SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION:

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

1.2 RELATED WORK:

A. Sustainable design requirements and procedures including submittal requirements: Section 018111, SUSTAINABLE DESIGN REQUIREMENTS.

B. Procedures and requirements for managing and disposing construction and demolition waste: Section 017419, CONSTRUCTION WASTE MANAGEMENT.

C. Factory glazed by manufacturer in following units:

1. Sound resistant doors: Section 081113, HOLLOW METAL DOORS AND FRAMES, and Section 081400, WOOD DOORS.
2. Mirrors: Section 102800, TOILET, BATH, AND LAUNDRY ACCESSORIES.
3. Section 084113, ALUMINUM-FRAMED ENTRANCES and Section 084116, INTERIOR ALUMINUM FRAMED STOREFRONTS.
4. Section 084413, GLAZED ALUMINUM CURTAIN WALLS.
5. Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass: Section 090600, SCHEDULE FOR FINISHES.

1.3 LABELS:

A. Temporary labels:

1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
3. Temporary labels shall remain intact until glass is approved by Resident Engineer.

B. Permanent labels:

1. Locate in corner for each pane.
2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
   a. Tempered glass.
   b. Laminated glass or have certificate for panes without permanent label.
   c. Organic coated glass.
3. Bullet resistance glass or plastic assemblies:
   a. Bullet resistance glass or plastic assemblies in accordance

with UL 752 requirements for power rating specified.

b. Identify each security glazing permanently with glazing manufacturer's name, date of manufacture, product number, and DOS Code number inconspicuously located in lower corner on protective side and visible after glazing is framed.

c. The "attack (threat) side" shall be identified in bold lettering on each side of glazing with removable label.

1.4 PERFORMANCE REQUIREMENTS:

A. Building Enclosure Vapor Retarder and Air Barrier:

1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass Thickness:

1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7 code.

2. Test in accordance with ASTM E 1300.

3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

C. Exterior Glass Blast Design Criteria and Structural Performance:

1. General:

a. The glass shall be designed, fabricated, and installed to resist the required directly applied blast loads.

b. The structural analysis of glass shall be performed using a glass hazard predictor code that is recognized by the US Government. Pre-approved glass hazard codes are WinGard, HazL, and WinLac or equivalent.

c. The glass shall be capable of withstanding all other applicable design loads within limits and under conditions indicated in the respective sections.

2. Applicability: Blast design criteria and structural performance requirements apply to new construction only; they do not apply to existing glass.

3. Blast Loads: Linearly decaying peak pressure of GP2 (actual numbers will be supplied to the contractors separately).

4. Performance Criteria: Design, fabricate, and install glass units to comply with the following:

a. Vertical glass: After glass breakage occurs in response to full design blast loading, glass fragments that enter space shall land on floor no further than 10 feet from the window and curtain wall systems consistent with a Low Hazard performance condition per ASTM standard F1642-04.

5. Minimum Glass Requirements: Minimum glazing makeup for blast loads shall be as indicated in the glazing schedule of the specifications.

6. Glazing Bite Design: The glass unit connections to the window, curtain wall and atria systems shall be designed, fabricated, and installed to resist the blast loads specified in this section within limits and under conditions indicated.

   a. Minimum Glazing Bite: Provide a minimum 1/2 inch glazing bite between all edges of glass units and window, curtain wall, and atria framing.

1.5 SUBMITTALS:

A. In accordance with Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Certificates:

1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.

2. Certificate on shading coefficient.

3. Certificate on "R" value when value is specified.

4. Certificate that blast resistant glass meets the requirements of UFC4-010-01.

C. Warranty: Submit written guaranty, conforming to General Condition requirements, and to œWarranty of Construction Article in this Section.

D. Manufacturer's Literature and Data:

1. Glass, each kind required.

2. Insulating glass units.

3. Transparent (one-way vision glass) mirrors.

4. Elastic compound for metal sash glazing.

5. Putty, for wood sash glazing.

6. Glazing cushion.

7. Sealing compound.

8. Plastic glazing material, each type required.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).

2. Tinted glass.

3. Reflective glass.

4. Transparent (one-way vision glass) mirrors.

F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer™s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. LEED Submittals: Submit in accordance with Section 018111.

1. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

2. LEED Product Data Submittal Form: Submit completed product data form provided by the Contracting Officer's Representative; certified by vendor, installer, subcontractor, and/or manufacturer as appropriate.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

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

1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling shall comply with Manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.

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

3. Temporary protections: The glass front and polycarbonate back of glazing shall be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces shall be approved and applied by manufacturer.

4. Edge protection: To cushion and protect glass clad, polycarbonate, and Noviflex edges from contamination or foreign matter, the four edges shall be sealed the depth of glazing with continuous standard-thickness Santoprene tape. Alternatively, continuous channel shaped extrusion of Santoprene shall be used, with flanges extending into face sides of glazing.

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

1.7 PROJECT CONDITIONS:

A. Field Measurements: Field measure openings before ordering

tempered glass products. Be responsible for proper fit of field measured products.

1.8 WARRANTY:

A. Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21, except extend warranty period for the following:

1. Insulating glass units to remain sealed for 10 years.

2. Laminated glass units to remain laminated for 5 years.

1.9 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American National Standards Institute (ANSI):

1. Z97.1-09 Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test.

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

1. C542-05 Lock-Strip Gaskets

2. C716-06 Installing Lock-Strip Gaskets and Infill Glazing Materials.

3. C794-10 Adhesion-in-Peel of Elastomeric Joint Sealants

4. C864-05 Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

5. C920-11 Elastomeric Joint Sealants

6. C964-07 Standard Guide for Lock-Strip Gasket Glazing

7. C1036-06 Flat Glass

8. C1048-12 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

9. C1376-10 Pyrolytic and Vacuum Deposition Coatings on Flat Glass

10. D635-10 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position

11. D4802-10 Poly (Methyl Methacrylate) Acrylic Plastic Sheet

12. E84-10 Surface Burning Characteristics of Building Materials

13. E119-10 Standard Test Methods for Fire Test of Building Construction and Material

14. E2190-10 Insulating Glass Unit

D. Commercial Item Description (CID):

1. A-A-59502 Plastic Sheet, Polycarbonate

E. Code of Federal Regulations (CFR):

1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; 2010

F. National Fire Protection Association (NFPA):

1. 80-13 Fire Doors and Windows.

2. 252-12 Standard Method of Fire Test of Door Assemblies

3. 257-12 Standard on Fire Test for Window and Glass Block Assemblies

G. National Fenestration Rating Council (NFRC)

H. Safety Glazing Certification Council (SGCC) 2012:

1. Certified Products Directory (Issued Semi-Annually).

I. Underwriters Laboratories, Inc. (UL):

1. 752-11 Bullet-Resisting Equipment.

J. Unified Facilities Criteria (UFC):

1. 4-010-01-2012 DOD Minimum Antiterrorism Standards for Buildings

K. Glass Association of North America (GANA):

1. Glazing Manual (Latest Edition)

2. Sealant Manual (2009)

L. American Society of Civil Engineers (ASCE):

1. ASCE 7-10 Wind Load Provisions

PART 2 - PRODUCT

2.1 GLASS:

A. Use thickness stated unless specified otherwise in assemblies.

B. Clear Glass:

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

2. Thickness, as indicated.

3. Coordinate color/tint/coating to accommodate required security monitoring.

C. Wired Flat Glass *(ADD#01)*

1. ASTM C1036, Type II, Class 1,Form 1, Pattern Pl, Finish F1, Quality Q5, Mesh m1.

2. Thickness, 6 mm (1/4 inch).

2.2 HEAT-TREATED GLASS:

A. Clear Heat Strengthened Glass:

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

2. Thickness, as indicated.

B. Clear Tempered Glass:

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

2. Thickness, as indicated.

2.3 COATED GLASS:

A. Spandrel Glass:

1. ASTM C1048, Kind HS, Condition B, Type I.

2. Thickness, as indicated.

B. Low-E Tempered Glass:

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

with low emissivity pyrolytic coating having an E of 0.15.

2. Apply coating to ~~[second] [third]~~indicated(ADD#01) surface of insulating glass units.

3. Thickness, as indicated.

C. Ceramic Coated Vision Glass:

1. ASTM C1048, Kind FT , Quality q3 with ceramic coating applied by silk-screen process.

2. Pattern as indicated in Drawings.

3. Thickness, ~~[6 mm (1/4 inch)][~~as indicated~~]~~*(ADD#01)*.

D. Ceramic Coated Spandrel Glass:

1. ASTM C1048, Kind FT , Quality q3 with ceramic coating applied over and fused into glass surface.

2. Pattern as indicated in drawings.

3. Thickness, as indicated.

2.4 LAMINATED GLASS:

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

B. Use 1.5 mm (0.060 inch) thick interlayer for:

1. Heat strengthened or fully tempered glass assembles.

2.5 LAMINATED GLAZING ASSEMBLIES:

A. Clear Tempered Glazing:

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

2. Thickness: Each pane as indicated .

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.

B. Assemble units using glass types specified:

C. Sealed Edge Units (SEU): See Schedule.

1. Glass shall be annealed, heat strengthened or tempered as required by codes, or as required to meet thermal stress and wind loads.

2. Glass heat-treated by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed when specified.

2.7 FIRE RESISTANT GLASS WITHOUT WIRE MESH:

A. Type 1 (Transparent float glass), Class 1 (Clear).

B. Fire-protective glass products used to protect against smoke and flames only shall be rated for 20 minutes as required by local building code and shall be tested in accordance with NFPA 252 (Standard Methods of Fire Tests of Door Assemblies) and NFPA 257 (Standard on Fire Test for Window and Glass Block Assemblies)

C. Fire-resistive products used to protect against smoke, flame, and the transmission of radiant heat shall be rated for 60 minutes and shall be tested in accordance with NFPA 252, NFPA 257, and ASTM E119 (Standard Test Methods for Fire Tests of Building Construction and Materials).

D. Fire-rated glass or glass assembly shall be classified by Underwriters Laboratory (UL), Intertek Testing Services- Warnock Hersey (ITS-WHI) or any other OSHA certified testing laboratory. All glass shall bear a permanent mark of classification in accordance with local building code.

E. Maximum size is per the manufacturer¢s test agency listing for doors, transoms, side lights, borrowed lights, and windows.

F. Where safety glazing is required by local building code, fire-rated glass shall be tested in accordance with CPSC 16 CFR 1201 Category I or II and bear a permanent mark of classification.

1. Category I products are limited to 0.84 m2 Ó 9 ft2 and tested to no less than 203 Nm-150 ft-lbs impact loading.

2. Category II products are greater than 0.84 m2 Ó 9 ft2 and tested to no less than 542 Nm-400 ft-lbs impact loading. Category II products can be used in lieu of Category I products.

2.8 GLAZING ACCESSORIES:

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work shall have a finish that will not corrode or stain while in service.

B. Setting Blocks: ASTM C864:

1. Channel shape; having 6 mm (1/4 inch) internal depth.

2. Shore a hardness of 80 to 90 Durometer.

3. |Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.

4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.

5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:

1. Channel shape having a 6 mm (1/4 inch) internal depth.

2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.

3. Lengths: One to 25 to 76 mm (one to three inches).

4. Shore a hardness of 40 to 50 Durometer.

D. Sealing Tapes:

1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.

2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.

E. Glazing Gaskets: ASTM C864:

1. Firm dense wedge shape for locking in sash.

2. Soft, closed cell with locking key for sash key.

3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.

F. Glazing Sealants: ASTM C920, silicone neutral cure:

1. Type S.

2. Class 25

3. Grade NS.

4. Shore A hardness of 25 to 30 Durometer.

G. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.

1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.

2. Designed for dry glazing.

H. Color:

1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames shall match color of the finished aluminum and be nonstaining.

2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted shall be black, gray, or neutral color.

I. Frit Applied to Insulated Glass Units:

1. Surface numbers start from the exterior of the glass assembly and go to the interior. In laminated glass, faces 4 and 5 are interior at the interlayer.

2. Type 1: Simulated acid etch ceramic frit on No. 5 surface.

3. Type 2: Silk-screened line pattern ceramic frit on No. 2 surface.

J. Color Filter: Biaxially oriented polyethylene film. Deep red, transmission 1%, color temperature 6774K.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.

2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.

B. Advise Contractor of conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation: Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION:

A. For sealant glazing, prepare glazing surfaces in accordance with

GANA-02 Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION – GENERAL:

A. Install in accordance with GANA-01 Glazing Manual and GANA-02 Sealant Manual unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

G. Laminated Glass:

1. Tape edges to seal interlayer and protect from glazing sealants.

2. Do not use putty or glazing compounds.

H. Insulating Glass Units:

1. Glaze in compliance with glass manufacturer's written instructions.

2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.

3. Do not use putty or glazing compounds.

4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.

5. Install with tape or gunnable sealant in wood sash.

I. Fire Resistant Glass:

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

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

A. Cut glazing tape to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.

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

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Trim protruding tape edge.

3.5 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT):

A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.

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

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.

E. Fill gaps between pane and applied stop with silicone type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.6 REPLACEMENT AND CLEANING:

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.

B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.

C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.7 PROTECTION:

A. Protect finished surfaces from damage during erection, and after completion of work. .

3.8 GLAZING SCHEDULE:

A. Tempered Glass:

1. Install in interior butt-glazed storefront.

B. Insulating Glass:

1. G-1 Low-E Sealed-Edge Insulating Glass Unit:

a. Exterior Lite: Clear Tempered, blast mitigation (50’ standoff distance) Outer Lite: 6 mm (1/4”) Fully Tempered (FT) Glass Air Gap: 13 mm (1/2”)

b. Inner Lite: 4.75 mm (3/16”) Annealed Glass + 1.5 mm (0.030”) PVB + 4.75 mm (3/16”) Annealed Glass Low-E Coating on No. 2 surface.

2. G-2 Low-E Sealed-Edge Insulating Glass Unit Clear, blast mitigation (50’ standoff distance)

a. Outer Lite: 6 mm (1/4”) Heat-Strengthened (HS) Glass Air Gap: 13 mm (1/2”)

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface

3. G-3 Low-E Sealed-Edge Insulating Glass Unit Clear, blast mitigation (50' standoff distance)

a. Outer Lite: 6 mm (1/4") Heat-Strengthened (HS) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 2 on face 2.

4. G-4 Low-E Sealed-Edge Insulating Glass Unit:

a. Exterior Lite: Clear Tempered, blast mitigation (50' standoff distance) Outer Lite: 6 mm (1/4") Fully Tempered (FT) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 1 on face 5 and frit type 2 on face 2.

5. G-5 Low-E Sealed-Edge Insulating Glass Unit:

a. Exterior Lite: Clear Tempered, blast mitigation (50' standoff distance) Outer Lite: 6 mm (1/4") Fully Tempered (FT) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 2 on face 2.

6. G-6 Low-E Sealed-Edge Insulating Glass Unit Clear, blast mitigation (50' standoff distance)

a. Outer Lite: 6 mm (1/4") Heat-Strengthened (HS) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 1 on face 5 and type 2 on face 2.

7. G-7 Low-E Sealed-Edge Insulating Glass Unit:

a. Exterior Lite: Clear Tempered, blast mitigation (50' standoff distance) Outer Lite: 6 mm (1/4") Fully Tempered (FT) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.030") PVB + 4.75 mm (3/16") Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 1 on face 5.

8. G-8 Low-E Sealed-Edge Insulating Glass Unit Clear, blast mitigation (50' standoff distance)

a. Outer Lite: 6 mm (1/4") Heat-Strengthened (HS) Glass Air Gap: 13 mm (1/2")

b. Inner Lite: 4.75 mm (3/16”) Annealed Glass + 1.5 mm (0.030”) PVB + 4.75 mm (3/16”) Annealed Glass Low-E Coating on No. 2 surface.

c. Frit type 1 on face 5.

C. ~~Laminated Glass: Install as specified in doors, observation windows and interior pane of dual glazed windows where indicated.~~ *(ADD#1)*

1. ~~G9 (at doors): Laminated Glass œ Clear; 6 mm (1/4) Two layers of 3 mm (1/8•) Annealed Glass with (0.060•) PVB interlayer.~~

2. ~~If laminated glass is required for double glazed windows, provide it for interior panes only.~~

?. ~~Where laminated glass is required for blast-resistant windows, follow UFC4-010-01, DOD Minimum Antiterrorism Standards for Buildings.~~

D. Interior Glass

1. IG-1: Tempered Safety Glass; 6mm (1/4”)thick

2. IG-2: Laminated, tempered, 13 mm (1/2”) thick; fritted.

3. IG-3: Tempered Safety Glass at butt glazing: 9mm (3/8") thick.

4. IG-13T tempered glass lite in doors with red plastic filter sheet applied to glass.

5. IG-4: Wired glass. *(ADD#01)*

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

3.9 CONSTRUCTION WASTE MANAGEMENT

A. General: Comply with Contractor's Waste Management Plan and Section 017419, CONSTRUCTION WASTE MANAGEMENT.

B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor’s Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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