Temporary labels are to remain intact until glass is approved by Contracting Officer Representative (COR).

B. Permanent labels:

1. Locate in corner for each pane.
2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
  - a. Tempered glass.
  - b. Laminated glass.
  - c. Organic coated glass.
3. Fire rated glazing assemblies: Mark insuin accordance with IBC.

- A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.
- B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.
  2. Design Wind Pressures: As indicated on construction documents and in accordance with ASCE 7.
  3. Wind Design Data: As indicated on construction documents and in accordance with ASCE 7.
  4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 19 mm (0.75 inch) whichever is less.
- C. Windborne-Debris-Impact Resistance: Comply with enhanced-protection testing requirements in ASTM E1996 for project wind zone when tested according to ASTM E1886, based upon testing of specimens not less than the size required for project and utilizing installation method identical to that specified for project.
1. Project Wind Zone: Wind Zone as indicated on drawings.
  2. Large-Missile Test: For glazing located within 9.1 m (30 feet) of grade.
  3. Small-Missile Test: For glazing located more than 9.1 m (30 feet) above grade.

D. Building Enclosure Vapor Retarder and Air Barrier:

1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

**1.5 SUBMITTALS:**

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Manufacturer's Certificates:

1. Certificate on solar heat gain coefficient when value is specified.
2. Certificate on "R" value when value is specified.

D. Manufacturer Warranty.

E. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Insulating glass units.
3. Transparent (one-way vision glass) mirrors.
4. Elastic compound for metal sash glazing.
5. Glazing cushion.
6. Sealing compound.

F. Samples:

1. Size: 305 mm by 305 mm (12 inches by 12 inches).
2. Tinted glass.

G. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

**1.6 DELIVERY, STORAGE AND HANDLING:**

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

#### **1.7 PROJECT CONDITIONS:**

Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

#### **1.8 WARRANTY:**

- A. Warranty: Conform to terms of "Warranty" Article, FAR clause 52.246-21, except extend warranty period for the following:
1. Insulating glass units to remain sealed and free of obstruction of vision by dust, moisture, or film on interior surfaces of glass for 10 years from the date of manufacture.
  2. Laminated glass units to remain visibly clear without edge separation, delamination affecting vision, and blemishes for 10 years from the date of manufacture.
  3. Coated glass units to remain visibly clear without peeling, cracking, or discoloration for 10 years from the date of manufacture.

#### **1.9 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
- 800.....Test Methods for Sealants
  - 810.1-77.....Expanded Cellular Glazing Tape
- C. American National Standards Institute (ANSI):
- Z97.1-14.....Safety Glazing Material Used in  
Building - Safety Performance Specifications  
and Methods of Test
- D. American Society of Civil Engineers (ASCE):
- 7-10.....Wind Load Provisions
- E. ASTM International (ASTM):
- C864-05(R2011).....Dense Elastomeric Compression Seal Gaskets,  
Setting Blocks, and Spacers
  - C920-14a.....Elastomeric Joint Sealants
  - C1036-11(R2012).....Flat Glass
  - C1048-12.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated  
and Uncoated Glass.

- C1172-14.....Laminated Architectural Flat Glass
- C1349-10.....Standard Specification for Architectural Flat  
Glass Clad Polycarbonate
- C1376-10.....Pyrolytic and Vacuum Deposition Coatings on  
Flat Glass
- E84-14.....Surface Burning Characteristics of Building  
Materials
- E119-14.....Standard Test Methods for Fire Test of Building  
Construction and Material
- E1300-12a.....Load Resistance of Glass in Buildings
- E1886-13a.....Standard Test Method for Performance of  
Exterior Windows, Curtain Walls, Doors, and  
Impact Protective Systems Impacted by  
Missile(s) and Exposed to Cyclic Pressure  
Differentials
- E1996-14a.....Standard Specification for Performance of  
Exterior Windows, Curtain Walls, Doors, and  
Impact Protective Systems Impacted by Windborne  
Debris in Hurricanes
- E2190-10.....Insulating Glass Unit
- F1233-08.....Standard Test Method for Security Glazing  
Materials and Systems
- F1642-12.....Test Method for Glazing and Glazing Systems  
Subject to Airblast Loadings
- F. Code of Federal Regulations (CFR):
- 16 CFR 1201-10.....Safety Standard for Architectural Glazing  
Materials
- G. Glass Association of North America (GANA):
- 2010 Edition.....GANA Glazing Manual
- 2008 Edition.....GANA Sealant Manual
- 2009 Edition.....GANA Laminated Glazing Reference Manual
- 2010 Edition.....GANA Protective Glazing Reference Manual
- H. International Code Council (ICC):
- IBC.....International Building Code
- I. Insulating Glass Certification Council (IGCC)
- J. Insulating Glass Manufacturer Alliance (IGMA):

TM-3000.....North American Glazing Guidelines for Sealed  
 Insulating Glass Units for Commercial and  
 Residential Use

K. Intertek Testing Services - Warnock Hersey (ITS-WHI)

L. National Fire Protection Association (NFPA):

80-16.....Fire Doors and Windows

252-12.....Fire Tests of Door Assemblies

257-12.....Standard on Fire Test for Window and Glass  
 Block Assemblies

M. National Fenestration Rating Council (NFRC)

N. Safety Glazing Certification Council (SGCC) 2012:

Certified Products Directory (Issued Semi-Annually).

O. Underwriters Laboratories, Inc. (UL):

9-08(R2009).....Fire Tests of Window Assemblies

263-14.....Fire Tests of Building Construction and  
 Materials

P. U.S. Veterans Administration:

Physical Security Design Manual for VA Facilities (VAPSDG); Life Safety  
 Protected

Physical Security Design Manual for VA Facilities (VAPSDG); Mission  
 Critical Facilities

Architectural Design Manual for VA Facilities (VASDM)

Q. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission  
 Standards for Consumer and Commercial Products

## **PART 2 - PRODUCT**

### **2.1 GLASS:**

A. Provide minimum thickness stated and as additionally required to meet  
 performance requirements.

1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise  
 indicated.

B. Obtain glass units from single source from single manufacturer for each  
 glass type.

C. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality q3.

D. Low-emissivity-coated glass: ASTM C1036, Type I, Class 2, Quality q3.

**2.2 HEAT-TREATED GLASS:**

- A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:
  - 1. Maximum peak to valley rollerwave 0.003" (0.08mm) in the central area and 0.008" (0.20mm) within 10.5" (267mm) of the leading and trailing edge.
  - 2. For clear or low-iron glass 1/4" to 3/8" thick without ceramic frit or ink, maximum + or - 100mD (millidiopter) over 95% of the glass surface.
  - 3. Maximum bow and warp 1/32" per lineal foot (0.79mm).
- B. Clear Heat-Strengthened Float Glass: ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
- C. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

**2.3 COATED GLASS**

- A. Ceramic Coated Spandrel Glass: ASTM C1048, Kind HS or FT, Condition B, Type I, Quality q3 with ceramic coating applied over and fused into glass surface.

**2.4 LAMINATED GLASS:**

- A. Laminated Glass: ASTM C1172. Two or more lites of glass bonded with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent-resin interlayer complying with interlayer manufacturer's written instructions.
- B. Interlayer: Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing unless otherwise indicated in construction documents.
- C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
  - 3. Assemblies requiring heat strengthened or fully tempered glass.
- D. Interlayer: Use 2.28 mm (0.090 inch) thick interlayer where required to meet performance requirements.
- E. Interlayer Color: Clear.

**2.5 INSULATING GLASS UNITS:**

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.
- B. Assemble units using glass types specified in Insulating Glass Schedule.

**2.6 GLAZING ACCESSORIES:**

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work are to have a finish that will not corrode or stain while in service. Fire rated glazing to be installed with glazing accessories in accordance with the manufacturer's installation instructions.
- B. Installation sealants, adhesives and coatings shall comply with specified VOC limits. Refer to 01 81 11 / 01 81 13 Sustainable Requirements for additional details.
- C. Setting Blocks: ASTM C864:
  - 1. Channel shape; having 6 mm (1/4 inch) internal depth.
  - 2. Shore A hardness of 80 to 90 Durometer.
  - 3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
  - 4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
  - 5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- D. Spacers: ASTM C864:
  - 1. Channel shape having a 6 mm (1/4 inch) internal depth.
  - 2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
  - 3. Lengths: One to 25 to 76 mm (one to three inches).
  - 4. Shore a hardness of 40 to 50 Durometer.
- E. Glazing Tapes:
  - 1. Semi-solid polymeric based closed cell material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
  - 2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
  - 3. Complying with AAMA 800 for the following types:
    - a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
    - b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- F. Glazing Gaskets: ASTM C864:
  - 1. Firm dense wedge shape for locking in sash.



2. Soft, closed cell with locking key for sash key.
  3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- G. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- H. Glazing Sealants: ASTM C920, silicone neutral cure:
1. Type S.
  2. Class 25 or 50 as recommended by manufacturer for application.
  3. Grade NS.
  4. Shore A hardness of 25 to 30 Durometer.
  5. VOC Content: For sealants used inside the weatherproofing system, not more than 250 g/L or less when calculating according to 40 CFR 59, (EPA Method 24).
- I. Structural Sealant: ASTM C920, silicone acetoxo cure:
1. Type S.
  2. Class 25.
  3. Grade NS.
  4. Shore a hardness of 25 to 30 Durometer.
- J. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
  2. Designed for dry glazing.
- K. Color:
1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to match color of the finished aluminum and be nonstaining.
  2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted are to be black, gray, or neutral color.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION:**

- A. Verification of Conditions:
1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
  2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturers approved shop drawings.

- B. Do not proceed with installation until above conditions have been verified or corrected, at no additional cost to government.
- C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

### **3.2 PREPARATION:**

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.
- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

### **3.3 INSTALLATION - GENERAL:**

- A. Install in accordance with GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- G. Laminated Glass:
  - 1. Tape edges to seal interlayer and protect from glazing sealants.
  - 2. Do not use putty or glazing compounds.
- H. Insulating Glass Units:
  - 1. Glaze in compliance with glass manufacturer's written instructions.
  - 2. When glazing gaskets are used, they are to be of sufficient size and depth to cover glass seal or metal channel frame completely.
  - 3. Do not use putty or glazing compounds.
  - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.

5. Install with tape or gunnable sealant in wood sash.

I. Fire Protective and Fire Resistance Glass:

1. Fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.

**3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING):**

- A. Cut glazing spline to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Trim protruding tape edge.

**3.5 REPLACEMENT AND CLEANING:**

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

**3.6 PROTECTION:**

- A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

**3.7 MONOLITHIC GLASS SCHEDULE:**

- A. Glass Type MG# 1: Clear fully tempered float glass.
  1. Unit Thickness: 6 mm (0.23 inch).
  2. Safety glazing label required.
  3. Location: Vision lites at interior doors and borrowed lite.
- B. Glass Type MG# 2: Tinted fully tempered float glass.
  1. Unit Thickness: 6 mm (0.23 inch).
  2. Tint Color: Bronze.
  3. Visible Light Transmittance: 37 percent minimum.
  4. Solar Heat Gain Coefficient: 0.21 maximum.
  5. Safety glazing label required.

- 6. Location: Exterior glazing.
- C. Glass Type MG#3: Ceramic-coated fully tempered spandrel glass.
  - 1. Unit Thickness: 6 mm (0.23 inch).
  - 2. Tint Color: Bronze.
  - 3. Safety glazing label required.
  - 4. Location: Exterior glazing.

### **3.8 LAMINATED GLASS SCHEDULE**

- A. Glass Type LG# 1: Clear laminated glass with two plies of fully tempered float glass.
  - 1. Minimum Thickness of Each Glass Ply: 3 mm.
  - 2. Interlayer Thickness: 0.76 mm (0.030 inch).
  - 3. Safety glazing required.
  - 4. Application: Interior glazing of units unless otherwise scheduled.

### **3.9 INSULATING-LAMINATED GLASS SCHEDULE:**

- A. Glass Type IG# 1: VNE 4-63 Bronze insulating glass with RoomSide Low-E.
  - 1. Overall Unit Thickness: 25 mm (1 inch).
  - 2. Minimum Thickness of Outdoor Lite: 6 mm bronze with VNE-63 #2.
  - 3. Outdoor Lite: Heat-strengthened float glass, except fully tempered float glass where required.
  - 4. Interspace Content: Air with black Extreme Edge Spacer.
  - 5. Indoor Lite: Clear, laminated glass with two plies of heat-strengthened float glass with Roomside Low-E #4, and fully tempered float glass where required.
    - a. Minimum Thickness of Each Glass Ply: 3 mm.
    - b. Interlayer Thickness: 0.76 mm (0.030).
  - 6. Visible Light Transmittance: 37 percent minimum.
  - 7. Solar Heat Gain Coefficient: .21 maximum.
  - 8. Winter U-value: .23
  - 9. Safety glazing required.
  - 10. Location: All exterior glazing except spandrel glazing.

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