

**SECTION 088000**

**GLAZING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies glass, plastic, related glazing materials and accessories. Glazing products specified apply to factory or field glazed items.

**1.2 RELATED WORK**

- A. Factory glazed by manufacturer in following units:
  - 1. Sound resistant doors: Section 081113, HOLLOW METAL DOORS AND FRAMES, and Section 081400, WOOD DOORS.
  - 2. Mirrors: Section 102800, TOILET, BATH, AND LAUNDRY ACCESSORIES.

**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.
  - 2. Temporary labels shall remain intact until glass is approved by Resident Engineer.
- B. Permanent labels:
  - 1. Locate in corner for each pane.
  - 2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
    - a. Tempered glass.
    - b. Laminated glass or have certificate for panes without permanent label.

**1.4 PERFORMANCE REQUIREMENTS**

- A. Glass Thickness:
  - 1. Test in accordance with ASTM E 1300.
  - 2. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
  - 3. Coordinate with Physical Security Design Manual requirements.

**1.5 SUBMITTALS**

- A. In accordance with Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Warranty: Submit written guaranty, conforming to General Condition requirements, and to Warranty of Construction Article in this Section.

C. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Elastic compound for metal sash glazing.
3. Glazing cushion.
4. Sealing compound.

D. 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.

D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":

1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling shall comply with Manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
2. Temporary protections: The glass front and polycarbonate back of glazing shall be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces shall be approved and applied by manufacturer.
3. Edge protection: To cushion and protect glass clad, polycarbonate, and Noviflex edges from contamination or foreign matter, the four edges shall be sealed the depth of glazing with continuous standard-thickness Santoprene tape. Alternatively, continuous channel shaped extrusion of Santoprene shall be used, with flanges extending into face sides of glazing.

4. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 C, during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

#### **1.7 PROJECT CONDITIONS**

- A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

#### **1.8 WARRANTY**

- A. Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21, except extend warranty period for the following:
  1. Laminated glass units to remain laminated for 5 years.
  2. Polycarbonate to remain clear and ultraviolet light stabilized for 5 years.

#### **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 National Standards Institute (ANSI):
  1. Z97.1-09 Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test.
- C. American Society for Testing and Materials (ASTM):
  1. C716-06 Installing Lock-Strip Gaskets and Infill Glazing Materials.
  2. C794-10 Adhesion-in-Peel of Elastomeric Joint Sealants
  3. C864-05 Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
  4. C920-11 Elastomeric Joint Sealants
  5. C1036-06 Flat Glass
  6. C1048-12 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
  7. D635-10 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position
  8. E84-10 Surface Burning Characteristics of Building Materials
  9. E119-10 Standard Test Methods for Fire Test of Building Construction and Material
- D. Commercial Item Description (CID):
  1. A-A-59502 Plastic Sheet, Polycarbonate
- E. Code of Federal Regulations (CFR):

- F. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 2010
- G. National Fire Protection Association (NFPA):
  - 1. 80-13 Fire Doors and Windows.
  - 2. 252-12 Standard Method of Fire Test of Door Assemblies
  - 3. 257-12 Standard on Fire Test for Window and Glass Block Assemblies
- H. National Fenestration Rating Council (NFRC)
- I. Safety Glazing Certification Council (SGCC) 2012:
- J. Certified Products Directory (Issued Semi-Annually).
- K. Unified Facilities Criteria (UFC):
  - 1. 4-010-01-2012 DOD Minimum Antiterrorism Standards for Buildings
- L. Glass Association of North America (GANA):
- M. Glazing Manual (Latest Edition)
- N. Sealant Manual (2009)
- O. American Society of Civil Engineers (ASCE):
  - 1. ASCE 7-10 Wind Load Provisions

## **PART 2 - PRODUCT**

### **2.1 GLASS**

- A. Use thickness stated unless specified otherwise in assemblies.
- B. Clear Glass:
  - 1. ASTM C1036, Type I, Class 1, Quality q3.
  - 2. Thickness, 6 mm (1/4 inch).

### **2.2 HEAT-TREATED GLASS**

- A. Clear Tempered Glass:
  - 1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
  - 2. Thickness, 6 mm (1/4 inch).
- B. Tempered Patterned Glass (obscure):
  - 1. Thickness 10.7 mm (0.422 inch) unless otherwise indicated on Drawings.

### **2.3 LAMINATED GLASS**

- A. Two or more lites of glass bonded with an interlayer material for use in building glazing
- B. Use 1.5 mm (0.060 inch) thick interlayer for:
  - 1. Acoustical glazing.
  - 2. Heat strengthened or fully tempered glass assemblies.

- C. Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing where 1.5 mm (0.060 inch) interlayer is not otherwise shown or required.

#### **2.4 LAMINATED GLAZING ASSEMBLIES**

- A. Clear Glazing:
  - 1. Both panes clear glass ASTM C1036, Type I, Class 1, Quality q3.
  - 2. Thickness: Each pane, as indicated.
- B. Clear Tempered Glazing:
  - 1. Both panes ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
  - 2. Thickness: Each pane as indicated.
- C. Decorative Laminated Glazing:
  - 1. Both panes ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3; etched tempered.
  - 2. Interlayer: 0.060 colored PVB; color as indicated in Finish Legend; linear pattern.
  - 3. Thickness: 1/4-inch each pane; 9/16-inch laminated unit.
  - 4. STC Rating: 39.

#### **2.5 GLASS CLAD POLYCARBONATE SECURITY GLAZING ASSEMBLY**

- A. Use 1.3 mm (0.050 inch) polyurethane sheeting for interlayer between glass and polycarbonate.
- B. Clear Heat Strengthened Glass Clad Polycarbonate.
  - 1. Use ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3, outer glass panes.
  - 2. Use clear polycarbonate sheet, 3 mm (1/8 inch) thick core.
  - 3. Thickness, 11 mm (7/16 inch).
- C. Clear Tempered Glass Clad Polycarbonate:
  - 1. Use ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, 3 mm (1/8 inch) thick outer glass panes.
  - 2. Use clear polycarbonate sheet, 3 mm (1/8 inch) thick core.
  - 3. Thickness, 11 mm (7/16 inch).
- D. Maximum Allowable Area: Laminated glazing shall not exceed 1.32 meter square unless glazing has been certified.

#### **2.6 INSULATING GLASS UNITS**

- A. Assemble units using glass types specified:

#### **2.7 FIRE RESISTANT GLASS WITHOUT WIRE MESH**

- A. Type 1 (Transparent float glass), Class 1 (Clear).
- B. Fire-protective glass products used to protect against smoke and flames only shall be rated for 20 or 45 minutes as required by

local building code and shall be tested in accordance with NFPA 252 (Standard Methods of Fire Tests of Door Assemblies) and NFPA 257 (Standard on Fire Test for Window and Glass Block Assemblies)

- C. Fire-resistive products used to protect against smoke, flame, and the transmission of radiant heat shall be rated for 60, 90, or 120 minutes and shall be tested in accordance with NFPA 252, NFPA 257, and ASTM E119 (Standard Test Methods for Fire Tests of Building Construction and Materials).
- D. Fire-rated glass or glass assembly shall be classified by Underwriters Laboratory (UL), Intertek Testing Services- Warnock Hersey (ITS-WHI) or any other OSHA certified testing laboratory. All glass shall bear a permanent mark of classification in accordance with local building code.
- E. Maximum size is per the manufacturer's test agency listing for doors, transoms, side lights, borrowed lights, and windows.
- F. Where safety glazing is required by local building code, fire-rated glass shall be tested in accordance with CPSC 16 CFR 1201 Category I or II and bear a permanent mark of classification.
  - 1. Category I products are limited to 0.84 m<sup>2</sup> - 9 ft<sup>2</sup> and tested to no less than 203 Nm-150 ft-lbs impact loading.
  - 2. Category II products are greater than 0.84 m<sup>2</sup> - 9 ft<sup>2</sup> and tested to no less than 542 Nm-400 ft-lbs impact loading. Category II products can be used in lieu of Category I products.

## **2.8 MAGNETIC MARKER GLASS**

### **A. Materials:**

- 1. Mounting Hardware: Minimum of one horizontal Z-Clip per board, secured as a wall-mount, in length consistent to the glass width.
- 2. Sheet Products:
  - a. Steel: 0.024-inch-thick steel backer, powder-coated with white paint and adhered to glass.
  - b. Face Sheet: 1/4-inch thick tempered, low-iron glass panel with polished edges on all sides, meeting all ANSI Z97.1 specifications.
  - c. Coatings: Dual application, zero-VOC, water-based paint, 100 percent opacity with consistent uniformity across entire board.
  - d. Adhesive: Permanent silicon acrylic.

## **2.9 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 shall have a finish that will not corrode or stain while in service.
- B. 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.
- C. 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.
- D. Sealing Tapes:
1. Semi-solid polymeric based 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.
- E. 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.
- F. Glazing Sealants: ASTM C920, silicone neutral cure:
1. Type S.
  2. Class 25
  3. Grade NS.
  4. Shore A hardness of 25 to 30 Durometer.
- G. 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.
- H. Color:
1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall 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 shall 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 manufacturer's approved shop drawings.
- B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do not proceed with installation until unsatisfactory conditions have been corrected.
- 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-02 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-01 Glazing Manual and GANA-02 Sealant Manual 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. Fire Resistant Glass:

1. Other fire resistant glass: Glaze in accordance with UL design requirements.

**3.4 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)**

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- 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 tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- 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 Resident Engineer.
- 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 GLAZING SCHEDULE**

- A. Fire Resistant Glass:
  - 1. Use Fire Resistant Glass without wire mesh unless otherwise indicated
- B. Tempered Glass:
  - 1. Install in full and half glazed doors unless indicated otherwise.
  - 2. Use clear tempered glass on interior side lights and doors unless otherwise indicated or specified.
- C. Laminated Glass: Install as specified in doors, observation windows and interior pane of dual glazed windows where indicated.

1. Provide laminated glass for all windows in Psychiatric Nursing Units, Alcohol Dependency Treatment Nursing Units, Drug Abuse Treatment Nursing Units and Security Bedrooms. Laminated glass shall be 7/16-in thick in locked patient units and security rooms, 5/16-in thick elsewhere.(min. 1.5 mm interlayer).

**D. Pattern Glass (obscure):**

1. Install in interior pane of dual glazed windows where indicated.

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