

**SECTION 08 80 00
GLAZING**

PART 1 - GENERAL

1.1 DESCRIPTION

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. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
2. Lead glass: Section 13 49 00, RADIATION PROTECTION.
3. Section 08 41 13, ALUMINUM FRAMED ENTRANCES AND STOREFRONT.
4. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
5. Section 08 56 19 PASS WINDOWS
6. Color of spandrel glass, and tinted (heat absorbing or light reducing) glass: Section 09 06 00, SCHEDULE FOR FINISHES.

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. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
3. Temporary labels shall remain intact until glass is approved by COR.

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. 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.

B. Glass Thickness:

1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with applicable code.
2. Test in accordance with ASTM E 1300.
3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

C. Blast resistance glass assemblies:

1. For blast resistant windows follow Unified Facilities Criteria, DOD Minimum Antiterrorism Standards for Buildings UFC4-010-01.
2. Spall Resistance: Laminated glazing shall not produce spall to interior (protected side) when impacted with scheduled ballistics. Tolerances:
3. Outside dimensions: Overall outside dimensions (height and width) of laminated security glazing shall maintain tolerance of ± 3 mm.
4. Warpage: Out-of-flat (warpage or bowing) condition of laminates shall not exceed 2.5 mm per lineal meter. The condition, if present, shall be localized to extent not greater than 0.75 mm for any 0.3 meter section.
5. Coordinate with Physical Security Design Manual requirements.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Certificates:
 1. Certificate on shading coefficient.
 2. Certificate on "R" value when value is specified.
 3. Certificate that blast resistant glass meets the requirements of UFC4-010-01.
- C. Warranty: Submit written guaranty, conforming to General Condition requirements, and to "Warranty of Construction" Article in this Section.
- D. Manufacturer's Literature and Data:
 1. Glass, each kind required.
 2. Insulating glass units.
 3. Elastic compound for metal sash glazing.
 4. Glazing cushion.
 5. Sealing compound.
 6. Plastic glazing material, each type required.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).
2. Spandrel glass.
3. Coated Glass.
4. Fire Resistant Glass.

F. 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. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
 3. 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.

4. 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.
5. 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. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
 2. Insulating glass units to remain sealed for 10 years.
 3. Laminated glass units to remain laminated for 5 years.
 4. Polycarbonate to remain clear and ultraviolet light stabilized for 5 years.
 5. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for 10 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):

Z97.1-04.....Safety Glazing Material Used in Building -
Safety Performance Specifications and Methods
of Test.

C. American Society for Testing and Materials (ASTM):

C1363-05.....Thermal Performance of Building Assemblies, by
Means of A Hot Box Apparatus
C542-05.....Lock-Strip Gaskets.
C716-06.....Installing Lock-Strip Gaskets and Infill
Glazing Materials.
C794-06.....Adhesion-in-Peel of Elastomeric Joint Sealants.
C864-05.....Dense Elastomeric Compression Seal Gaskets,
Setting Blocks, and Spacers.
C920-08.....Elastomeric Joint Sealants.
C964-07.....Standard Guide for Lock-Strip Gasket Glazing.
C1036-06.....Flat Glass.
C1048-04.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass.
C1172-09.....Laminated Architectural Flat Glass.
C1376-10.....Pyrolytic and Vacuum Deposition Coatings on
Flat Glass.
D635-06.....Rate of Burning and/or Extent and Time of
Burning of Self-Supporting Plastic in a
Horizontal Position.
D4802-02.....Poly (Methyl Methacrylate) Acrylic Plastic
Sheet.
E84-09.....Surface Burning Characteristics of Building
Materials.
E1300-09.....Determining Load Resistance of Glass in
Buildings.
E2190-08.....Insulating Glass Unit

D. Commercial Item Description (CID):

A-A-59502.....Plastic Sheet, Polycarbonate

E. Code of Federal Regulations (CFR):

16 CFR 1201 - Safety Standard for Architectural Glazing Materials;
1977, with 1984 Revision.

F. National Fire Protection Association (NFPA):

80-08.....Fire Doors and Windows.

G. National Fenestration Rating Council (NFRC)

- H. Safety Glazing Certification Council (SGCC)2009:
Certified Products Directory (Issued Semi-Annually).
- I. Underwriters Laboratories, Inc. (UL):
752-06.....Bullet-Resisting Equipment.
- J. Unified Facilities Criteria (UFC):
4-010-01-2007.....DOD Minimum Antiterrorism Standards for
Buildings
- K. Glass Association of North America (GANA):
Glazing Manual (Latest Edition)
Sealant Manual (2008)
- L. American Society of Civil Engineers (ASCE):
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, (1/4 inch), as indicated.

2.2 HEAT-TREATED GLASS (G-4)

- A. Clear Tempered Glass:
 - 1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
 - 2. Thickness, 6 mm (1/4 inch).

2.3 COATED GLASS

- A. Low-E Tempered Glass:
 - 1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with
low emissivity magnetic sputter vacuum deposition coating.
 - 2. Apply coating to first surface.
 - 3. Thickness, 6 mm (1/4 inch) as indicated.

2.4 LAMINATED GLASS

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

- D. 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.

2.5 GLASS CLAD POLYCARBONATE SECURITY GLAZING ASSEMBLY (G-6)

- 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 FIRE RESISTANT GLASS WITHOUT WIRE MESH (G-5)

- A. Fire resistant glass or glass assembly classified by UL in Building Materials Directory or other approved testing laboratory bearing permanent mark of classification.
- B. Firelite.
 - 1. UL listing R13377-1, 4.8 mm (3/16 inch) thick, unpolished.
 - 2. Distributed by Technical Glass Products; Kirkland, WA 98033.
- C. Pyrovue Commercial.
 - 1. UL listing R10178(N), 41 mm (1-5/8 inch) thick.
 - 2. Represented by Advanced Glass Systems Corporation, Trumbauersville, PA 18970-0051

2.7 INSULATING GLASS UNITS (G-1)

- 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:
- C. Sealed Edge Units (SEU):
 - 1. Insulating Glass Unit Makeup
 - a. Outboard Lite
 - 1. Glass type: Clear

- 2. Glass Tint: None
- 3. Nominal Thickness: 1/4"
- 4. Glass Strength: Annealed
- 5. Coating Orientation: Surface #2
- b. Spacer
 - 1. Nominal Thickness: 1/2"
 - 2. Gas Fill: (Air)
- c. Inboard Lite
 - 1. Glass Type: Low emissivity coated
 - 2. Glass Tint: None
 - 3. Nominal Thickness: 1/4"
 - 4. Glass Strength: Heat treated
 - 5. Coating Orientation: N/A
- 2. Performance Characteristics (Center of Glass)
 - a. Visible Transmittance: 70%
 - b. Visible Reflectance: 11%
 - c. Winter U-factor (U-value): .29
 - d. Shading Coefficient (SC): .44
 - e. Solar heat Gain Coefficient (SHGC): .38

2.8 LAMINATED GLAZING ASSEMBLIES (G-2), SPANDREL (G-3)

- A. Outboard Lite - Laminated glass
 - 1. Thickness: [0.060] inch.
- B. Inboard Lite - Coated glass
 - 1. Visible Light Transmittance: **62** percent minimum.
 - 2. Winter Nighttime U-Factor: **0.28** maximum.
 - 3. Summer Daytime U-Factor: **0.26** maximum.
 - 4. Solar Heat Gain Coefficient: **0.35** maximum.
 - 5. Outdoor Visible Reflectance: **13** percent maximum
 - 6. Light to Solar Gain (LSG): **1.75** minimum.

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. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.
- 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
 3. Grade NS.
 4. Shore A hardness of 25 to 30 Durometer.
- I. 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.

J. 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.

K. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control. Comply with requirements of local Fire Department.

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. Insulating Glass Units:
 - 1. Glaze in compliance with glass manufacturer's written instructions.
 - 2. When glazing gaskets are used, they shall 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 Resistant Glass:
 - 2. Other fire resistant glass: Glaze in accordance with UL design requirements.
- J. Polycarbonate Material:
 - 1. Glaze as recommended by manufacturer, using glazing material which will permit expansion and contraction of the bullet resistive material in the frame.
 - 2. The polycarbonate surface shall not be cleaned by scraping, razor blade, squeegee, or use of highly alkaline cleaner. At no time shall polycarbonate material be exposed to chemical solvents (benzene, gasoline, acetone, paint thinners) or aromatic hydrocarbons (toluene or xylene), nor shall any of these solvents or fumes be used or present in confined area such as Marine Guard Booth. Due care shall be exercised (paint formula, ventilation, protection of polycarbonate) when painting becomes necessary to interiors of rooms

of hardline glazed units; exposure to chemical solvents could result in irreparable damage to security glazings (delaminations, distortions, cracks, severe stress crazing, air bubbles).

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

- A. Cut glazing tape 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 GLAZING SCHEDULE

- A. Install glass type as indicated on drawings

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