

01-01-21

SECTION 08 80 00

GLAZING

1. .

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the following:

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

1.2 RELATED WORK

- A. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS: Sound resistant doors.
- B. Section 08 56 53, SECURITY WINDOWS: Forced Entry (FE) resistant and Ballistic Resistance (BR) rated glazing and frames.
- C. Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES: Mirrors.
- D. Section 08 56 59, SERVICE AND TELLER WINDOW UNITS Section 08 56 59,
- E. Section 13 49 00, RADIATION PROTECTION: Lead glass.
- F. Section 08 51 13, ALUMINUM WINDOWS: Aluminum Windows.
- G. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS Glazed Curtain Walls: Glazed Curtain Walls Section 08 56 59, SERVICE AND TELLER WINDOW UNITS: Service and Teller Windows.
- H. Lead glass: Section 13 49 00, RADIATION PROTECTION.
- I. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES: Wiring (120 V AC, 15A or 20A).
- J. Intrusion Detection: Section 28 16 11, INTRUSION DETECTION SYSTEM.
- K. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Junction and Switch Boxes.
- L. 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 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 is approved by Contracting Officer Representative (COR).

01-01-21

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 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.

01-01-21

2. Design Wind Pressures: In accordance with ASCE 7 and applicable code.
3. Wind Design Data: In accordance with ASCE 7 and applicable code.
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.

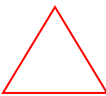

C. Ballistic- and Blast- resistant glass glazing assemblies:

1. For blast-resistant and ballistic-resistant units comply with requirements in Physical Security Design Manual for VA /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 ± 3 mm (± 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.

D. Blast Performance Requirements: All glazing for all exterior windows, curtainwalls, storefronts and glazed doors must be designed to meet the blast-resistant design requirements for Mission Critical facilities per Section 6.3.1 of the VA Physical Security and Resilience Design Manual (2020). The blast design must follow the requirements shown below:

1. The exterior glazing must be designed to achieve a glass Performance Condition 2 (i.e. glass may crack but must remain attached to the frame) in response to a design blast load of 13.5 psi peak reflected pressure and 51 psi-msec reflected impulse. The design of the glazing must be done using dynamic analysis methods.

01-01-21

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2. The dynamic analysis must be performed using window glazing blast analysis and design software developed by the US Government, such as SBEDS-W or WINGARD PE, which are capable of predicting the glass, film, and laminate response when subjected to the blast loading environment. The dynamic analysis must use a glass probability of failure (POF) of 500 breaks per 1000. In addition, the blast analysis must include calculation of the maximum capacity of the glazing (maximum blast load resulting in Performance Condition 2) for balanced design purposes.
 3. All exterior glazing must use laminated glass (for IGU, laminated glass is required only for the inner lite). A minimum 1/2" bite and a continuous 3/8" bead of structural silicone adhesive shall be provided to develop post-damage glazing capacity. Alternatively, a dry glazed system can be used if the adequacy to meet the above blast-resistant design requirements is demonstrated by dynamic analysis.
 4. Blast analysis and design calculations must be performed by a licensed professional engineer with a minimum of five years of professional experience in blast-resistant design.

E. 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 2 .
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.

F. 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.

01-01-21

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. 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.
- C. Manufacturer Warranty.
- D. Manufacturer's Literature and Data:
 - 1. Glass, each kind required.
 - 2. Insulating glass units.
 - 3. Glazing cushion.
 - 4. Sealing compound.
 - 5. Bullet resistive material.
- E. Samples:
 - 1. Size: 305 mm by 305 mm (12 inches by 12 inches).
 - 2. Tinted glass.
 - 3. Reflective glass.
- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING

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

01-01-21

- 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

01-01-21

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.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
- 800.....Test Methods for Sealants
 - 810.1-77.....Expanded Cellular Glazing Tape
- C. American National Standards Institute (ANSI):
- Z97.1-14.....Safety Glazing Material Used in Building -
Safety Performance Specifications and Methods
of Test
- D. American Society of Civil Engineers (ASCE):
- 7-10.....Wind Load Provisions
- E. ASTM International (ASTM):
- C542-05(2017).....Lock-Strip Gaskets
 - C716-06(2020).....Installing Lock-Strip Gaskets and Infill
Glazing Materials
 - C794-18.....Adhesion-in-Peel of Elastomeric Joint Sealants

01-01-21

C864-05(2019).....Dense Elastomeric Compression Seal Gaskets,
Setting Blocks, and Spacers
C920-18.....Elastomeric Joint Sealants
C964-20.....Standard Guide for Lock-Strip Gasket Glazing
C1036-16.....Flat Glass
C1048-18.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated
and Uncoated Glass.
C1172-19.....Laminated Architectural Flat Glass
C1349-17.....Standard Specification for Architectural Flat
Glass Clad Polycarbonate
C1376-15.....Pyrolytic and Vacuum Deposition Coatings on
Flat Glass
D635-18.....Rate of Burning and/or Extent and Time of
Burning of Self-Supporting Plastic in a
Horizontal Position
D4802-16.....Poly (Methyl Methacrylate) Acrylic Plastic
Sheet
E84-20.....Surface Burning Characteristics of Building
Materials
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

01-01-21

- 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):

01-01-21

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

2.1 GLASS

- A. Provide minimum thickness stated and as additionally required to meet performance requirements.
1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.
B. Obtain glass units from single source from single manufacturer for each glass type.
C. Clear Glass:
1. ASTM C1036, Type I, Class 1, Quality q3.
D. Tinted Heat reflective and low emissivity coated glass:
1. ASTM C1036, Type I, Class 2, Quality q3.

2.2 HEAT-TREATED GLASS.

- A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:

01-01-21

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.

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.

2.3 COATED GLASS

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.
2. Thickness, as indicated in construction documents.

2.4 LAMINATED GLASS

- 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 scheduled .
- C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
1. 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 scheduled .

2.5 SECURITY GLAZING ASSEMBLY

- A. Provide ballistic level as scheduled in accordance with UL 752.
- B. Forced Entry Resistance: As scheduled, in accordance with ASTM F1233.

01-01-21

- 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 Mission Critical Protected Facilities) October 2020 as indicated in Specification Section 08 56 53.
- 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.

2.6 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

2.7 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, 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.
 - 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.
 - 5. Fire-Protection-Rated Tempered Glass: For 20-minute fire-protection-rated door assemblies, of thickness scheduled.
 - 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.

01-01-21

- 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, 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.

2.8 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.
- 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.

01-01-21

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.
- F. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbeted sash without stops.
- G. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond shaped pieces, 6 mm (1/4 inch) minimum size.
- H. Glazing Gaskets: ASTM C864:
 1. Firm dense wedge shape for locking in sash.
 2. Soft, closed cell with locking key for sash key.
 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- J. Glazing Sealants: ASTM C920, silicone neutral cure:
 1. Type S.
 2. Class 25 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 250g/L or less when calculating according to 40 CFR 59, (EPA Method 24).
- K. Structural Sealant: ASTM C920, silicone acetoxycure:
 1. Type S.
 2. Class 25.
 3. Grade NS.
 4. Shore a hardness of 25 to 30 Durometer.
- L. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
 1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.

01-01-21

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.

01-01-21

3.3 INSTALLATION - GENERAL

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

01-01-21

or fumes by 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 - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 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.

3.5 INSTALLATION - WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 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.

01-01-21

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

3.6 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.

3.7 PROTECTION

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

3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type MG#1: Clear fully tempered float glass. (Interior Standard)
1. Unit Thickness: 6 mm (0.23 inch).
 2. Safety glazing label required.

3.9 INSULATING LAMINATED GLASS SCHEDULE (FORCE PROTECTION AND PHYSICAL SAFETY)

- A. Glass Type IL# 1 Tinted, low-e coated insulating laminated glass.
1. Overall Unit Thickness: 25 mm (1 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: 6 mm (0.23 inch).
 - b. Tint Color: Gray
 3. Interspace Content: 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: 6 mm (0.23 inch).
 - b. Interlayer Thickness: 1.52 mm (0.060 inch).
 5. Low-E Coating: Sputtered on second surface.
 6. Safety glazing label required.
 7. Windborne debris-resistant glazing unit required.
 8. Blast Resistance: Provide units meeting the following:
 - a. GP Value As provided by Owner and coordinated with blast report.

01-01-21

- B. Glass Type IL# 2: Low-E-coated, Silicone coated insulating laminated glass for spandrel glass (Exterior Spandrel.)
1. Overall Unit Thickness: 25 mm (1 inch)
 2. Outdoor Lite: Fully tempered float glass where indicated.
 - a. Minimum Thickness of Outdoor Lite: 6 mm (0.23 inch).
 3. Interspace Content: 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: 6 mm (0.23 inch).
 - b. Interlayer Thickness: 1.52 mm (0.060 inch).
 - c. Indoor Lite requirements to be coordinated with blast report included as part of contract documents. Modify lite as required by manufacturer to meet or exceed blast requirements.
 5. Low-E coating: Sputtered on second surface.
 6. Silicone Coating: As selected from manufacturer's full range.
 7. Safety glazing label required.
 8. Windborne debris-resistant glazing unit required.
 9. Blast Resistance: Provide units meeting the following:
 - a. GP Value As provided by Owner and coordinated with blast report.

3.10 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE

- A. Glass Type #FR-1: Fire-protection-rated laminated ceramic tempered glazing (Glazing at door to ED from Reception):
1. Thickness: 5/16"
 2. Rating: 60 and 90 minutes.
 3. Application: Fire-protection-rated door and window assemblies.

3.11 SECURITY GLAZING SCHEDULE

- A. Glass Type SG# 1: 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.

01-01-21

- 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.
- B. Glass Type SG# 2: Clear Heat Strengthened Glass Clad Polycarbonate Security Glazing Unit (Bullet-Resistant Interior Level 3)
- C. Glass Type SG# 3: Clear Tempered Glass Clad Polycarbonate Security Glazing Unit (Bullet Resistant Exterior / Level 3)

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