

**SECTION 08 80 00  
GLAZING**

SPEC WRITER NOTES:

1. Delete between // // if not applicable to project. Also delete any other item or paragraph not applicable in section and renumber paragraph.
2. Coordinate with other sections to specify type of glazing required.
3. See International Building Code and Consumer Product Safety Commission requirements for "Safety Glass." Category II (CPSC 16 CFR 1201).
4. See VA Architectural Design Manuals for VA criteria on windows.
5. Determine design criteria for glazing required by building code. Specify glazing to meet design criteria.
6. Mental Health and Behavioral Science Service for Psychiatric, alcohol and Drug Dependency Treatment areas require "SECURITY GLAZING" assemblies.
7. See VA Physical Security Design Manual for VA Facilities for glazing requirements of blast-, forced-entry, and ballistic-resistant glazed openings.
8. For major projects and small projects with special security issues, consult project security consultant for project-specific criteria for blast-, forced-entry, and ballistic-resistance criteria for glazed openings.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. This section specifies the following:

1. Glass.
2. Plastic glazing.
3. //Switchable privacy glass and control system.//
4. //Electrochromic (EC) glass and control system.//
5. Glazing materials and accessories for both factory and field glazed assemblies.

**1.2 RELATED WORK**

- A. //Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS: Sustainable Design Requirements.//
- B. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS: Sound resistant doors.

- C. Section 08 42 33, REVOLVING DOOR ENTRANCES: Revolving doors.
- D. Section 08 56 53, SECURITY WINDOWS: Forced Entry (FE) resistant and Ballistic Resistance (BR) rated glazing and frames.
- E. Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES: Mirrors.
- F. Section 08 56 59, SERVICE AND TELLER WINDOW UNITS Section 08 56 59, SERVICE AND TELLER WINDOW UNITS: Bullet resisting glass.
- G. Section 13 49 00, RADIATION PROTECTION: Lead glass.
- H. Section 08 51 13, ALUMINUM WINDOWS: Aluminum Windows.
- I. Section 08 51 13.11, SIDE HINGED ALUMINUM WINDOWS: Operable Windows (Double Glazed).
- J. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS Glazed Curtain Walls: Glazed Curtain Walls.
- K. Security Windows: Section 08 56 53, SECURITY WINDOWS.
- L. Section 08 56 59, SERVICE AND TELLER WINDOW UNITS: Service and Teller Windows.
- M. Section 08 63 00, METAL-FRAMED SKYLIGHTS.
- N. Section 09 06 00, SCHEDULE FOR FINISHES: Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass.
- O. Section 08 34 53, SECURITY DOORS AND FRAMES: Forced Entry (FE) resistant and Ballistic Resistance (BR) rated doors and frames.
- P. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES: Wiring (120 V AC, 15A or 20A).
- Q. Intrusion Detection: Section 28 16 11, INTRUSION DETECTION SYSTEM.
- R. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Junction and Switch Boxes.
- S. Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS: Access Control Systems.

### 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 label requirements.
  3. Temporary labels are to remain intact until glass // and plastic material // 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 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" is to be identified in bold lettering on each side of glazing with removable label.
4. Fire rated glazing assemblies: Mark in accordance with IBC.

#### **1.4 PERFORMANCE REQUIREMENTS**

- 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.

SPEC WRITER NOTE: Verify that design wind pressures and wind design data noted below are provided on structural drawings, or retain optional requirement for Contractor to verify requirements of ASCE 7 or other applicable code.

2. Design Wind Pressures: // As indicated on construction documents //  
// In accordance with ASCE 7 // // In accordance with applicable  
code //.
3. Wind Design Data: // As indicated on construction documents // // In  
accordance with ASCE 7 // // In accordance with applicable code //.

SPEC WRITER NOTE: Default values for  
center-of-glass deflection below are  
examples only; modify as required for  
project conditions.

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. Ballistic- and Blast- resistant glass or plastic glazing assemblies:

1. For blast-resistant and ballistic-resistant units comply with  
requirements in Physical Security Design Manual for VA //Life Safety  
// //Mission Critical// Protected Facilities, and project-specific  
criteria provided on the drawings and specifications.
2. Spall Resistance: Laminated glazing is not permitted to produce  
spall to interior (protected side) when impacted with scheduled  
ballistics.
3. Tolerances:
  - a. Outside dimensions: Overall outside dimensions (height and width)  
of laminated security glazing is to maintain tolerance of  $\pm 3$  mm  
( $\pm 0.12$  inch).
  - b. Warpage: Out-of-flat (warpage or bowing) condition of laminates  
is not to exceed 2.5 mm per lineal meter (0.10 inch per  
3.3 lineal foot). The condition, if present, is to be localized  
to extent not greater than 0.75 mm (0.03 inch) for any 0.3 meter  
(0.98 feet) section.

SPEC WRITER NOTE: Typically delete  
paragraph below. Retain paragraph for  
projects located in IBC-defined windborne  
debris regions. Enhanced protection  
applies to essential facilities. Verify  
requirements of authorities having  
jurisdiction; select appropriate wind  
zone.

- D. //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 1 // // Wind Zone 2 // // Wind Zone 3 // // Wind Zone 4 //.
  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. //
- E. 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

SPEC WRITER NOTE: List below items intended for use in project, necessary for review prior to manufacture. Refer to Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES for submittal requirements. Include additional submittal requirements for items specified.

- 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 stating that fire-protection and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.
  2. Certificate on solar heat gain coefficient when value is specified.
  3. Certificate on "R" value when value is specified.
  4. Certificate test reports confirming compliance with specified bullet resistive rating.
  5. Certificate that blast resistant glass meets the specified requirements.

SPEC WRITER NOTE: Retain next paragraph and subparagraphs if electrochromic glazing is used.

6. //Electrochromic Glazing Certificates:

- a. //Certification: IGCC/IGMA certification for insulating glass units containing electrochromic system. Provide certificate stating that insulating glass units (IGUs) that passed the testing requirement contained the electrochromic system (EC coatings, bus bars, wires etc.) as in the product specified herein. If triple glazing is specified, certification covering triple glazing is required. If capillary tubes are required for altitude applications, certification covering units with capillary tubes is also required.
- b. //Documentation indicating compliance with ASTM E2141, Chromogenic fenestration standard as verified by third party test laboratory such as National Renewable Energy Laboratory (NREL) or equivalent.
- c. Test Report: ASTM E2190 Specification for IGU Seal Durability. Provide certificate or test report stating that IGUs that passed the testing requirement contained the electrochromic system (electrochromic coatings, bus bars, wires etc.) as in the product specified herein. If triple glazing is specified herein, a test report for triple glazing is required.//

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. Putty, for wood sash glazing.
6. Glazing cushion.
7. Sealing compound.
8. Bullet resistive material.
9. Plastic glazing material, each type required.

F. Samples:

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

4. Transparent (one-way vision glass) mirrors.
- 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.
- 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 to 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 are to 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 is to be approved and applied by manufacturer.

4. Edge protection: To cushion and protect glass clad, and polycarbonate edges from contamination or foreign matter, the four (4) edges are to be sealed the depth of glazing with continuous standard-thickness thermoplastic rubber tape. Alternatively, continuous channel shaped extrusion of thermoplastic rubber are to 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 degrees C (60 to 75 degrees F), 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 to assure for proper fit of field measured products.

#### **1.8 WARRANTY**

- A. Construction Warranty: Comply with the FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.
  1. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
  2. Insulating glass units to remain sealed for ten (10) years.
  3. Laminated glass units to remain laminated for five (5) years.
  4. Polycarbonate to remain clear and ultraviolet light stabilized for five (5) years.
  5. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for ten (10) years.
  6. //Warrant electrochromic laminated products against lamination defects, such as edge separation or delamination, that materially obstruct vision through the glass for a period of five (5) years.
  7. Warrant electrochromic controls against defects in material or workmanship for a period of five (5) years. //



- E119-20.....Standard Test Methods for Fire Test of Building  
Construction and Material
- E1300-16.....Load Resistance of Glass in Buildings
- E1886-19.....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
- E1996-17.....Standard Specification for Performance of  
Exterior Windows, Curtain Walls, Doors, and  
Impact Protective Systems Impacted by Windborne  
Debris in Hurricanes
- E2141-14.....Test Methods for Assessing the Durability of  
Absorptive Electrochromic Coatings on Sealed  
Insulating Glass Units
- E2190-19.....Insulating Glass Unit
- E2240-06.....Test Method for Assessing the Current-Voltage  
Cycling Stability at 90 Degree C (194 Degree F)  
of Absorptive Electrochromic Coatings on Sealed  
Insulating Glass Units
- E2241-06.....Test Method for Assessing the Current-Voltage  
Cycling Stability at Room Temperature of  
Absorptive Electrochromic Coatings on Sealed  
Insulating Glass Units
- E2354-10.....Assessing the Durability of Absorptive  
Electrochromic Coatings within Sealed  
Insulating Glass Units
- E2355-10.....Test Method for Measuring the Visible Light  
Transmission Uniformity of an Absorptive  
Electrochromic Coating on a Glazing Surface
- F1233-08 (2019).....Standard Test Method for Security Glazing  
Materials and Systems
- F1642/F1642M-17.....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):
  - TB-3001-13.....Guidelines for Sloped Glazing
  - 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
  - 752-11.....Bullet-Resisting Equipment.
- P. Department of Veterans Affairs:
- Q. //Physical Security Design Manual for VA Mission Critical Protected  
Facilities January 2015//
- R. Architectural Design Manual for VA Facilities (VASDM)
- S. Environmental Protection Agency (EPA):
  - 40 CFR 59 (2014).....National Volatile Organic Compound Emission  
Standards for Consumer and Commercial Products

**PART 2 - PRODUCT**

SPEC WRITER NOTES:

1. Refer to glass manufacturers' literature for structural properties.
2. Specify glass by thickness and ASTM designations and supplement standard for additional properties. Refer to

information following end of section for guides to ASTM C1036 and ASTM C1048 designations.

3. Establish and coordinate glass types to identify glass or glazing assemblies on drawings, preferably on exterior elevations for exterior windows.
4. Coordinate to retain glass types required with glazing assemblies.

## 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.

SPEC WRITER NOTE: Usually specify quality q3; use q4 for general glazing applications.

C. Clear Glass:

1. ASTM C1036, Type I, Class 1, Quality // q3 // // q4 //.

D. Ultra-clear-Low-Iron Float Glass:

1. ASTM C1036, Type I, Class 1, Quality // q3 // // q4 // and with visible light transmission of not less than 90 percent.

SPEC WRITER NOTES:

1. Select tint color from manufacturers' data and samples.
2. Note that varying thicknesses of tinted or heat absorbing glass exhibit different color shades of the same tint.
3. Coordinate color/tint/coating to accommodate required security monitoring.

E. Tinted Heat reflective and low emissivity coated glass:

1. ASTM C1036, Type I, Class 2, Quality q3.

SPEC WRITER NOTES:

1. Specify m1 where fire-protection rating is required.
2. Wired flat glass does not qualify as safety glazing per ANSI Z97.1A/B or 16 CFR 1201 Category I/II and should not be used where it may be exposed to contact by occupants.

F. Patterned and Wired Flat Glass:

1. ASTM C1036, Type II, Class 1, Pattern P1, Finish F1, Quality // Q5  
// // Q6 //, Mesh // m1 // // m2 //.

## 2.2 HEAT-TREATED GLASS

### SPEC WRITER NOTES:

1. Specify heat strengthened and fully tempered glass by thickness and ASTM C1048 designations, and supplement standard for additional properties. Refer to information following end of section for guides to ASTM C1036 and ASTM C1048 designations.
2. Do not use heat strengthened glass where compliance with ANSI Z97.1 or 16 CFR 1201 is required except with manufacturer's written documentation of compliance.
3. Coordinate color/tint/coating to accommodate required security monitoring.

- 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. Measurement Parallel to Line: Maximum peak to valley 0.203 mm (0.008 inch).
2. Measurement Perpendicular to Line: Maximum 0.0254 mm (0.001 inch).
3. Bow/Warp: Maximum 50 percent of bow and warp allowed by ASTM C1048.

- B. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.

### SPEC WRITER NOTES:

1. Use heat strengthened below for tinted glass on exterior panes when fully tempered tinted glass is not used.
2. Specify tint color as selected from manufacturers' data and samples.

- C. Tinted Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 2, Quality q3.

- D. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

- E. Tinted Tempered Glass.

1. ASTM C1048, Kind FT, Condition A, Type I, Class 2, Quality q3.

### SPEC WRITER NOTES:

1. Use ASTM C1048, Kind FT for tempered.
2. Laminate pattern glass if additional strength is needed for size of opening.

3. See laminated glass article for other obscure options.

F. Tempered Patterned Glass:

1. ASTM C1048, Kind FT, Type II, Class 1, Form 3, finish, pattern and quality as // indicated in construction documents //  
// scheduled //.

### 2.3 COATED GLASS

SPEC WRITER NOTES:

1. Glass may be coated by pyrolytic or sputtering (vacuum) process per ASTM C1376.
2. Solar-reflective metallic-oxide pyrolytic coatings are applied to hot glass during manufacture. This results in a more scratch-resistant coating. Pyrolytic coatings may be applied on the first (exterior) surface, where they can reflect heat before it is absorbed by glass; such applications may avoid need for heat-treatment, but mirror-like appearance may not be acceptable. Colors are generally limited to silver, pewter, and gold. Pyrolytic coated glass may be heat treated after coating.
3. Metallic-oxide or metallic-nitride sputter coatings are applied after manufacture and heat-treatment. It is normally applied to second and third surfaces of laminated and insulating glass, where it is protected from scratching. Some manufacturers will allow use of stainless steel, chrome, and titanium-based coatings on the second surface of monolithic glass. Sputter coating offers a broader color range and is more common as a Low-E-Type coating in current use.
4. See laminated and insulating glass articles for location of coated surfaces in these assemblies.
5. See ceramic-coated spandrel glass and laminated glass article for other spandrel options.
6. Coordinate color/tint/coating to accommodate required security monitoring.

A. Reflective-Coated Spandrel Glass:

1. ASTM C1376, Kind CS and ASTM C1048, Kind HS, Condition B, Type I.

B. Reflective-Coated Low-E Coated Tempered Glass:

1. ASTM C1376 and ASTM C1048, Kind FT, Condition C, Type I, Class 1, Quality q3 with reflective metallic coating.

SPEC WRITER NOTE: Indicate pattern of silk-screened ceramic frit coating on drawings or describe below.

C. Ceramic Coated Vision Glass:

1. ASTM C1048, Kind HS or FT, Condition C, Type I, Quality q3 with ceramic coating applied by silk-screen process.
2. Pattern as // indicated in construction documents //  
// scheduled //.

SPEC WRITER NOTE: Coating below may be applied to second surface of lites with pyrolytic solar coating on first surface.

D. Silicone Coated Spandrel Glass:

1. ASTM C1048, Kind HS or FT, Condition B, Type I, Quality q3 with silicone coating applied over glass surface.
2. Pattern as // indicated in construction documents //  
// scheduled //.

E. 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 ELECTROCHROMIC COATED GLASS

- A. Provide electrochromic coated glass products fabricated to provide compliance with the following:

1. Durability of Coating: ASTM E2141 and ASTM E2354.
2. Current Voltage Cycling Stability: ASTM E2240 and ASTM E2241.
3. Visible Light Transmission Uniformity: ASTM E2355.
4. Pyrolytic and Vacuum Deposition Coatings: ASTM C1376.

SPEC WRITER NOTE: Delete the following control system if not required on project.

B. //Electrochromic Panel Mounted Control System (or COR Approved Equal)

1. Wall Switch:

a. Power Specifications:

- 1) Peak Power: 1 watt.
- 2) Max Input Voltage: 12 volts DC.
- 3) Max Input Current: 0.1 amp.

2. Electrochromic Glass Controller (One Electrochromic Glass Controller required for every 3 - 6 electrochromic IGUs, depending on the number of sub-panes per IGU):

a. Power Specifications:

- 1) Electrical Peak Power: 80 watts max.
- 2) Maximum Input Voltage: 24 volts DC.
- 3) Maximum Input Current: 0.6 amps.
- 4) Maximum Output Voltage: 5 volts DC.
- 5) Maximum Output Current (per channel): 4 amps.

3. I/O Controller (requires one backplane slot; provides analog/digital inputs and outputs):

a. Power Specifications:

- 1) Electrical Peak Power: 80 watts.
- 2) Maximum Input Voltage: 24 volts DC.
- 3) Maximum Input Current: 3.3 amps.
- 4) Maximum Output Voltage: 22 volts DC.
- 5) Maximum Output Current (per channel): 90 mA.

SPEC WRITER NOTE: Use the following if integration into building automation systems such as lighting controls through dry contact input is required.

- 6) Dry Contact Input. One channel of the I/O Controller Card provides 5 VDC to one terminal of up to 11 independent contact closure inputs.

4. Backplane (attaches into Control Panel; one required for each one to four Electrochromic Glass Controllers in a panel, depending on IGU size and configuration).

5. 24V Power Supply (one required for each Backplane in a panel):

a. Power Specifications:

- 1) UL Listed, Class 1 or 2.

- 2) Max input Power: 110 watts.
  - 3) Input voltage: 90 - 264 volts AC, 50/60 Hz.
  - 4) Max output power: 91.2 watts.
  - 5) Output voltage: 24 volts DC.
  - 6) Max output current: Up to 41.6 amps.
6. 12V Power Supply (one required for each System Integration Module and/or network of Wall Switches):
- a. Power Specifications:
    - 1) UL Listed, Class 2.
    - 2) Max input Power: 65 watts.
    - 3) Input voltage: 90 - 264 volts AC, 50/60 Hz.
    - 4) Max output power: 54 watts.
    - 5) Output voltage: 12 volts DC.
    - 6) Max output current: 4.5 amps.
7. System Integration Module:
- a. Power Specifications:
    - 1) Peak Power: 60 watts.
    - 2) Maximum Input Voltage: 12 volts DC.
    - 3) Maximum Input Current: 1 amp.
  - b. Interfaces:
    - 1) //RS-232.//
    - 2) //Ethernet.//
    - 3) //BACnet MS/TP or IP.//
    - 4) //LonWorks.//
8. Exterior Daylight Sensor
- a. Photosensor.
  - b. Illuminance Ranges: 0 - 1000 fc.
  - c. Power Specifications:
    - 1) Max Input Voltage: 24V DC.
    - 2) Output Voltage: 0-10V DC.
9. Interior Daylight Sensor
- a. Photosensor
  - b. Illuminance Ranges: 0-3.2 klux, 0-32 klux, 0-65 klux.
  - c. Power Specifications
    - 1) Max Input Voltage: 24V DC.
    - 2) Output Voltage: 0-10V DC.
  - d. Color: White.

10. Panels: Provide panels sized to accommodate back planes, system integration module and power supplies.
11. Terminal Box:
- a. Terminal Box Enclosure with Cover:
    - 1) Capacity: Four (4) 12-conductor Cables.
    - 2) Terminal Block Type: Screw terminals. //
- SPEC WRITER NOTE: Delete the following control system if not required on project.
- C. //Solo Output Module Control System (integrated two-button switch with a four-output controller or COR approved equal):
- 1. Power specifications:
    - a. Peak Power: 40 watts.
    - b. Maximum Input Voltage: 12 volts DC.
    - c. Maximum Input Current: 3.4 amps.
    - d. Fuse Rating: 4 amps.
    - e. Maximum Output Voltage: 12 volts DC.
    - f. Maximum Output Current (per channel): 1 amp.
  - 2. Power Supply:
    - a. UL Listed, Class 2.
    - b. Max input power: 70 watts.
    - c. Input voltage: 90-305 volts AC, 50/60 Hz.
    - d. Max output power: 60 watts.
    - e. Max output voltage: 12 volts DC.
    - f. Max output current: 5 amps.
    - g. 120V AC Power Cord.//
- D. //Class 2 Wiring:
- 1. 12-conductor Cable: Twelve conductor 16 or 18 AWG cable. Provide cable of type Plenum PVC, CMP/CL2P insulation which complies with the typical requirements of the NEC and applicable building codes for Class 2 low voltage DC circuits.
  - 2. Electrochromic Bus Cable: Four-conductor cable containing an 18 AWG power pair and a 22 AWG twisted/shielded data pair. Provide cable of type Plenum PVC, CMP/CL2P insulation and complies with the typical requirements of the NEC and Codes for Class 2 low voltage DC circuits.//

## 2.5 PLASTIC GLAZING

SPEC WRITER NOTES:

1. Use abrasive resistant coated plastic when plastic is not in assembly protected by glass covering.
2. Coordinate with drawings to show thickness with glazing designation.
3. For acrylic use not less than the following minimum thickness:

| Thickness              | Long Dimension of Sheet                 |
|------------------------|---|
| 3 mm (0.125 inch)      | 610 mm<br>(24 inches or less)           |
| 5 mm (0.187 inch)      | 610 - 915 mm<br>(24 through 36 inches)  |
| 6.5 mm<br>(0.250 inch) | 915 - 1524 mm<br>(36 through 60 inches) |

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

| Thickness                       | Long Dimension of Sheet                        | Edge Lap            |
|---------------------------------|--|---------------------|
| 3 mm<br>(0.125 inch)            | 610 -<br>1219 mm<br>(24 through<br>48 inches)  | 19 mm (3/4<br>inch) |
| 9.5 mm<br>(0.375<br>inch)       | 1219 -<br>1524 mm<br>(48 through<br>60 inches) | 25 mm<br>(3/4 inch) |
| 13 mm<br>(Over<br>0.50<br>inch) | 1524 mm<br>(Over<br>60 inches)                 | 25 mm<br>(1 inch)   |

5. Check: Window, door, and plastic manufacturer for glazing rabbet depth allowing for expansion and edge lap required for plastic.
6. Acrylic plastics have flame spreads that limit use on interior spaces.

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 in construction documents //  
// scheduled //.
- 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 in construction documents //  
// scheduled //.
- C. Clear Polycarbonate Sheet:
1. ASTM C1349, Appendix X1, Type II, (coated mar-resistant, UV stabilized), with coating on both sides. Flame spread of 10 or less when tested per ASTM E84.
  2. Thickness, as // indicated in construction documents //  
// scheduled //.

## 2.6 LAMINATED GLASS

### SPEC WRITER NOTE:

1. Specify laminated flat glass using the "Kind" designation in ASTM C1172, the C1036 designations for each lite of glass, and indicate the thickness and type of interlayer in the glass types schedule.
  2. Coordinate color/tint/coating to accommodate required security monitoring.
  3. VAPSDM requires use of laminated glass in lobby areas and specific laminated units in stipulated locations listed in Glazing Types schedules.
- A. Laminated Glass: ASTM C1172. Two or more lites of heat treated glass bonded with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent-resin interlayer complying with interlayer manufacturer's written instructions. Minimum total laminated thickness of 1/4" for blast resistant glazing.
- B. Interlayer: Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing unless otherwise // indicated in construction documents //  
// scheduled //.
- C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
1. Horizontal or sloped glazing.
  2. Acoustical glazing.

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, unless otherwise // indicated in construction documents // // scheduled //.

## 2.7 SECURITY GLAZING ASSEMBLY

### SPEC WRITER NOTES:

1. Specify assemblies below to meet actual project requirements.
  2. Bullet-resisting glazing material is available in four power ratings to resist scattered shots from (1) medium-power small arms (MSA); (2) high-power small arms (HSA); (3) super-power small arms (SSA); and (4) high-power rifles (HR).
  3. Bullet-resisting glass is available in thicknesses of 30.2 mm (1-3/16 inch), 38.1 mm (1-1/2 inch), 44.5 mm (1-3/4 inch), and 50.8 mm (2 inches), to meet those power ratings.
  4. Bullet-resisting acrylic sheet is listed by UL for MSA rating only and is 25.4 mm (one inch) thick.
  5. Bullet-resisting polycarbonate sheet is listed for MSA 25.4 mm (1 inch) thick and for HSA and SSA ratings 31.8 mm (1-1/4 inch) thick.
  6. Consult manufacturers for exact thicknesses and availability.
  7. UL Ballistic Level 3 below is minimum established in VAPSDM. More information available in GANA Protective Glazing Manual. Consult VA regarding appropriate ballistic level for project application.
- A. Provide ballistic level as scheduled in accordance with UL 752.

SPEC WRITER NOTE: Forced-Entry Resistance requirement below is for "15 minute rating." Consult VA regarding appropriate forced-entry resistance level. Thickness of components will be dictated by performance requirements.

- B. Forced Entry Resistance: As scheduled, in accordance with ASTM F1233.
- C. Blast Resistance: Provide // exterior glazing units that meet the specified blast pressures and impulses // // and interior security glazing units // providing protection based upon hazard rating as scheduled, in accordance with Physical Security and Resilience Design

Manual for //Life Safety// //Mission Critical// Protected Facilities)  
 October 2020 as indicated in Specification Section 08 56 53.

**SPEC WRITER NOTES:**

1. Example below is for guideline only. Specify combination glass and polycarbonate layers where appropriate.
2. Consider glass clad polycarbonate assemblies where the potential for injury by loose shards of glass from the side opposite impact is understood and accepted.
3. Mental health and behavioral science service for psychiatric, alcohol, and drug dependency treatment areas require "SECURITY GLAZING" assemblies, resistant to breakage and use as weapons. See glass type description under Laminated Glass Schedule.
4. For security (seclusion) rooms, including room doors, use 11 mm (7/16 inch) laminated clear glass, clear heat strengthened glass clad polycarbonate, or clear tempered glass clad polycarbonate.
5. For patient ward glazing use laminated assemblies of tinted, heat strengthened, clear, clear tempered, or clear heat strengthened glass.
6. Specify optional glazing of clear heat strengthened glass clad polycarbonate, or clear tempered glass clad polycarbonate for 11 mm (7/16 inch) thick laminated glass.
7. Refer to VAPSDM for glazing requirements of blast-resistant windows.

D. Laminated Glass Security Glazing Units: Fabricate from multiple lites of scheduled glass with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent resin interlayers between the layers of glazing.

**2.8 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. The exterior glass unit shall be fully tempered and the inner glass unit shall be laminated annealed at a minimum for all blast resistant glazing.

- B. Assemble units using glass types specified in Insulating Glass Schedule and Blast Glazing assembly requirements

SPEC WRITER NOTES:

1. Note the distinction between fire protection and fire resistance rated glazing. Fire resistance glass must be tested to ASTM E119 and NFPA 252.
2. Fire resistance glazing may be required in door vision panels, sidelites and transoms, and in interior openings and in exterior openings per IBC.
3. Fire resistance framing must be used with fire resistive glazing where required by the IBC.

## 2.9 FIRE PROTECTION AND FIRE RESISTANCE GLAZING

- A. Fire-Protection-Rated Glazing: Glazing units tested for use in fire door assemblies or fire windows, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC, for fire-protection ratings as // indicated on construction documents // // scheduled //, based upon positive-pressure testing per NFPA 257 or UL 9, and complying with NFPA 80.

1. Hose-Stream Test: Units must comply, except units having fire-protection rating of 20 minutes.

SPEC WRITER NOTES:

1. Delete temperature rise limitation where not required.
  2. Building codes typically exempt glazing from temperature rise limitation for fully sprinklered facilities.
  3. Confirm requirements with authorities having jurisdiction.
2. //Temperature Rise Limitation: Units over 0.065 square meter (100 square inch) must comply with 232 deg. C (450 degress F) limitation.//
  3. Labeling: Permanently label fire-protection-rated glazing units in accordance with IBC.
  4. Safety Glazing: Comply with 16 CFR 1201, Category II.

SPEC WRITER NOTE: Under IBC, Fire-Protection-Rated Tempered Glass meets 20-minute requirements for doors only, as it does not meet hose stream test that applies to transoms and sidelites.

5. Fire-Protection-Rated Tempered Glass: For 20-minute fire-protection-rated door assemblies, of thickness scheduled.

SPEC WRITER NOTE: Fire-Protection-Rated Laminated Ceramic Glazing is available for 20-, 45-, 60-, 90-, and 120-minute fire-protection rating, but not with temperature-rise limitation.

6. Fire-Protection-Rated Laminated Ceramic Glazing: Units made from two lites of clear, ceramic glass, 8 mm (5/16 inch) total thickness, for rating scheduled.

SPEC WRITER NOTE: Fire-Protection-Rated Laminated Glass with Intumescent Interlayers is available for 45-, 60-, 90-, and 120-minute fire-protection rating and meets temperature rise limitation.

7. Fire-Protection-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear (low-iron) float glass, in intumescent interlayers, of thickness and rating scheduled.

- B. Fire-Resistance-Rated Glazing: Glazing units tested for use in fire wall assemblies, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC for fire-resistance ratings of wall assemblies as // indicated on construction documents // // scheduled //, based upon testing according to NFPA 252 and ASTM E119 or UL 263.

1. Labeling: Permanently label fire-resistance-rated glazing units in accordance with IBC.
2. Safety Glazing: Comply with 16 CFR 1201, Category II.

SPEC WRITER NOTE: Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers is available for 45-, 60-, 90-, and 120-minute fire-protection rating.

3. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear low-iron float glass, in intumescent interlayers, of thickness and rating scheduled.

SPEC WRITER NOTE: Fire-Resistance-Rated Double Glazing Units with Gel Fill is available for 20-, 45-, 60-, 90-, and 120-minute fire-protection rating.

4. Fire-Resistance-Rated Double Glazing Units with Gel Fill: Units made from two lites of uncoated, fully tempered, ultra-clear (low-iron) float glass, with perimeter metal spacer and edge seal forming cavity filled with clear, fully transparent, heat-absorbing gel, of thickness and fire-protection rating scheduled.

SPEC WRITER NOTES:

1. Switchable Privacy Glass is a translucent glazing electrically operated to provide clear glazing.
2. Switchable Privacy Glass is more expensive and can only be justified in very selective spaces for vision panels in cubicle partitions separating patients in intensive care spaces. Such as surgical, cardiac, respiratory and isolation rooms where cubicle curtains are eliminated.
3. Do not use trade name on drawings. Use article Title: "Switchable Privacy Glass."
4. See manufacturer literature for installation and electrical requirements. Use 22 mm (7/8 inch) minimum rabbet depth and rabbet width glass thickness plus 9.5 mm (3/8 inch).
5. Thickness available is 8, 11, and 14 mm (5/16, 7/16, and 9/16 inch) in 991 mm (39 inches) by 2743 mm (9 feet) maximum size and 305 by 406 mm (12 by 16 inch) minimum size.
6. Do not use on exterior glazing.
7. Special units for exterior glazing are available in insulating glass units.

**2.10 SWITCHABLE PRIVACY GLASS**

- A. Laminated glass assembly for clear glass panes with polyvinyl butyral film (PVB) 0.76 mm (0.030 inch) (minimum) 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 (6 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 (6 inches) extending beyond flexible conduct end.
- C. Power Conditioner:
1. Designed to provide square wave electrical power to discharge the PDLC film, suppress voltage surges and transients, reduces in rush current, and discharge the PDLC film.
  2. Operate from 120 volt AC, 60 Hz input.
- D. Provide switchable privacy glass assembly listed by UL in Building Materials Directory or other approved U.S. 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 // // //.

## 2.11 INSULATING PLASTIC SHEETS

### SPEC WRITER NOTES:

1. Plastic sheets of either acrylic or polycarbonate formed into panels with face sheets separated by plastic ribs forming cells; providing translucent glazing.
  2. When code limits flammability use polycarbonate with a CC1 rating.
  3. Coordinate with Section 08 63 00, METAL FRAMED SKYLIGHTS, for specifying glazing and Division 8 for doors and windows.
  4. Only polycarbonate glazing is specified, add other sheets as required for project.
  5. Coordinate with manufacturers to specify tinted and curved shapes or special configurations and rabbet depths.
  6. Specify whether clear or tinted, and indicate minimum light transmission and shading coefficients.
- 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 and mar-resistant coated on both sides.

2. Flammability Rating: Combustibility classification CC1 by UL, ITS-WHI or any other certified testing agency when tested in accordance with ASTM D635 showing a burn rating of 25.4 mm (1 inch) or less.
  3. Flame-spread index: // 25 // // 75 // // 200 // or less.
  4. Thickness: 9.5 mm (3/8 inch) minimum, 17.4 mm (11/16 inch) maximum.
  5. Thermal: Maximum U factors 0.55 when tested in accordance with ASTM C236.
  6. Impact Resistance: No rupture when subjected to a falling dart with 13 mm (1/2 inch) radius tip at 298 J (220 feet pounds).
- B. // Clear // // Tinted // Insulating Plastic Sheet:
1. Light Transmission: Not less than // // percent.
  2. Shading Coefficient: Not less than // // percent.

## 2.12 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. Setting Blocks: ASTM C864:
1. Silicone type.
  2. Channel shape; having 6 mm (1/4 inch) internal depth.
  3. Shore A hardness of 80 to 90 Durometer.
  4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
  5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
  6. 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: 25 to 76 mm (1 to 3 inches).
  4. Shore A hardness of 40 to 50 Durometer.

SPEC WRITER NOTE: Coiled glazing tape will assure continuous seal without joints as compared to cut-to-length tape.

## D. 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.

## E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

SPEC WRITER NOTE: Glazing clips are only used when glazing in wood frames or in rolled section steel sash with face glazing (No stops).

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

SPEC WRITER NOTE: Points are for wood sash.

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

SPEC WRITER NOTE: Dense wedge gaskets with soft, closed cell gaskets used for dry glazing and wet/dry (sealant or sealing tape) glazing systems may be required by the window manufacturer. Gaskets may be furnished by the window manufacturer with the sash, especially for factory glazing and residential units. Coordinate with other Division 8 specification sections.

## 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.

SPEC WRITER NOTE: For design of Glazing Gaskets, see ASTM C542 and ASTM C964, Standard Guide for Lock-Strip Gasket

Glazing, and GANA Manuals. Use black only.

- I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

SPEC WRITER NOTE: Do not use non-skinning sealants.

- J. 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).//

SPEC WRITER NOTE: Delete the following if structural glazing does not occur on the project. Glass not retained by a frame having a rabbet and applied stop as per GANA Glazing Manual, Exterior Flush Glazing.

- 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.

SPEC WRITER NOTE: Vinyl glazing channels may be used in residential level windows, storm windows and some sliding glass doors. Vinyl channels may be furnished by the sash manufacture and in factory glazing units. Verify if window manufacturer requires. Do not use with plastic glazing.

- 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 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.

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 is approved shop drawings.

B. Review for 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.

#### **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.

SPEC WRITER NOTE: Select the following paragraphs in coordination with glass types specified in Part 2.

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 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.

L. Fire Protective and Fire Resistance Glass:

1. Wire Glass: Glaze in accordance with NFPA 80.
2. Other fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.

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 is not to be cleaned by scraping, razor blade, squeegee, or use of highly alkaline cleaner.

3. At no time is polycarbonate material be exposed to chemical solvents (benzene, gasoline, acetone, paint thinners) or aromatic hydrocarbons (toluene or xylene), nor should any of these solvents or fumes be used or present in confined area such as a security guard booth.
4. Due care is to 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, etc.).

#### **3.4 INSTALLATION - ELECTROCHROMIC GLAZING**

- A. Install glass per framing manufacturer's wiring diagram showing IGU orientation and wire exit point into building. Comply with glass manufacturer's labels and instructions for glass orientation.
- B. Protect IGU pigtail and Frame Cable from any damage during installation. Use grommets during installation to protect wire when routing through frame. If Frame Cable or the connector is damaged during installation the Frame Cable must be replaced. If the IGU pigtail connector is damaged during installation electrochromic glass manufacturer must be notified and the connector must be repaired with the manufacturer's approved method.
- C. PVC jacketed plenum cables (IGU Pigtails, 12 Conductor Cable, Frame Cables, Sensor Cables) should be conditioned for 24 hours at room temperature prior to installation and never installed below 0 degrees C (32 degrees F) ambient temperature. Once installed these wires must not be exposed to sunlight even through glass. If they are installed in an exposed location they must be covered or painted (manufacturer approved latex / water based paint only).
- D. Verify glazing pocket where IGU Pigtail and Frame Cable connection is made is a dry location.
- E. Once electronically tintable IGUs have been removed from manufacturer's packaging, remove labels within 30 days of exposure to sunlight or other UV light sources.
- F. Ensure that equipment, conduit, gang boxes, and other related materials are installed and ready to receive Work of this Section.
- G. Install Wall Switches, Interior Daylight sensors, Terminal Boxes and Panels in an indoor, climate-controlled environment.

- H. Ensure control panels and terminal boxes are installed so as to be accessible.
- I. Ensure 12-conductor cable runs between control panels and terminal boxes do not exceed the lengths shown in the following table, based on the length of Frame Cables used (top row):

Cable lengths in  
meters (feet)

|                                     |                |                |               |
|-------------------------------------|----------------|----------------|---------------|
| Standard Frame Cables               | 15.24<br>(50)  | 22.86<br>(75)  | 38.1<br>(125) |
| 12-Conductor Cable Maximum (AWG 18) | 60.96<br>(200) | 38.1<br>(125)  | -             |
| 12-Conductor Cable Maximum (AWG 16) | 91.44<br>(300) | 60.96<br>(200) | -             |

- J. Ensure total electrochromic bus cable run between control panels and wall switches is no longer than 457.2 meter (1500 feet).
- K. Ensure electrochromic bus cable connects all wall switches and control panels in a daisy-chain configuration.
- L. Ensure electrochromic bus cable has been properly terminated at each end of line, using the jumpers on the electrochromic glass controller, wall switch and system integration module.
- M. Install wall switches in standard single or multi-gang wall-mounted junction box.

**SPEC WRITER NOTES:**

1. Select the following articles in coordination with window and framing systems specified in other sections.
2. When glazing a pressure equalized system, it is necessary to create the air barrier and vapor retarder seal at the inside perimeter of the glass unit to create an air space void that equalizes with exterior air pressure and permits moisture drainage to the exterior. For exterior glazing requiring continuity of air and vapor seal from adjacent construction, select the "wet/dry" or "wet" method.

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

**SPEC WRITER NOTES:**

1. Select this glazing method where neither air barrier and vapor retarder

seal to glazing frame nor pressure equalized glazing space is required.

2. Glazing spline may be a roll-in type or a pressure type. Verify sealant used is compatible with the glazing tape compound.
  3. Select this glazing method for horizontal sliding aluminum windows. Install glass in continuous glazing gaskets secured with beads.
  4. Select this glazing method for aluminum doors unless door manufacture requires otherwise.
- 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.

### 3.6 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

#### SPEC WRITER NOTES:

1. This method is intended to achieve air barrier and vapor retarder seal through glazed assembly to glazing frame and achieve a pressure equalized glazing space.
  2. Use this system with aluminum windows with glazing beads unless window manufacturer requires otherwise.
- 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 152 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 sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.
- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

### **3.7 INSTALLATION - WET METHOD (SEALANT AND SEALANT)**

#### **SPEC WRITER NOTE:**

1. This method is intended to achieve air barrier and vapor retarder seal through glazed assembly to glazing frame and achieve a pressure equalized glazing space.

- 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 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.

### **3.8 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)**

#### **SPEC WRITER NOTES:**

1. Usually selected only for monumental buildings.
2. Verify that gaskets and backers have been tested for compatibility involving exposure to 2000 - 4000 microwatt per square centimeter UV radiation for 21 days while in contact with sealant on glass. Spacers with full contact on structural silicone should not discolor white silicone sealant during this test.

- A. Perform adhesion testing in accordance with ASTM C794. Provide primer per sealant manufacturer's recommendations. Submit test results.
- B. 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.
- C. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.
- D. 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.
- E. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.
- F. Remove masking tape.

### **3.9 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 sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.
- F. Trim protruding tape edge.

### **3.10 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.

### **3.11 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.

### 3.12 COMMISSIONING - ELECTROCHROMIC GLAZING

- A. Before start-up of electrochromic glass control system, conduct visual inspection to verify system is installed per code and in working order. Verify proper wire connections to and from equipment and insulating glass units.
- B. When system is in start-up, conduct an overall system test and verify system is operating per electrochromic IGU manufacturer's operating instructions.

SPEC WRITER NOTE: Use the following if integration with lighting control system is required.

- C. The electrochromic and lighting control systems are to be commissioned together to verify the Sequence of Operations by the lighting control system and the electrochromic glass manufacturers.

### 3.13 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.

### 3.14 PROTECTION

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

SPEC WRITER NOTES:

1. Defining glazing required on drawings is preferred to the glazing schedule.
2. Omit schedule or omit following paragraphs where types, thicknesses and locations of glass are indicated on the drawings.
3. Check details on drawings for types of glazing.
4. Where not indicated, edit paragraph to suit project; add types, thicknesses and locations of the glass not indicated. Coordinate paragraphs in Part-2 with the schedule.

5. Use this glazing schedule as a guide for defining glazing required.
6. In double glazed windows, only the interior pane is required to be laminated glass or other safety glazing for interior occupant safety.
7. Glass Schedules: Annealed glass is not included as an option for non-laminated interior glass units for safety reasons. Edit text if annealed glass is desired and acceptable to VA.
8. Minimum thickness of glass lites is established as 6 mm (1/4 inch). Edit requirement for minimum thickness in glass schedules if alternate thickness is desired.
9. Insert requirements for pyrolytic coated self-cleaning glass, if required for project.

### 3.15 MONOLITHIC GLASS SCHEDULE

#### SPEC WRITER NOTES:

1. Monolithic glass refers to glass that is made in a single sheet without being laminated.
2. Glass Type below is frequently utilized in entry doors.

A. Glass Type MG# // //: Clear fully tempered float glass.

1. Unit Thickness: //6 mm (0.23 inch)// // //.
2. Safety glazing label required.

SPEC WRITER NOTE: Ultra-clear (low-iron) glass is used selectively where very high visual acuity is required.

B. Glass Type MG# // //: Ultra-clear (low-iron) fully tempered float glass.

1. Unit Thickness: // 6 mm (0.23 inch)// // //.
2. Safety glazing label required.

C. Glass Type MG# // //: Tinted fully tempered float glass.

1. Unit Thickness: //6 mm (0.23 inch)// // //.
2. Tint Color: // Light Blue // // Blue // // Blue-green //  
// Bronze // // Light Green // // Green // // Dark Green // // Light  
Gray // // Gray // // Dark Gray //.
3. Visible Light Transmittance: // // percent minimum.
4. Solar Heat Gain Coefficient: // // maximum.
5. Safety glazing label required.

D. Glass Type MG# // //: Ceramic-coated vision glass; fully tempered float glass.

1. Unit Thickness: //6 mm (0.23 inch)// // //.
2. Tint Color: // Clear // // Ultra-clear (low iron) // // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray // .

SPEC WRITER NOTE: Frit pattern and extent of use should be indicated on drawings.

3. Ceramic Coating Color and Pattern: // As selected from manufacturer's full range // //As indicated on construction documents //.
4. Coating Location: Second surface.
5. Visible Light Transmittance: // // percent minimum.
6. Solar Heat Gain Coefficient: // // maximum.
7. Safety glazing label required.

E. Glass Type MG# // //: Silicone-coated spandrel glass; fully tempered float glass.

1. Match adjacent vision unit profile, glass thickness, coating, and performance.

SPEC WRITER NOTE: If spandrel unit varies from adjacent unit profile, delete subparagraph above, and retain and edit subparagraphs 2 through 5 below and edit to describe spandrel unit.

2. Unit Thickness: //6 mm (0.23 inch)// // //.
3. Tint Color: // Clear // // Ultra-clear (low iron) // // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray // .
4. Visible Light Transmittance: // // percent minimum.
5. Solar Heat Gain Coefficient: // // maximum.
6. Opaque Coating Location: Second surface.
  - a. Coating Color: //As selected by COR from manufacturer's full range// //As indicated in Section 09 06 00, SCHEDULE FOR FINISHES//.
7. Fallout Resistance: Passes ASTM C1048 fallout-resistance test.
8. Safety glazing label required.

**3.16 LAMINATED GLASS SCHEDULE**

## SPEC WRITER NOTES:

1. First three glazing units listed in this schedule are pre-edited to comply with VA Physical Security Design Manual (VAPSDM) and VA Architectural Design Manual (VAADM) requirements based upon the applications listed in the text. Edit as required for project and as approved by VA.
2. Use laminated glass in this schedule, or insulating laminated glass in the following schedule, for entrance doors, per VAPSDM.
3. Use laminated glass from this schedule for interior glass in lobby areas per VAPSDM.
4. Use laminated glass from this schedule for interior glass near Emergency Department entrance per VAPSDM.

- A. Glass Type LG# // //: Clear laminated glass with two (2) lites of fully tempered float glass.
1. Minimum Thickness of Each Glass Lite: 3 mm (0.12 inch).
  2. Interlayer Thickness: 1.52 mm (0.060 inch).
  3. Safety glazing label required.
  4. Application: Interior glazing of units unless otherwise scheduled.
- B. Glass Type LG# // //: Clear laminated glass with two (2) lites of fully tempered float glass.
1. Minimum Thickness of Each Glass Lite: 4 mm (0.16 inch).
  2. Interlayer Thickness: 1.52 mm (0.060 inch).
  3. Safety glazing label required.
  4. Application: Interior glazing units in Psychiatric Nursing Units, Alcohol Dependency Treatment Nursing Units, Drug Abuse Treatment Nursing Units, Medical, Surgical and Neurological (MS&N) Security Bedrooms, Security Exam Rooms, and Security Holding Rooms per VAADM.
- C. Glass Type LG# // //: Clear laminated glass with two (2) lites of fully tempered float glass.
1. Minimum Thickness of Each Glass Lite: 5 mm (0.19 inch).
  2. Interlayer Thickness: 2.29 mm (0.090 inch).
  3. Safety glazing label required.
  4. Application: Interior glazing units in locked patient units and security rooms per VAADM.
- D. Glass Type LG# // //: Clear laminated glass with two (2) lites of // heat-strengthened // // fully tempered // // ultra-clear (low-iron)

heat-strengthened // // ultra-clear (low-iron) fully tempered // float glass.

1. Unit Thickness: // 6 mm (0.24 inch) // //.
2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.24 inch) //.
3. Interlayer Thickness: // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) // .
4. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required for exterior glazing in hurricane high velocity wind zones; coordinate glass selection and interlayer thickness required based upon tested assemblies.

5. Windborne debris-resistant glazing unit required.

E. Glass Type LG# // //: Tinted laminated glass with two (2) lites of // annealed// // heat-strengthened // // fully tempered // float glass with outer ply tinted and inner lite clear.

1. Unit Thickness: //6 mm (0.23 inch)// // //.
2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
3. Tint Color: // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.
4. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) //.
5. Visible Light Transmittance: // // percent minimum.
6. Solar Heat Gain Coefficient: // // maximum.
7. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required for exterior glazing in hurricane high velocity wind zones; coordinate glass selection and interlayer thickness required based upon tested assemblies.

8. Windborne debris-resistant glazing unit required.

F. Glass Type LG# // //: Low-E-coated, laminated vision glass with two (2) lites of clear // annealed// // heat-strengthened // // fully tempered // float glass.

1. Minimum Thickness of Each Glass Lite: // (0.12 inch) // // 4 mm  
(0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch)// // As  
indicated //.
2. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060  
inch) // // 2.29 mm (0.090 inch) //.
3. Low-E Coating: // Sputtered on second // // Sputtered on third //  
surface.
4. Visible Light Transmittance: // // percent minimum.
5. Solar Heat Gain Coefficient: // // maximum.
6. Safety glazing label required.

SPEC WRITER NOTE: Retain below if  
required for exterior glazing in  
hurricane high velocity wind zones;  
coordinate glass selection and interlayer  
thickness required based upon tested  
assemblies.

7. Windborne debris-resistant glazing unit required.

### 3.17 INSULATING GLASS SCHEDULE

SPEC WRITER NOTES:

1. Use this schedule for applications  
where there are no force protection or  
other physical safety protection  
requirements that stipulate laminated  
glass lites for exterior openings.
2. For exterior openings requiring  
laminated glass indoor lites, use  
INSULATING LAMINATED GLASS SCHEDULE  
below.
3. Low emissivity coating should be on  
the air space surface of the inner  
pane of glass (the number 3 surface)  
in heating-dominated buildings, and on  
the number 2 surface (inside surface  
of the exterior pane) in  
cooling-dominated buildings.

- A. Glass Type IG# // //: Clear insulating glass.

1. Overall Unit Thickness: //25 mm (1 inch)// // //.
2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm  
(0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch)// .
3. Outdoor Lite: Annealed float glass, except heat-strengthened float  
glass where required, and fully tempered float glass where  
indicated.
4. Interspace Content: // Air // // Argon //.
5. Indoor Lite: Fully tempered float glass.

- 6. Visible Light Transmittance: 80 percent minimum.
- 7. Solar Heat Gain Coefficient: 0.75 maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

- 8. Safety glazing label required.

B. Glass Type IG# // //: Low-E-coated, clear insulating glass.

- 1. Overall Unit Thickness: //25 mm (1 inch)// // //.
- 2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
- 3. Outdoor Lite: Annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
- 4. Interspace Content: // Air // // Argon //.
- 5. Indoor Lite: Fully tempered float glass.
- 6. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon coating selection and thickness of components; below is example of typical performance.

- 7. Visible Light Transmittance: // 68 // // // percent minimum.
- 8. Solar Heat Gain Coefficient: // 0.38 // // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

- 9. Safety glazing label required.

SPEC WRITER NOTE: Specify high performance low-E-coated insulating glass units for applications where greater control of solar heat gain is required in order to control cooling loads or to meet energy code requirements.

C. Glass Type IG# // //: High performance low-E-coated, clear insulating glass.

- 1. Overall Unit Thickness: //25 mm (1 inch)// // //.
- 2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

3. Outdoor Lite: Annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
4. Interspace Content: // Air // // Argon //.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon coating selection and thickness of components; below is example of typical performance.

7. Visible Light Transmittance: // 62 // // // percent minimum.
  8. Solar Heat Gain Coefficient: // 0.27 // // // maximum.
- D. Glass Type IG# // //: Low-E-coated, tinted insulating glass.
1. Overall Unit Thickness: // 25 mm (1 inch) // // //.
  2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
  3. Outdoor Lite: Tinted annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
    - a. Tint Color: // Light Blue // // Blue // // Blue-green // // Bronze // //Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.
  4. Interspace Content: // Air // // Argon //.
  5. Indoor Lite: Fully tempered float glass.
  6. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon tint selection, coating selection, and thickness of components.

7. Visible Light Transmittance: // // percent minimum.
8. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

9. Safety glazing label required.

E. Glass Type IG# // //: Ceramic-coated, low-E coated, insulating vision glass.

1. Overall Unit Thickness: //25 mm (1 inch)// // //.
2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
3. Outdoor Lite: // Clear // // Tinted // annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
  - a. Tint Color: // Light Blue // // Blue // // Blue-green // // Bronze // //Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.
4. Interspace Content: // Air // // Argon //.
5. Indoor Lite: Fully tempered float glass.
6. Ceramic Coating Location: // Second // // Third // surface.

SPEC WRITER NOTE: Description of ceramic frit coating below is example only.

- a. Color and Frit Pattern: // 3 mm (1/8-inch) dot, 30 percent coverage, white // // as selected from manufacturer's full range // //as indicated on construction documents //.
7. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon tint selection, coating selection, and thickness of components.

8. Visible Light Transmittance: // // percent minimum.
9. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

10. Safety glazing label required.

F. Glass Type IG# // //: Reflective-coated, low-E coated insulating glass.

1. Overall Unit Thickness: // 25 mm (1 inch) // // //.
2. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

3. Outdoor Lite: Annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
- a. Tint Color: // Clear // // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.

## SPEC WRITER NOTES:

1. Pyrolytic coatings may be used on any surface of insulating glass.
2. Sputtered coatings may only be used facing interspace.
3. Usually locate coating on second surface where intent is to reduce cooling load.
4. Usually locate coating on third surface where intent is to reduce heating load.

- b. Reflective Coating Type: // Pyrolytic // // Sputter-coating (vacuum deposition process) //.
- 1) Coating Color: // Gold // // Pewter // // Silver //.
  - 2) Coating Location: // First // // Second // // Third // surface.
4. Interspace Content: // Air // // Argon //.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. OVR, VLT and SHGC will vary based upon tint selection, coating selection, and thickness of components.

7. Outdoor Visible Reflectance: // // percent maximum.
8. Visible Light Transmittance: // // percent minimum.
9. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

10. Safety glazing label required.
- G. Glass Type IG# // //: Ceramic-coated, insulating spandrel glass.
1. Match adjacent vision unit profile, glass thickness, tint, // low-E coating, // and performance.

SPEC WRITER NOTE: If spandrel unit varies from adjacent unit profile, delete

subparagraph above, and retain and edit subparagraphs 2 through 6 below and edit to describe spandrel unit.

2. Overall Unit Thickness: // 25 mm (1 inch) // // //.
3. Minimum Thickness of Each Glass Lite: // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
4. Outdoor Lite: Clear annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
5. Interspace Content: // Air // // Argon //.
6. Indoor Lite: Fully tempered float glass.
  - a. Opaque Coating Location: Fourth surface.
  - b. Coating Color: As selected by Architect from manufacturer's full range.

**3.18 INSULATING LAMINATED GLASS SCHEDULE (FORCE PROTECTION AND PHYSICAL SAFETY)**

SPEC WRITER NOTE: Use this schedule for exterior glazing units required to meet VA PSDM/UFC 4-010-01 force protection requirements or requiring inboard laminated glass for VA ADM physical safety requirements, or where windborne-debris-impact resistance is required, where outboard lite may be monolithic heat-strengthened, or tempered glass. Modify the following for those circumstances where the outboard lite is also required to be laminated glass.

- A. Glass Type IL# // //: Clear insulating laminated glass.
  1. Overall Unit Thickness: // 30 mm (1-1/4 inch) // // 25 mm (1 inch) // // 19 mm (3/4 inch) // // //.
  2. Outdoor Lite: Clear annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
    - a. Minimum Thickness of Outdoor Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
  3. Interspace Content: // Air // // Argon //.
  4. Indoor Lite: Clear laminated glass with two lites of annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
    - a. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

b. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm  
(0.060 inch) // // 2.29 mm (0.090 inch) //.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon thickness of components.

5. Visible Light Transmittance: // // percent minimum.  
6. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

7. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies.

8. Windborne debris-resistant glazing unit required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies. Performance values for bidding (GP value) furnished by VA on project-specific basis. Charge weight and standoff distance data to be furnished by VA on as-needed basis post-bid.

9. Blast Resistance: Provide units meeting the following:

a. GP Value // //.

- B. Glass Type IL# // //: Low-E-coated, clear insulating laminated glass.

1. Overall Unit Thickness: // 30 mm (1-1/4 inch) // // 25 mm (1 inch)  
// // 19 mm (3/4 inch) // // //.

2. Outdoor Lite: Clear annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.

a. Minimum Thickness of Outdoor Lite: // 3 mm (0.12 inch) // // 4 mm  
(0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

3. Interspace Content: // Air // // Argon //.

4. Indoor Lite: Clear laminated glass with two lites of annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.

a. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm  
(0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

b. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) //.

5. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon coating selection and thickness of components.

6. Visible Light Transmittance: // // // // percent minimum.

7. Solar Heat Gain Coefficient: // // // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

8. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies.

9. Windborne debris-resistant glazing unit required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies. Performance values for bidding (GP value) furnished by VA on project-specific basis. Charge weight and standoff distance data to be furnished by VA on as-needed basis post-bid.

10. Blast Resistance: Provide units meeting the following:

a. GP Value // //.

SPEC WRITER NOTE: Unit below describes typical skylight glazing unit incorporating high performance low-E-coating with ceramic frit pattern designed to further limit glare while still allowing substantial daylighting. Review available units with manufacturers and edit as required for project.

C. Glass Type IL# // //: Low-E-coated, ceramic-coated clear insulating laminated glass for skylights.

1. Overall Unit Thickness: // 30 mm (1-1/4 inch) // // 25 mm (1 inch) // // 19 mm (3/4 inch) // // //.

2. Outdoor Lite: Fully tempered float glass.

- a. Minimum Thickness of Outdoor Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) // .
- b. Tint Color: // Clear // // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.
- 3. Interspace Content: // Air // // Argon //.
- 4. Indoor Lite: Clear laminated glass with two lites of annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
  - a. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
  - b. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) //.
- 5. Low-E Coating: Sputtered on second surface.

SPEC WRITER NOTE: Description of ceramic frit coating below is example only.
- 6. Ceramic Coating Color and Frit Pattern: // 3 mm (0.12 inch) dot, 30 percent coverage, white // // as selected from manufacturer's full range // // as indicated on Drawings //.
  - a. Coating location: Silk-screened on third surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC of glazing unit will vary depending on frit pattern selected and thickness of components. Consult manufacturer.
- 7. Visible Light Transmittance: // // percent minimum.
- 8. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.
- 9. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies.
- 10. Windborne debris-resistant glazing unit required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies. Performance values

for bidding (GP value) furnished by VA on project-specific basis. Charge weight and standoff distance data to be furnished by VA on as-needed basis post-bid.

11. Blast Resistance: Provide units meeting the following:
- a. GP Value // //.
- D. Glass Type IL# // //: Tinted, low-e coated insulating laminated glass.
1. Overall Unit Thickness: // 30 mm (1-1/4 inch) // // 25 mm (1 inch) // // 19 mm (3/4 inch) // // //.
  2. Outdoor Lite: Tinted annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
    - a. Minimum Thickness of Outdoor Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
    - b. Tint Color: // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.
  3. Interspace Content: // Air // // Argon //.
  4. Indoor Lite: Clear laminated glass with two lites of annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.
    - a. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.
    - b. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) //.
  5. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. VLT and SHGC will vary based upon tint selected and thickness of components.

6. Visible Light Transmittance: // // percent minimum.
7. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

8. Safety glazing label required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies.

9. Windborne debris-resistant glazing unit required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies. Performance values for bidding (GP value) furnished by VA on project-specific basis. Charge weight and standoff distance data to be furnished by VA on as-needed basis post-bid.

10. Blast Resistance: Provide units meeting the following:

a. GP Value // //.

- E. Glass Type IL# // //: Reflective-coated, low-E coated, insulating laminated glass.

1. Overall Unit Thickness: // 30 mm (1-1/4 inch) // // 25 mm (1 inch) // // //.

2. Outdoor Lite: Heat-strengthened float glass, except fully tempered float glass where indicated.

a. Minimum Thickness of Outdoor Lite: // 6 mm (0.23 inch) //.

b. Tint Color: // Clear // // Light Blue // // Blue // // Blue-green // // Bronze // // Light Green // // Green // // Dark Green // // Light Gray // // Gray // // Dark Gray //.

c. Coating Type: // Pyrolytic // // Sputter-coating //.

1) Coating Color: // Gold // // Pewter // // Silver //.

SPEC WRITER NOTE: Pyrolytic coatings may be used on the exposed surfaces of insulating glass. Sputtered coatings are only used facing an interspace.

2) Coating Location: // First // // Second // surface.

3. Interspace Content: // Air // // Argon //.

4. Indoor Lite: Clear laminated glass with two lites of annealed float glass, except heat-strengthened float glass where required, and fully tempered float glass where indicated.

a. Minimum Thickness of Each Glass Lite: // 3 mm (0.12 inch) // // 4 mm (0.16 inch) // // 5 mm (0.19 inch) // // 6 mm (0.23 inch) //.

b. Interlayer Thickness: // 0.76 mm (0.030 inch) // // 1.52 mm (0.060 inch) // // 2.29 mm (0.090 inch) //.

5. Low-E Coating: // Sputtered on second // // Sputtered on third // surface.

SPEC WRITER NOTE: Insert performance values for selected glazing units based upon manufacturer's data. OVR, VLT, and SHGC will vary based upon tint selected and thickness of components. Consult manufacturer.

- 6. Outdoor Visible Reflectance: // // percent maximum.
- 7. Visible Light Transmittance: // // percent minimum.
- 8. Solar Heat Gain Coefficient: // // maximum.

SPEC WRITER NOTE: Retain subparagraph below if required.

9. Safety glazing label required.

SPEC WRITER NOTE: Retain subparagraph below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies.

10. Windborne debris-resistant glazing unit required.

SPEC WRITER NOTE: Retain below if required; coordinate glass selection and interlayer thickness required based upon approved assemblies. Performance values for bidding (GP value) furnished by VA on project-specific basis. Charge weight and standoff distance data to be furnished by VA on as-needed basis post-bid.

11. Blast Resistance: Provide units meeting the following:

- a. GP Value // //.

**3.19 ELECTROCHROMIC LAMINATED INSULATING GLASS SCHEDULE**

A. Glass Type EC# // //: Clear electrochromic laminated insulating glass unit.

SPEC WRITER NOTE: Outboard lite can be laminated or unlaminated. If unlaminated lite is used, provide EC coating on surface 2.

1. Laminated Outboard Lite:

a. Outer Lite (Surface 1 & 2):

- 1) Glass Type: Coated float glass.
- 2) Glass Tint: Clear with transparent optical coating.
- 3) Nominal Thickness: 3.9 mm (0.16 inch).
- 4) Heat Treatment: // Heat-strengthened // // Tempered //.
- 5) Coating orientation: Surface No. 2.

6) Obscuration: Less than 21 mm (13/16 inch) from IGU edge black ink obscuration band on surface 2 around the perimeter.

b. Interlayer (Between Surface 2 & 3):

- 1) Interlayer Type: PVB Interlayer.
- 2) Interlayer Tint: Clear.
- 3) Nominal Thickness: 0.90 mm (0.038 inch).

c. Inner Lite (Surface 3 & 4):

- 1) Glass Type: Electrochromic coated clear float glass.
- 2) Glass Tint: Electronically variable tintable.
- 3) Nominal Thickness: 2.2 mm (0.087 inch).
- 4) Heat treatment: Annealed.
- 5) Coating Orientation: Surface 4.

2. Cavity:

- a. Spacer Material: Austenitic standard stainless steel with // mill finish // // black finish //.
- b. Nominal Thickness: 11.5 mm +/- 0.5 mm (0.45 inch +/- 0.02 inch).
- c. Cavity: 12.2 mm (0.5 inch)
- d. Wall Thickness: >/= .178 mm (0.007 inch).
- e. Gas Fill: // Air // // 90% Argon with 10% Air //.
- f. Desiccant: Four legs filled with blend of 3A molecular sieve and silica gel desiccant.

3. Inboard Lite:

- a. Glass Type: Float glass.
- b. Glass Tint: Clear.
- c. Nominal Thickness: 6 mm (0.250 inch).
- d. Heat Treatment: // Tempered // // Heat-strengthened //.

4. Pigtail:

- a. Multi-conductor sheathed cable.
- b. 2, 3 or 4 pin weather tight connector.

SPEC WRITER NOTES:

- 1. Select 0.32 U-factor with air fill.
- 2. Select 0.28 U-factor with 90% Argon with gas fill.

5. Clear Performance Characteristics (Center of Glass):

- a. Visible Transmittance: 60 percent.
- b. Exterior Reflectance: No greater than 16 percent.
- c. Interior Reflectance: No greater than 15 percent.
- d. Summer U-factor (U-value): // 0.32 // // 0.28 //.

- e. Winter U-factor (U-value): // 0.32 // // 0.28 //.
- f. Solar Heat Gain Coefficient (SHGC): // 0.42 with 90% Argon fill // //0.41 with 90% Argon fill //.
- g. Shading Coefficient: 0.48.
- h. Exterior reflected color using the  $l^*a^*b^*$  color system to have a negative value of  $b^*$  (blue). The  $b^*$  coordinate of the reflected exterior color is not permitted to be positive (yellow) according to Window 6 calculations using appropriate NFRC approved International Glazing Database data file.

## SPEC WRITER NOTES:

- 1. Select 0.32 U-factor with air fill.
- 2. Select 0.28 U-factor with 90% Argon with gas fill.

- 6. Tinted Performance Characteristics (Center of Glass):
  - a. Visible Transmittance: 1 percent.
  - b. Exterior Reflectance: 11 percent.
  - c. Interior Reflectance: No greater than 10 percent.
  - d. Summer U-factor (U-value): // 0.32 // // 0.28 with 90% Argon fill //.
  - e. Winter U-factor (U-value): // 0.32 // // 0.28 with 90% Argon fill //.
  - f. Solar Heat Gain Coefficient (SHGC): 0.09.
  - g. Shading Coefficient: 0.10.

SPEC WRITER NOTE: Coordinate in-pane zoning requirements with architectural drawings for specific location and number of in-pane zones.

- 7. In-Pane Zoning
  - a. Provide up to three (3) separate, independently tintable sections (zones) within each electrochromic insulating glass unit to provide optimum daylight control, glare control and indoor light color quality.
  - b. Each zone within the pane is to be individually controllable in accordance with standard, published capabilities of single zone panes with regard to level of tint and integration with system controllers and accessories.
  - c. For a three zone EC insulating glass unit, provide a segmented individual pane so that zones/sections are vertically above the other to create a bottom, middle and top zone in the unit.

- d. For a two zone EC insulating glass unit, provide a segmented individual pane so that zones/sections are vertically above the other to create a bottom and top zone in the unit.
  - e. For a one zone electrochromic insulating glass unit, provide the entire area of the pane controlled as one segment.
8. Frame Cable (one per IGU):
- a. Multi-conductor plenum rated sheathed cable type CMP/CL2P.
  - b. 2, 3, or 4-pin weathertight connector.
  - c. Provide thin connector at not more than 5.1 mm (0.2 inch) in height and install in the glazing pocket or other easy to access space in the framing system for ease of maintenance.

### 3.20 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE

SPEC WRITER NOTE: Retain one or more glass types below if required; coordinate with product descriptions in PART 2. Fire-protective-rated glass may be used in fire-labeled doors and windows; fire-resistance rated glass may be used in doors, sidelites and transoms, and in fire-rated wall construction.

- A. Glass Type FR# // //: Fire-protection-rated tempered glass.
  - 1. Thickness: // 6 mm (0.23 inch) // // 10 mm (0.39 inch) // // 12 mm (0.47 inch) //.
  - 2. Rating: 20 minutes.
  - 3. Application: Fire-protection-rated door assemblies with openings not over 0.65 square meter (100 square inch).
- B. Glass Type FR# // //: Fire-protection-rated laminated ceramic glazing.
  - 1. Thickness: // //.
  - 2. Rating: // 20- // // 45- // 60- // // 90- // // 120- // minute.
  - 3. Application: Fire-protection-rated door and window assemblies.

SPEC WRITER NOTE: Retain first option in paragraphs below for application in door or window assemblies; retain second option for wall assemblies.

- C. Glass Type FR# // //: // Fire-protection-rated // // Fire-resistance-rated // laminated glass with intumescent interlayers.
  - 1. Thickness: // //.
  - 2. Rating: // 45- // 60- // // 90- // // 120- // minute.
  - 3. Application: // Fire-protection-rated door and window assemblies // //Fire-resistance-rated wall assemblies //.

D. Glass Type FR# // //: Fire-resistance-rated double glazing units with gel fill.

1. Thickness: // //.
2. Rating: // 20- // // 45- // 60- // // 90- // // 120- // minute.
3. Application: Fire-resistance-rated wall assemblies.

### 3.21 SECURITY GLAZING SCHEDULE

#### SPEC WRITER NOTES:

1. Consider glass clad polycarbonate assemblies where the potential for injury by loose shards of glass from the side opposite impact is understood and accepted.
2. Mental health and behavioral science service for psychiatric, alcohol, and drug dependency treatment areas require "SECURITY GLAZING" assemblies, resistant to breakage and use as weapons.
3. Security (seclusion) rooms, including room doors, use 11 mm (7/16 inch) laminated clear glass, clear heat strengthened glass clad polycarbonate, or clear tempered glass clad polycarbonate.
4. For patient ward glazing use laminated assemblies of tinted, heat strengthened, clear, clear tempered, or clear heat strengthened glass.
5. Specify optional glazing of clear heat strengthened glass clad polycarbonate, or clear tempered glass clad polycarbonate for 11 mm (7/16 inch) thick laminated glass.
6. Refer to VAPSDM for glazing requirements of blast-resistant windows.
7. Unit described below meets VA requirements for observation window unit up to 1.4 square meters (12.3 square. feet)

A. Glass Type SG# // //: Tinted reflective-coated symmetrical glass-clad polycarbonate, ASTM C1349.

1. Overall Unit Thickness: 13.3 mm (0.52 inch).
2. Outer Lite: 6 mm (0.23 inch) heat-strengthened tinted float glass.
  - a. Glass Tint Color: Gray.
  - b. Tinted Glass Location: Outer lite.
  - c. Coating Color: Silver.
  - d. Coating Location: Second surface.
  - e. Visible Light Transmittance of Outer Lite: 11 percent.

- 3. Single Core: Polycarbonate, 3 mm (0.12 inch) thick.
- 4. Inner Lite: Heat-strengthened float glass, 1.3 mm (0.05 inch).
- 5. Interlayer Type and Thickness: Clear, 1.52 mm (0.06 inch).
- 6. Application: Security glazing for observation window.

SPEC WRITER NOTE: Below are descriptions of two example security glazing assemblies edited to present true performance specifications based upon the criteria listed in Part 2. Modify as required for project.

B. Glass Type SG# // //: Clear Heat Strengthened Glass Clad Polycarbonate Security Glazing Unit:

- 1. Outer Glass Panes: Heat strengthened, 3 mm (0.12 inch) thick.
- 2. Interlayers: Minimum 1.3 mm (0.050 inch) polyurethane sheeting, in thickness required to meet performance requirements.
- 3. Core: Clear polycarbonate sheet, minimum 3 mm (0.12 inch) thick, in thickness required to meet performance requirements.
- 4. Ballistic-Resistance Rating: // //.
- 5. Forced Entry Resistance Rating: // //.
- 6. Blast Resistance: Provide units meeting the following:
  - a. GP Value // //.

C. Glass Type SG# // //: Clear Tempered Glass Clad Polycarbonate Security Glazing Unit:

- 1. Outer Glass Panes: Fully tempered, 3 mm (0.12 inch) thick.
- 2. Interlayers: Minimum 1.3 mm (0.050 inch) polyurethane sheeting, in thickness required to meet performance requirements.
- 3. Core: Clear polycarbonate sheet, minimum 3 mm (0.12 inch) thick, in thickness required to meet performance requirements.
- 4. Ballistic-Resistance Rating: // //.
- 5. Forced Entry Resistance Rating: // //.
- 6. Blast Resistance: Provide units meeting the following:
  - a. GP Value // //.

SPEC WRITER NOTES:

- 1. The following glazing items have not been scheduled as they are special glazing items not normally used:
  - a. Tinted Heat absorbing and Light Reducing glass.
  - b. Tinted Light Reducing glass.
  - c. Reflective Tempered glass.
  - d. Low E Tempered glass.
  - e. Acrylic sheet.
  - f. Polycarbonate sheet.

- g. Obscure glazing assembly  
(laminated).
- 2. Add paragraphs to clearly define these  
locations when required in the  
project.

- - - E N D - - -