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. Sound resistant doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
2. Revolving doors: Section 08 42 33, REVOLVING DOOR ENTRNCES.
3. Forced Entry (FE) resistant and Ballistic Resistance (BR) rated glazing and frames: 08 56 53 SECURITY WINDOWS
4. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
5. Bullet resisting glass: Section 08 56 59, SERVICE AND TELLER WINDOW UNITS.
6. Lead glass: Section 13 49 00, RADIATION PROTECTION.
7. Section 08 51 13, ALUMINUM WINDOWS (Single // Double // Triple // Hung).
8. Section 08 51 13.11, SIDE HINGED ALUMINUM WINDOWS (Double Glazed).
9. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
10. Section 08 56 53 SECURITY WINDOWS.
11. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 09 06 00, SCHEDULE FOR FINISHES.
12. Forced Entry (FE) resistant and Ballistic Resistance (BR) rated doors and frames: Section 08 34 53, SECURITY DOORS AND FRAMES.
13. Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
14. Section 28 16 11, INTRUSION DETECTION SYSTEM.

1.3 LABELS

A. Temporary labels:

1. Provide temporary label on each light of glass // and plastic material // 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 // and plastic material // 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.
   c. Organic coated glass.
3. Bullet resistance glass or plastic assemblies:
   a. Bullet resistance glass or plastic assemblies in accordance with UL 752 requirements for power rating specified.
   b. Identify each security glazing permanently with glazing manufacturer's name, date of manufacture, product number, and DOS Code number inconspicuously located in lower corner on protective side and visible after glazing is framed.
   c. The "attack (threat) side" shall be identified in bold lettering on each side of glazing with removable 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 // ASCE 7 // applicable // code.
2. Test in accordance with ASTM E 1300.
3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

C. Bullet resistance glass or plastic 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. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.
   2. Certificate on shading coefficient.
   3. Certificate on "R" value when value is specified.
   4. Certificate test reports confirming compliance’s with specified bullet resistive rating.
   5. 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. Transparent (one-way vision glass) mirrors.
   4. Elastic compound for metal sash glazing.
   5. Putty, for wood sash glazing.
   6. Glazing cushion.
   7. Sealing compound.

8. Bullet resistive material.
9. Plastic glazing material, each type required.

E. Samples:
1. Size: 150 mm by 150 mm (6 inches by 6 inches).
2. Tinted glass.
3. Reflective glass.
4. Transparent (one-way vision glass) mirrors.

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

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 // // q4 //.
2. Thickness, // 6 mm (1/4 inch) // //as indicated //.
3. Coordinate color/tint/coating to accommodate required security monitoring.

C. Tinted Heat reflective and low emissivity coated glass:
1. ASTM C1036, Type I, Class 2, Quality q3.
2. Color:
3. Thickness, // 6 mm (1/4 inch) // // as indicated //.

D. Patterned and Wired Flat Glass:
1. ASTM C1036, Type II, Class 1,Form 1, Pattern Pl, Finish F1, Quality // Q5 // // Q6 //, Mesh // m1 // // m2 //.
2. Thickness, // 6 mm (1/4 inch) // // as indicated //.

2.2 HEAT-TREATED GLASS

A. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness, // 3 mm (1/8 inch) // // 6 mm (1/4 inch) // // as indicated //.

B. Tinted Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 2, Quality q3.
2. Color: ___.
3. Thickness, // 6 mm (1/4 inch) // // as indicated //.

C. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, // 6 mm (1/4 inch) // // as indicated //.

D. Tinted Tempered Glass.

1. ASTM C1048, Kind FT, Condition A, Type I, Class 2, Quality q3.
2. Color: ____
3. Thickness, // 6 mm (1/4 inch) // // as indicated //.

E. Tempered Patterned Glass (obscure):

1. ASTM C1048, Kind FT, Type II, Class 1, Form 3, Quality q8, Finish f1, Pattern p3.
2. Thickness // 10.7 mm (0.422 inch) // // as indicated //.

2.3 COATED GLASS

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.
2. Thickness, // 6 mm (1/4 inch) // // as indicated //.

B. Reflective Tempered Glass:

1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with reflective metallic coating, having nominal values of 25 percent day light, 30 percent solar, and 7.9 percent ultraviolet transmittance within three percent plus or minus.
2. Thickness, // 6 mm (1/4 inch) // // as indicated //.

C. Low-E Tempered Glass:

1. ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with low emissivity pyrolytic coating having an E of 0.15.
2. Apply coating to // second // third // surface of insulating glass units.
3. Thickness, // 4.8 mm (3/16 inch) // // as indicated //.

D. Ceramic Coated Vision Glass:
   1. ASTM C1048, Kind // HS // // FT //, Condition C, Type I, Class // 1 // // 2 // // 3 //, Quality q3 with ceramic coating applied by silk-screen process.
   2. Pattern as indicated in Drawings.
   3. Apply coating to // second surface of monolithic glass // // second // // third // // fourth // surface of // insulating glass units // // laminated glass //.
   4. Thickness, // 6 mm (1/4 inch) // // as indicated //.
E. Ceramic Coated Spandrel Glass:
   1. ASTM C1048, Kind // HS // // FT //, Condition B, Type I, Class // 1 // // 2 // // 3 //, Quality q3 with ceramic coating applied over and fused into glass surface.
   2. Pattern as indicated in drawings.
   3. Apply coating to second surface.
   4. Thickness, // 6 mm (1/4 inch) // // as indicated //.
F. Organic Coated Glass:
   1. Optional for tempered, heat strengthened, or laminated glass.
   2. Polyester coated to obtain safety glazing ANSI Z97.1 and SGCC label.
   3. Applied to // clear // // tinted // //or patterned // glass.
G. Transparent Mirror (One-Way-Vision Glass):
   1. ASTM C1036, Type I, Class 1, Quality q2 or Class 3, Quality q3; Grey Glass.
   2. Thickness, // 6 mm (1/4 inch) // //as indicated //.
   3. Coated one face with a hard adherent reflective film of chromium or other coating of proven equivalent durability.
   4. Visible light transmittance; eight percent, plus or minus two percent.
   5. Visible reflectance; sixty percent, plus or minus five percent.
   6. Light ratio; mirror side 10 or more; observer side one or less.
   7. Assemble with coating covered and protected with a layer of clear glass not less than 3 mm (1/8 inch) thick.
   8. Clean interface glass prior to assembly.
   9. Tape edge to seal interface and hold panes together.

2.4 PLASTIC

Thickness	**Long Dimension of Sheet**
3 mm (0.125 inch)	600 mm (24 inches or less)
5 mm (0.187 inch)	600 - 900 mm (24 through 36 inches).
6.5 mm (0.250 inch)	900 – 1500 mm (36 through 60 inches).

4. For polycarbonate use not less than the following minimum thickness:

Thickness	Long Dimension of Sheet	Edge Lap
3 mm (0.125 inch)	600 – 1200 mm (24 through 48 inches).	19 mm (3/4 inch)
9.5 mm (0.375 inch)	1200 - 1500 mm (48 through 60 inches).	25 mm (3/4 inch)
13 mm (0.50 inch)	1500 mm (Over 60 inches).	25 mm (1 inch)

A. Clear Acrylic Sheet:
   1. ASTM D4802. Type UVF, Category A-1, clear, smooth both sides, and formulated with ultraviolet absorber.
   2. Thickness, as indicated.
B. Clear Acrylic Sheet, Abrasion Resistant:
   1. ASTM D4802. Type UVF, Category A-1, Finish 3, clear, smooth, formulated with ultraviolet absorber, and having an abrasive resistant coating on both sides.
   2. Thickness, as indicated.
C. Clear Polycarbonate Sheet:
   1. Fed. Spec. A-A-59502, Type I, standard sheet, Class 1, ultraviolet light stabilized. Flame spread of 10 or less when tested per ASTM E84.

2. Thickness, as indicated.

D. Clear Polycarbonate Sheet, Abrasion Resistant:

1. Fed. Spec. A-A-59502, Type III, coated mar resistant, Class 1, ultraviolet light stabilized, Grade A, High abrasion resistance. Flame spread of 10 or less when tested per ASTM E84.
2. Thickness, as indicated.

2.5 LAMINATED GLASS

A. Two or more lites of glass bonded with an interlayer material for use in building glazing

B. Colored Interlayer:

1. Use color interlayer ultraviolet light color stabilization.
2. Option: Use colored interlayer with clear glass in lieu of tinted glass and clear interlayer.
3. Option: Use white interlayer with clear glass in lieu of obscure glass and clear interlayer.
4. The interlayer assembly shall have uniform color presenting same appearance as tinted glass assembly.

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 assembles.

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.

2.6 LAMINATED GLAZING ASSEMBLIES

A. Clear Glazing:

1. Both panes clear glass ASTM C1036, Type I, Class 1, Quality q3.
2. Thickness: Each pane, // 3 mm (1/8 inch) thick // // 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 // 4.8 mm (3/16 inch) thick // // as indicated // // ____ //.

C. Tinted Tempered Glazing:
   1. Exterior pane ASTM C1036, Type I, Class 3, Quality q3, // 3 mm (1/8 inch) // // ____ // thick.
   2. Interior pane ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, // 3 mm (1/8 inch) // // ____ // thick.
D. Clear Heat Strengthened Glazing:
   1. Both panes, ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
   2. Thickness: Each pane, // 3 mm (1/8 inch) thick // // as indicated // // ____ //.
E. Tinted Heat Strengthened Glazing:
   1. Both panes, ASTM C1048, Kind HS, Condition A, Type I, Class 2, Quality q3.
   2. Thickness: Each pane, // 3 mm (1/8 inch) thick // // as indicated // // ____ //.
F. Tempered Obscure Glazing:
   1. One pane ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3, // 3 mm (1/8 inch) // // ____ // thick.
   2. One pane ASTM C1048, Kind FT, Type II, Class 1, Form 3, Quality q8, Finish f1, Pattern p__, // 3 mm (1/8 inch)// // ____ // thick.

2.7 BULLET RESISTIVE ASSEMBLY

A. Provide protection listed by UL ABPMED as bullet resisting, with a power rating of // Medium Power-Small Arms (MSA) // // High Power-Small Arms (HSA) // // Super-Power Small Arms // // High-Power Rifles (HR) // ballistic level in accordance with UL 752.
B. Fabricate from Type I, Class 1, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass. Provide // _____ // //where indicated //.
   1. Exterior pane // ____ // thick.
   2. Interior pane // ____ // thick.

2.8 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

E. square unless glazing has been certified.

2.9 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:

C. Sealed Edge Units (SEU):
1. Insulating Glass Unit Makeup
a. Outboard Lite
1. Glass type:
2. Glass Tint:
3. Nominal Thickness:
4. Glass Strength: (Annealed, Heat-Strengthened, Tempered)
5. Coating Orientation: (N/A, Surface #__)
b. Spacer
1. Nominal Thickness:
2. Gas Fill: (Air or 90% Argon)
c. Inboard Lite
1. Glass Type:
2. Glass Tint:
3. Nominal Thickness:
4. Glass Strength: (Annealed, Heat-Strengthened, Tempered)
5. Coating Orientation: (N/A, Surface #__)
2. Performance Characteristics (Center of Glass)
a. Visible Transmittance: ___%
b. Visible Reflectance: ___%
c. Winter U-factor (U-value): ___
d. Shading Coefficient (SC): ___

e. Solar heat Gain Coefficient (SHGC): ___

3. Glass shall be annealed, heat strengthened or tempered as required by codes, or as required to meet thermal stress and wind loads.
4. Glass heat-treated by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed when specified.

D. Fused Edge Units, (FEU):
1. Glass to glass sealed edges electrically fused.
2. Air space not less than 4.8 mm (3/16 inch) wide up to 6 mm (1/4 inch) wide.
3. R value not less than 1.5.

E. FEU Clear Glass.
1. Interior and exterior panes, ASTM C1036, Type I, Class 1, Quality q3, 3 mm (1/8 inch) thick.
2. Thickness, 11 mm (7/16 inch) minimum.

2.10 FIRE RESISTANT GLASS WITHOUT WIRE MESH

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

2.11 SWITCHABLE PRIVACY GLASS

A. Laminated glass assembly for clear glass panes with polyvinyl butyral film (PVB) 0.76 mm (0.030 inch) thick film on each side of polymer dispersed liquid crystal film (PDLC) core having electrical connections:
1. With voltage PDLC core becomes transparent.
2. Without voltage PDLC core becomes translucent.

B. Electric Connections:
1. Locate steel channel cap on one panel edges, integrally connected to glass panel.

2. Integrally connect flexible steel conduit, not less than 1800 mm (six feet long), to steel channel cap. Provide threaded end fitting at free end.
3. Integrally connect type TFFN or THHN number 18 AWG minimum size to panel with not less than 150 mm (six inches) extending beyond flexible conduct end.

C. Power Conditioner:
1. Designed to provide square wave electrical power to discharge the LC film, suppress voltage surges and transients, reduces in rush current, and reliably discharge the LC film.
2. Operate from 120 volt AC, 60 Hz input.

D. Switchable privacy glass assembly listed by UL in Building Materials Directory or other approved testing laboratory bearing permanent mark of approval.

E. Switchable privacy glass:
1. Both panes ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3, 4.8 mm (3/16 inch) thick.
2. Size as indicated.
3. Thickness // as indicated // // ___ //.

F. Switchable Privacy Glass system meeting the above specifications as manufactured by Polytronics Corporation, Telephone No. 972-238-7045, is acceptable.

2.12 INSULATING PLASTIC SHEETS

A. Homogenous polycarbonate assembly integrally joined face sheets separated by either vertical or angled ribs forming airspace cells between face sheets:
1. Treated to prevent ultraviolet light discoloration.
2. Flammability Rating: CCI classification by BOCA, ICBO, and SBCC Building Code Organizations when tested in accordance with ASTM D635 showing a burn rating of 25.4 mm (one inch) or less.
3. Nominal Thickness: 9.5 mm (3/8 inch) minimum, 17.4 mm (11/16 inch) maximum.
4. Thermal: U factors 0.55 when tested in accordance with ASTM C236.
5. Impact Resistance: No rupture when subjected to a falling dart with 13 mm (½ inch) radius tip at 298 J (220 ft. lbs).

B. // Clear // // Tinted // Insulating Plastic Sheet:
   1. Light Transmission: Not less than ___ percent.
   2. Shading Coefficient: Not less than ___ percent.

2.13 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 Clips: Galvanized steel spring wire designed to hold glass in position in rabbeted sash without stops.

G. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond shaped pieces, 6 mm (1/4 inch) minimum size.

H. 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.
I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
J. 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.
K. Structural Sealant: ASTM C920, silicone acetoxy cure:
   1. Type S.
   2. Class 25.
   3. Grade NS.
   4. Shore a hardness of 25 to 30 Durometer.
L. 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.
M. 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.
N. 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. Patterned Glass:
   1. Install units with one patterned surface with smooth surface on the weather side.
   2. Install units in interior partitions with pattern in same direction in all openings.
G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
H. Transparent (One-Way Vision Glass) Mirror: Use continuous channel glazing gasket.
I. Plastic:
   1. Use dry glazing method.
   2. Use only neoprene or EPDM gaskets.
J. Laminated Glass:
   1. Tape edges to seal interlayer and protect from glazing sealants.
   2. Do not use putty or glazing compounds.
K. 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.
L. Fire Resistant Glass:
   1. Wire glass: Glaze in accordance with NFPA 80.
   2. Other fire resistant glass: Glaze in accordance with UL design requirements.
M. Bullet Resisting 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 by 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 // // spline // to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.

B. Place setting blocks at // 1/4 // // 1/3 // 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 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at // 1/4 // // 1/3 // points with edge block no more than 150 mm (6 inches) from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

F. Fill gap between glazing and stop with _____ type sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line.

G. Apply cap bead of _____ type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.6 INSTALLATION - WET METHOD (SEALANT AND SEALANT)

A. Place setting blocks at // 1/4 // // 1/3 // points and install glazing pane or unit.

B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.

C. Fill gaps between glazing and stops with _____ type sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.

D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)

A. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.

B. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.

C. Apply sealant to open side of joint in continuous operation; thoroughly fill the joint without displacing the foam rod. Tool the sealant surface smooth to concave profile.

D. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.

E. Remove masking tape.

3.8 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 // // 1/3 // 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 _____ type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.9 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.

B. Locate and secure glazing pane using // glazers' // // spring wire // clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.10 INSTALLATION - REGLAZING HISTORIC FRAMING

A. Steel Windows: For glazing with glazing beads: ASTM C920.

B. Wood Sash: For glazing with glazing beads: Tape or ASTM C920, gunnable sealant.

C. Lock-strip Gaskets: Follow ASTM C716 for installation.

3.11 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.

3.12 PROTECTION

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

3.13 GLAZING SCHEDULE

A. Fire Resistant Glass:

1. Install clear wire glass in interior fire rated or labeled doors and windows.
2. Install clear wire glass in exterior windows and doors indicated to receive wire glass.

// 3. Install patterned (obscure) wire glass in bath, toilet, and locker room windows, except where indicated to receive clear wire glass. //

// 4. Use Fire Resistant Glass without wire mesh in the following:
   a.
   b. .//

B. Tempered Glass:
   1. Install in full and half glazed doors unless indicated otherwise.
   2. Install in storefront, windows, and door sidelights adjacent to doors.
   3. Use clear tempered glass on interior side lights and doors, and on exterior doors and sidelights unless otherwise indicated or specified.
   //4. Use SEU clear tempered insulating glass on storefronts and sidelights.//
   //5. Use SEU tinted tempered and clear tempered insulating glass on storefront and sidelights.//
   //6. Use SEU Low E tempered and clear glass, G-41, on storefront and sidelights.//
   //7. Use SEU reflective tempered and clear tempered glass on storefront and sidelights.//
   //8. Use tinted tempered glass in exterior pane and clear tempered glass in interior pane unless specified otherwise of insulating glass units adjacent to door.//
   //9. Use clear tempered glass in exterior and interior panes unless specified otherwise at insulating glass units adjacent to door.//

C. Clear Glass:
   1. Interior observation windows not specified otherwise.
   2. Interior pane of dual glazed windows not receiving tempered, laminated or organic coated glass, or other special glass indicated or specified.

D. Tinted Glass: Exterior pane of dual glazed windows not receiving tinted tempered glass.

E. Insulating Glass:
   1. Install SEU clear tempered glass in windows, // interior pane of dual glazed windows, // storefronts, // curtain walls, // adjacent to entrances or walks.

2. Install SEU clear glass in windows, // interior pane of dual glazed windows, // storefronts, // curtain walls, // not adjacent to entrances or walks.
3. Install SEU tinted tempered and clear tempered glass in storefronts, // curtain walls // adjacent to entrances or walks.
4. Install SEU // clear// // tinted // // coated // tempered and laminated glass in skylights and other overhead conditions.

F. 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).
2. If laminated glass is required for double glazed windows, provide it for interior panes only.
3. Where laminated glass is required for blast-resistant windows, follow UFC4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

G. Bullet Resisting Assembly, Install specified assembly in service windows at // Pharmacy // // Agent Cashier // // Credit Union // // other location //.

H. Transparent Mirror (One-Way-Vision Glass): Install in observation windows where indicated.

I. Pattern Glass (obscure):
1. Install in interior pane of dual glazed windows of toilets, baths, and locker rooms and where indicated.
2. Pattern Glass (obscure), unless specified otherwise.
3. Fire Rated Doors: Use patterned (obscure) wire glass.
4. Other Doors: Use tempered patterned glass.

J. Spandrel Glass: Install specified spandrel glazing where indicated.

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