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## SECTION 088853 - SECURITY GLAZING

### **TIPS:**

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## PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section includes:

1. Laminated-glass security glazing.
2. Laminated-glass, fire-resistant security glazing.
3. Glass-clad polycarbonate security glazing.
4. Insulating security glazing.
5. Air-gap security glazing.

#### B. Related Requirements:

1. Section 085653 "Security Windows."
2. Section 119821 "Detention Windows."

## 1.2 DEFINITIONS

- A. Bullet-Resistant Glass: Multiple layers of laminated glass or plastic designed to resist penetration and minimize spalling from various calibers of ballistic weapons.
- B. Fire-Resistive Glazing: Multiple layers of glass, plastic, and intumescent material designed to withstand physical attack or ballistic assaults and to protect against radiant and conductive heat transfer.
- C. Forced-Entry Glass: Multiple layers of glass or plastic designed to withstand extensive physical attack.
- D. Glazing Manufacturers: Firms that produce primary glass, monolithic plastic glazing, or fabricated security glazing, as defined in referenced glazing publications.
- E. Interspace: Space between lites of air-gap security glazing or insulating security glazing.

## 1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

## 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.
  - 1. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for security glazing during and after installation.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of **[glass tint]** **[glass coating]** **[colored interlayer]** **[sealant]** **[and]** **[colored spacer]**.
- C. Samples for Verification:
  - 1. Glazing: Actual sample of finished products for each type of security glazing.
    - a. Size: **12 by 12 inches (305 by 305 mm)**.
- D. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.

- E. Delegated Design Submittal: For security glazing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Sustainable Design Submittals:
  - 1. Environmental Product Declaration (EPD): For each product.
  - 2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
  - 3. Product Certificates: For indigenous materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each indigenous material.
  - 4. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports:
  - 1. Product Test Reports:
    - a. For each type of security glazing, for tests performed by **[qualified testing agency] [manufacturer and witnessed by a qualified testing agency]**.
      - 1) Certification not required for glazing materials bearing manufacturer's permanent label designating type of glass, provided labels represent a quality-control program involving a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction.
    - b. Product Test Listings: From an acceptable NRTL, indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.
    - c. For each type of glazing sealant, for tests performed by a qualified testing agency.
      - 1) Provide test reports based on testing current sealant formulations within previous 36-month period.
  - 2. Preconstruction Test Reports: For preconstruction adhesion and compatibility testing.
- B. Qualification Statements: For **[installers] [manufacturers of insulating or air-gap security glazing with sputter-coated, low-E coatings] [glazing testing agency] [and] [sealant testing agency]**.
- C. Sample warranties.

## 1.7 QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturers: For insulating or air-gap security glazing units with sputter-coated, low-E coatings, a qualified insulating glazing manufacturer who is approved[ **and certified**] by coated-glass manufacturer.
2. Installers: Qualified installers who are certified by the National Glass Association.
3. Security Glazing Testing Agency: Subject to compliance with requirements, testing agency is one of the following:
  - a. Intertek.
  - b. Underwriters Laboratories, Inc.
  - c. NTS Chesapeake.
  - d. Wiss, Janney, Elstner Associates, Inc.
4. Sealant Testing Agency: An independent testing agency qualified in accordance with ASTM C1021 to conduct the testing indicated.

## 1.8 MOCKUPS

- A. Build mockups **[to verify selections made under Sample submittals] [to demonstrate aesthetic effects] [to set quality standards for materials and execution] [to set quality standards for fabrication and installation] [and] [for preconstruction testing]**.
  1. Install security glazing in mockups specified in [**Section 084113 "Aluminum-Framed Entrances and Storefronts"**] [**Section 084413 "Glazed Aluminum Curtain Walls"**] [**Section 085113 "Aluminum Windows"**] [**Section 085653 "Security Windows"**] [**Section 119821 "Detention Windows"**] <Insert Section number and title> to match glazing systems required for Project, including glazing methods.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each security glazing type, tape sealant, gasket, glazing accessory, and glazing-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  1. Testing will not be required if data based on previous testing of current sealant products and glazing materials match those submitted.
  2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to security glazing, tape sealants, gaskets, and glazing channel substrates.
  3. Test no fewer than [**eight**] <Insert number> Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
  4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect security glazing and glazing materials in accordance with manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating security glazing and with air-gap security glazing manufacturers' written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
- C. Store in a dry, climate-controlled area.

#### 1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

#### 1.12 WARRANTY

- A. Manufacturer's Special Warranty on Fire-Protection-Rated Tempered Glass: Manufacturer agrees to replace units that deteriorate within specified warranty period.
  - 1. Deterioration of tempered glass is defined as defects developed from normal use not attributed to glass breakage or to maintaining and cleaning tempered glass contrary to manufacturer's written instructions.
    - a. Defects are not to exceed those allowed by referenced tempered glass standard.
  - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty, Coated Glass: Manufacturer agrees to replace coated glass that fails in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Defects developed in coated glass from normal use that is not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 2. Warranty Period: [10] <Insert number> years from date of Substantial Completion.
- C. Special Warranty, Laminated-Glass Security Glazing: Manufacturer agrees to replace laminated-glass security glazing that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated-glass security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
  2. Warranty Period: **[Five]** **[10]** **<Insert number>** years from date of Substantial Completion.
- D. Special Warranty, Laminated-Polycarbonate Security Glazing: Manufacturer agrees to replace laminated-polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to maintaining and cleaning laminated-polycarbonate security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced standard, yellowing, and loss of light transmission.
  2. Warranty Period: **[Five]** **[10]** **<Insert number>** years from date of Substantial Completion.
- E. Special Warranty, Glass-Clad Polycarbonate Security Glazing: Manufacturer agrees to replace glass-clad polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning glass-clad polycarbonate security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced polycarbonate standard, yellowing, and loss of light transmission.
  2. Warranty Period: **[Five]** **[10]** **<Insert number>** years from date of Substantial Completion.
- F. Special Warranty, Laminated-Glass and -Polycarbonate Security Glazing: Manufacturer agrees to replace laminated-glass and -polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated-glass and -polycarbonate security glazing contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding

those allowed by referenced polycarbonate standard, yellowing, and loss of light transmission.

2. Warranty Period: **[Five]** **[10]** **<Insert number>** years from date of Substantial Completion.
- G. Special Warranty, Insulating Security Glazing: Manufacturer agrees to replace insulating security glazing that fails in materials and workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Defects in individual lites developed from normal use or failure of hermetic seal under normal use. Defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning insulating security glazing contrary to manufacturer's written instructions are not included.
    - b. Defects in coated-glass lites include peeling, cracking, and other indications of deterioration in coating.
    - c. Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
    - d. Defects in glass-clad polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced glass-clad polycarbonate standard, yellowing, and loss of light transmission.
    - e. Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.
  2. Warranty Period: **[Five]** **[10]** **<Insert number>** years from date of Substantial Completion.
- H. Special Warranty, Air-Gap Security Glazing: Manufacturer agrees to replace air-gap security glazing that fails in materials and workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Defects in individual lites developed from normal use or failure of hermetic seal under normal use. Defects in individual lites or failure of hermetic seal that is attributed to glass breakage or to maintaining and cleaning air-gap security glazing contrary to manufacturer's written instructions are not included.
    - b. Defects in coated-glass lites include peeling, cracking, and other indications of deterioration in coating.
    - c. Defects in laminated-glass lites include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
    - d. Defects in laminated-polycarbonate lites include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced standard, yellowing, and loss of light transmission.
    - e. Evidence of hermetic seal failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glazing.

2. Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.
  - I. Manufacturer's Special Warranty for Surface-Laminated Monolithic Ceramic Glazing: Manufacturer agrees to replace defective glazing within specified warranty period. Surface-laminated monolithic ceramic glazing defects are defined as edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced surface-laminated-glass standard.
    1. Warranty Period: Three years from date of Substantial Completion.
  - J. Special Warranty, Monolithic Polycarbonate Security Glazing: Manufacturer agrees to replace monolithic polycarbonate security glazing that fails in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
      - a. Defects developed from normal use that are not attributed to maintaining and cleaning monolithic polycarbonate security glazing contrary to manufacturer's written instructions. Defects include yellowing and loss of light transmission.
    2. Warranty Period: [**10**] <**Insert number**> years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of security glazing from single source from single manufacturer.
  1. Obtain [**tinted**] [**and**] [**coated**] glass from single source from single manufacturer.
- B. Obtain glazing [**sealants**] [**and**] [**gaskets**] from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General:
  1. Installed security glazing will withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
  2. Installed security glazing will withstand security-related loads and forces without damage to the glazing beyond that allowed by referenced standards.
- B. Structural Performance: Glazing will withstand the following design loads within limits and under conditions indicated:
  1. Design Procedure for Glass: ASTM E1300 and the IBC.



2. Design Wind Pressures: [As indicated on Drawings] [Determine design wind pressures applicable to Project in accordance with ASCE/SEI 7, based on heights above grade indicated on Drawings].
    - a. Wind Design Data: As indicated on Drawings.
    - b. Basic Wind Speed: [85 mph (38 m/s)] [90 mph (40 m/s)] [100 mph (44 m/s)] [110 mph (49 m/s)] <Insert value>.
    - c. Importance Factor: <Insert factor>.
    - d. Exposure Category: [B] [C] [D].
  3. Design Snow Loads: [As indicated on Drawings] <Insert design snow load>.
  4. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
- D. Temperature Change: [120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces] <Insert temperature change>.
- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- F. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.
- G. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label indicates manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.
- H. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.
- ### 2.3 SECURITY GLAZING, GENERAL
- A. Glazing Publications: Comply with published instructions of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. AAMA Publications: AAMA GDSG-1 and AAMA TIR-A7.
  2. IGMA Publication for Sloped Glazing: IGMA TB-3001.
  3. IGMA Publication for Insulating Glass: SIGMA TM-3000.
  4. NGA Publications: ["Laminated Glazing Reference Manual" and ]"GANA Glazing Manual."

- B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.
- C. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of **[the Safety Glazing Certification Council] [the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction] [or] [manufacturer]**. Label will indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.
- D. Insulating Glazing Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.
- E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- F. Fire-Test-Response Characteristics of Polycarbonate Sheets: As determined by testing polycarbonate sheets identical to those used in security glazing products by a qualified testing agency acceptable to authorities having jurisdiction.
  - 1. Self-ignition temperature of **650 deg F (343 deg C)** or more when tested in accordance with ASTM D1929 on plastic sheets in thicknesses indicated for the Work.
  - 2. Smoke-developed index of 450 or less when tested in accordance with ASTM E84 or UL 723, or smoke density of 75 or less when tested in accordance with ASTM D2843 on plastic sheets in thicknesses indicated for the Work.
  - 3. Burning extent of **1 inch (25 mm)** or less when tested in accordance with ASTM D635 at a nominal thickness of **0.060 inch (1.52 mm)** or thickness indicated for the Work.
- G. Thermal and Optical Performance Properties: Provide security glazing with performance properties specified, as indicated in manufacturer's published test data, based on construction products indicated and on procedures indicated below:
  - 1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as **Btu/sq. ft. x h x deg F (W/sq. m x K)**.
  - 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW 7.7 computer program.
  - 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  - 2. For heat-strengthened float glass, comply with requirements for Kind HS.

3. For fully tempered float glass, comply with requirements for Kind FT.
4. For uncoated glass, comply with requirements for Condition A.
5. For coated vision glass, comply with requirements for Condition C (other coated glass).

- C. Reflective-Coated Vision Glass: ASTM C1376, Kind CV (coated vision glass), coated by [pyrolytic process] [vacuum deposition (sputter-coating) process], and complying with other requirements specified.

## 2.5 LAMINATED-GLASS SECURITY GLAZING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; [BallisticDefend 1] [BallisticDefend 3] [DefendED] [DefendED Lite] [DefendEntry] [DefendMed] or comparable product by one of the following:

1. <Insert manufacturer's name>.

- B. Laminated-Glass Security Glazing: ASTM C1172. Two or more glass lites bonded with interlayer. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
2. Interlayer Color: Clear unless otherwise indicated.

## 2.6 LAMINATED-GLASS, FIRE-RATED SECURITY GLAZING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; FireDefend [10] [20] [40] [60] or comparable product by one of the following:

1. <Insert manufacturer's name>.

- B. Fire-Resistance-Rated, Laminated-Glass Security Glazing: ASTM C1172. Two or more fire-rated, tempered, low-iron float glass lites, [6] [8] [10] [12] [15] [19]-mm thick, bonded with intumescent interlayers; complying with 16 CFR 1201, Category II. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

## 2.7 GLASS-CLAD POLYCARBONATE SECURITY GLAZING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; [AttackDefend 10] [AttackDefend 20] [AttackDefend 60] [DefendED Plus] [FireDefend] security glazing or comparable product by one of the following:

1. **<Insert manufacturer's name>**.

- B. Glass-Clad Polycarbonate Security Glazing: ASTM C1349. One or more cores of polycarbonate sheet, clad with glass, bonded with clear urethane interlayer. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
- C. Laminated Glass and Polycarbonate: ASTM C1349. Two or more glass lites and polycarbonate bonded with interlayer. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

## 2.8 INSULATING SECURITY GLAZING

A. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; [**AttackDefend 10**] [**AttackDefend 20**] [**AttackDefend 60**] [**DefendED Plus**] [**FireDefend**] security IGU glazing or comparable product by one of the following:

1. **<Insert manufacturer's name>**.

B. Insulating Security Glazing: Factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with [**manufacturer's standard**] [**polyisobutylene and polysulfide**] [**polyisobutylene and silicone**] [**polyisobutylene and hot-melt butyl**] [**polyisobutylene and polyurethane**] **<Insert description>** primary and secondary sealants.
2. Spacer: [**Manufacturer's standard spacer material and construction**] [**Aluminum with mill or clear anodic finish**] [**Aluminum with black, color anodic finish**] [**Aluminum with bronze, color anodic finish**] [**Aluminum with powdered metal paint finish in color selected by Architect**] [**Galvanized steel**] [**Stainless steel**] [**Polypropylene-covered stainless steel in color selected by Architect**] [**Thermally broken aluminum**] [**Nonmetallic laminate**] [**Nonmetallic tube**] **<Insert material>**.
3. Desiccant: Molecular sieve or silica gel, or blend of both.
4. Framing: See [**Section 085653 "Security Windows"**] [**Section 119821 "Detention Windows."**]
5. Interior Low-E-Coated Interior Lite: See Section 088000 "Glazing."

## 2.9 AIR-GAP SECURITY GLAZING

A. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; [**AttackDefend 10**] [**AttackDefend 20**] [**AttackDefend 60**] [**DefendED Plus**] [**FireDefend**] security glazing or comparable product by one of the following:

1. **<Insert manufacturer's name>**.

B. Air-Gap Security Glazing: Factory-assembled units, consisting of sealed lites of glazing material indicated separated by a dehydrated interspace.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer Specifications: Manufacturer's standard[ **rigid**] spacer material and construction.

## 2.10 SPALL-RESISTANT FILM

- A. Composite of clear polyvinyl butyral film and clear abrasion-resistant polyester film.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kuraray America, Inc.
    - b. Madico.
    - c. **<Insert manufacturer's name>**.
- B. Laminating Process: Factory laminate spall-resistant film to glazing assemblies to produce laminated lites free of foreign substances, air, and glass pockets.

## 2.11 GLAZING SEALANTS

- A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Sealant to comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  4. Sealant to comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions are to not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
  5. Sealant to comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  6. Sealant to comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde is to not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde is to not exceed 9 mcg/cu. m.
  7. Colors of Exposed Glazing Sealants: **[As indicated by manufacturer's designations]** **[Match Architect's samples]** **[As selected by Architect from manufacturer's full range of Industry colors]**.
- B. Glazing Sealant: Dow **[795]** **[999]** **[995]**.

1. Neutral-Curing Silicone Glazing Sealant, Class 100/50: Complying with ASTM C920, Type S, Grade NS, Use NT.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) GE Construction Sealants; Momentive Performance Materials Inc.
      - 2) The Dow Chemical Company.
      - 3) Tremco Incorporated.
      - 4) **<Insert manufacturer's name>**.
    - b. Applications: **<Describe types of glazing applications where this sealant is required>**.
  2. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) GE Construction Sealants; Momentive Performance Materials Inc.; SCS2000 SilPruf.
      - 2) The Dow Chemical Company; Dow [795] [995].
      - 3) Tremco Incorporated.
      - 4) **<Insert manufacturer's name>**.
    - b. Applications: **<Describe types of glazing applications where this sealant is required>**.
  3. Neutral-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) GE Construction Sealants; Momentive Performance Materials Inc.
      - 2) The Dow Chemical Company; Dow 999.
      - 3) Tremco Incorporated.
      - 4) **<Insert manufacturer's name>**.
    - b. Applications: **<Describe types of glazing applications where this sealant is required>**.
- C. Security Sealant: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with low movement complying with ASTM C920, Grade NS, Class 12.5 or 25, Use NT, and with a Shore A hardness of at least 45 when tested in accordance with ASTM C661.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. **<Insert manufacturer's name>**.

## 2.12 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
  - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.13 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of security glazing and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks:
  - 1. [EPDM] [Silicone] [Thermoplastic Rubber] [Santoprene] with Shore A durometer hardness of 85, plus or minus 5.
  - 2. Type recommended in writing by sealant or glass manufacturer.
- D. Spacers:
  - 1. Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.
  - 2. Type recommended in writing by sealant or security glazing manufacturer.
- E. Edge Blocks:
  - 1. [Elastomeric] [EPDM] [Silicone] with Shore A durometer hardness in accordance with manufacturer's written instructions.
  - 2. Type recommended in writing by sealant or security glazing manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.14 FABRICATION OF SECURITY GLAZING

- A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Grind smooth and polish exposed security glazing edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing for security glazing, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Minimum required bite.
  - 5. Effective sealing between joints of framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving security glazing immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of it off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.



- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
- F. Provide spacers for security glazing lites where the length plus width is larger than **50 inches (1270 mm)**.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of security glazing. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with performance requirements.
  - 2. Provide **1/8-inch (3-mm)** minimum bite of spacers on glazing lites and use thickness equal to sealant width. With glazing tape, use thickness of slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and in accordance with requirements in referenced glazing publications.
- H. Set security glazing in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set coated security glazing with proper orientation so that coatings and films face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.

- F. Apply heel bead of elastomeric sealant.
- G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended in writing by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glazing unit and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center security glazing in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center security glazing in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in security glazing. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between security glazing and glazing stops to maintain face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems. Secure spacers, or spacers and backings, in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to security glazing and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from security glazing.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

- B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter. Examine security glazing surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.
- C. Wash security glazing on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash security glazing as recommended in writing by security glazing manufacturer.

### 3.8 LAMINATED-GLASS SECURITY GLAZING SCHEDULE

- A. Security Glazing Type SG-1: Clear laminated glass.
  - 1. Basis-of-Design Product: McGrory Glass, Inc.; DefendED Lite.
  - 2. Forced-Entry Resistance, ASTM F1233: Class 1.1 in accordance with ASTM F1233.
  - 3. Maximum Overall Unit Thickness: **5/16 inch (7.9 mm)**.
  - 4. Number of Plies: Two.
  - 5. Outer Ply: 3 mm heat-strengthened float glass.
  - 6. Inner Ply: 3 mm heat-strengthened float glass.
  - 7. Interlayer Material: Proprietary.
- B. Attack-Resistant Security Glazing Type SG-2: Clear laminated glass.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; DefendED.
  - 2. Forced-Entry Resistance: Class 1.4 Body Passage in accordance with ASTM F1233.
  - 3. Nominal Overall Unit Thickness: **3/8 inch (9.5 mm)**.
  - 4. Number of Plies: Two.
  - 5. Outer Ply: 2.7 mm-thick, float glass.
  - 6. Inner Ply: 2.7 mm-thick, float glass.
  - 7. Interlayer Material: Proprietary.
- C. Attack-Resistant Security Glazing Type SG-3: Clear laminated glass.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; DefendMED.
  - 2. Forced-Entry Resistance: Class 1.4 Body Passage/1.3 Contraband Passage in accordance with ASTM F1233.
  - 3. Nominal Overall Unit Thickness: **7/16 inch (11.1 mm)**.
  - 4. Number of Plies: Two.
  - 5. Outer Ply: 3 mm-thick, heat-strengthened float glass.
  - 6. Inner Ply: 3 mm-thick, heat-strengthened float glass.
  - 7. Interlayer Material: Proprietary.
- D. Attack-Resistant Security Glazing Type SG-4: Clear laminated glass.

1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; DefendENTRY.
2. Forced-Entry Resistance: Class 1.4 Body Passage in accordance with ASTM F1233.
3. Nominal Overall Unit Thickness: **5/8 inch (15.9 mm)**.
4. Number of Plies: Two.
5. Outer Ply: 6 mm-thick, heat-strengthened float glass.
6. Inner Ply: 6 mm-thick, heat-strengthened float glass.
7. Interlayer Material: Proprietary.

### 3.9 MONOLITHIC POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Security Glazing[, **Type SG-3**]: Monolithic polycarbonate with mar-resistant coating on both surfaces.
1. Basis-of-Design Product: **<Insert manufacturer's name; product name or designation>**.
  2. Detention Security Grade: Grade 4 in accordance with ASTM F1915 [**cold-temperature impact test**] [**warm-temperature impact test**] [**and**] [**torch and small blunt impactor test**].
  3. Thickness: [**3/8 inch (9.25 mm)**] [**1/2 inch (12.7 mm)**] **<Insert thickness>**.

### 3.10 LAMINATED-POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Security Glazing[, **Type SG-4**]: Laminated polycarbonate.
1. Basis-of-Design Product: McGrory Glass, Inc.; BallisticDefend 1.
  2. Ballistic Resistance, UL 752: Level 1, 0.9 mm, in accordance with UL 752.
  3. Maximum Overall Unit Thickness: **0.8125 inch (20.6 mm)**.
  4. Interlayer Material: Proprietary.
- B. Bullet-Resistant Security Glazing Type SG-BR-2: Nonsymmetrical [**clear**] [**tinted**] [**reflective-coated**] laminated glass and polycarbonate with glass plies on attack or threat side and polycarbonate plies on witness side.
1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; BallisticDefend 1.
  2. Ballistic Resistance: Level 3, 0.44 Magnum in accordance with UL 752.
  3. Maximum Overall Unit Thickness: **1.25 inch (31.75 mm)**.
  4. Construction: Proprietary.

### 3.11 GLASS-CLAD POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Security Glazing Type SG-FE1: Clear glass-clad polycarbonate (GCP).
1. Basis-of-Design Product: McGrory Glass, Inc.; AttackDefend 10.
  2. Forced-Entry Resistance, HPW-TP-0500.03: Level I in accordance with HPW-TP-0500.03.
  3. Forced-Entry Resistance: Grade 4 in accordance with ASTM F1915.

4. Ballistic Resistance, UL 752: Level 1 in accordance with UL 752.
  5. Maximum Overall Unit Thickness: **9/16 inch (14.3 mm)**.
  6. Outer Ply: 3 mm clear heat-strengthened float glass.
  7. Single Core: **0.220-inch- (5.6-mm-)** thick polycarbonate.
  8. Inner Ply: 3 mm clear heat-strengthened float glass.
  9. Interlayer Material: Thermoplastic urethane (TPU).
  10. Interlayer Thickness: **0.050 inch (1.27 mm)**.
- B. Forced-Entry Security Glazing Type SG-FE2: Clear glass-clad polycarbonate (GCP).
1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; AttackDefend 20.
  2. Forced-Entry Resistance: Grade 3 in accordance with ASTM F1915.
  3. Nominal Overall Unit Thickness: **3/4 inch (19 mm)**.
  4. Outer Ply: 3mm-thick, clear heat-strengthened float glass.
  5. Core Ply 1: **0.220-inch- (5.6-mm-)** thick polycarbonate.
  6. Core Ply 2: **0.118-inch- (3-mm-)** thick polycarbonate.
  7. Inner Ply: 3mm-thick, clear heat-strengthened float glass.
  8. Interlayer Material: Thermoplastic urethane (TPU).
  9. Interlayer Thickness: **0.050 inch (1.27 mm)**.
- C. Forced-Entry Security Glazing Type SG-FE3: Clear glass-clad polycarbonate (GCP).
1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; AttackDefend 60.
  2. Forced-Entry Resistance: Grade 1 in accordance with ASTM F1915.
  3. Nominal Overall Unit Thickness: **1 inch (25.4 mm)**.
  4. Outer Ply: 3mm-thick, clear heat-strengthened float glass.
  5. Core Ply 1: **0.220-inch- (5.6-mm-)** thick polycarbonate.
  6. Core Ply 2: **0.375-inch- (9.5-mm-)** thick polycarbonate.
  7. Inner Ply: 3mm-thick, clear heat-strengthened float glass.
  8. Interlayer Material: Thermoplastic urethane (TPU).
  9. Interlayer Thickness: **0.050 inch (1.27 mm)**.
- D. Forced-Entry Security Glazing Type SG-FE4: Clear glass-clad polycarbonate (GCP).
1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; DefendED Plus.
  2. Forced-Entry Resistance: Level 1 in accordance with HPW-TP-0500.03.
  3. Forced-Entry Resistance: Grade 4 in accordance with ASTM F1915.
  4. Ballistic Resistance: Level A, 0.38 Special in accordance with HPW-TP-0500.03.
  5. Nominal Overall Unit Thickness: **9/16 inch (14.3 mm)**.
  6. Outer Ply: 3mm-thick, clear heat-strengthened float glass.
  7. Single Core: **0.220-inch- (5.6-mm-)** thick polycarbonate.
  8. Inner Ply: 3mm-thick, clear heat-strengthened float glass.
  9. Interlayer Material: Thermoplastic urethane (TPU).
  10. Interlayer Thickness: **0.050 inch (1.27 mm)**.

## 3.12 LAMINATED-GLASS AND -POLYCARBONATE SECURITY GLAZING SCHEDULE

- A. Security Glazing Type SG-BR1: Nonsymmetrical glass and polycarbonate with glass plies on the attack or threat side and polycarbonate plies on the witness side.
1. Basis-of-Design Product: McGrory Glass, Inc.; BallisticDefend 1.
  2. Ballistic Resistance, UL 752: Level 1 in accordance with UL 752.
  3. Maximum Overall Unit Thickness: **0.8125 inch (20.6 mm)**.
  4. Construction: Proprietary.
- B. Bullet-Resistant Security Glazing Type SG-BR-2: Nonsymmetrical [**clear**] [**tinted**] [**reflective-coated**] laminated glass and polycarbonate with glass plies on attack or threat side and polycarbonate plies on witness side.
1. Basis-of-Design Product: Subject to compliance with requirements, provide McGrory Glass, Inc.; BallisticDefend 1.
  2. Ballistic Resistance: Level 3, 0.44 Magnum in accordance with UL 752.
  3. Maximum Overall Unit Thickness: **1.25 inch (31.75 mm)**.
  4. Construction: Proprietary.

## 3.13 INSULATING SECURITY GLAZING SCHEDULE

- A. Security Glazing[ **Type SG-7**]: [**Clear insulating security glazing**] [**Tinted insulating security glazing**] [**Reflective-coated, clear insulating security glazing**] [**Reflective-coated, tinted insulating security glazing**]. Outdoor lite is made of monolithic glass, and indoor lite is made of glass-clad polycarbonate.
1. Basis-of-Design Product: **<Insert manufacturer's name; product name or designation>**.
  2. Detention Security Grade: [**Grade 1**] [**Grade 2**] [**Grade 3**] [**Grade 4**] in accordance with ASTM F1915 [**cold-temperature impact test**] [**warm-temperature impact test**] [**and**] [**torch and small blunt impactor test**].
  3. Overall Unit Thickness: **<Insert dimension>**.
  4. Outdoor Lite: [**Float glass**] [**Heat-strengthened float glass**] [**Fully tempered float glass**].
  5. Indoor Lite: Glass-clad polycarbonate.
    - a. Outer Ply: [**3 mm**] [**5 mm**] [**6 mm**] **<Insert dimension>** [**heat-strengthened**] [**chemically strengthened**] [**fully tempered**] float glass.
    - b. Single Core: [**0.118-inch (4.57-mm)**] [**0.177-inch (2.97-mm)**] [**0.236-inch (5.99-mm)**] polycarbonate.
    - c. Multiple Core:
      - 1) Outer Core Ply: [**0.118-inch (4.57-mm)**] [**0.177-inch (2.97-mm)**] [**0.236-inch (5.99-mm)**] polycarbonate.
      - 2) [**Single Inner Core Ply**] [**Double Inner Core Plies**]: [**0.118-inch (4.57-mm)**] [**0.177-inch (2.97-mm)**] [**0.236-inch (5.99-mm)**] polycarbonate.
    - d. Inner Ply: [**3 mm**] [**5 mm**] [**6 mm**] **<Insert dimension>** [**heat-strengthened**] [**chemically strengthened**] [**fully tempered**] float glass.

6. Interspace Content: [Air] [Argon].
7. Interspace Dimension: <Insert dimension>.
8. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
9. Tinted Glass Location: Outdoor lite.
10. Coating Color: [Gold] [Pewter] [Silver] <Insert color>.
11. Coating Location: [Second] [Third] [Fifth] surface.
12. Overall Visible Light Transmittance: <Insert number> percent minimum.
13. Outdoor Visible Reflectance: <Insert number> percent maximum.
14. Winter Nighttime U-Factor: <Insert value> maximum.
15. Summer Daytime U-Factor: <Insert value> maximum.
16. Solar-Heat-Gain Coefficient: <Insert value> maximum.
17. Provide safety glazing labeling.

B. Security Glazing[ **Type SG-8**]: [**Low-E-coated, clear insulating security glazing**] [**Low-E-coated, tinted insulating security glazing**]. Outdoor lite is made of monolithic glass, and indoor lite is made of glass-clad polycarbonate.

1. Basis-of-Design Product: <Insert manufacturer's name; product name or designation>.
2. Detention Security Grade: [Grade 1] [Grade 2] [Grade 3] [Grade 4] in accordance with ASTM F1915 [cold-temperature impact test] [warm-temperature impact test] [and] [torch and small blunt impactor test].
3. Overall Unit Thickness: <Insert dimension>.
4. Outdoor Lite: [Float glass] [Heat-strengthened float glass] [Fully tempered float glass].
5. Indoor Lite: Glass-clad polycarbonate.
  - a. Outer Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] [fully tempered] float glass.
  - b. Single Core: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - c. Multiple Core:
    - 1) Outer Core Ply: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
    - 2) [Single Inner Core Ply] [Double Inner Core Plies]: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - d. Inner Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] [fully tempered] float glass.
6. Interspace Content: [Air] [Argon].
7. Interspace Dimension: <Insert dimension>.
8. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
9. Tinted Glass Location: Outer lite.
10. Low-E Coating: [Pyrolytic on second surface] [Pyrolytic on third surface] [Sputtered on second surface] [Sputtered on third surface].
11. Overall Visible Light Transmittance: <Insert number> percent minimum.
12. Winter Nighttime U-Factor: <Insert value> maximum.
13. Summer Daytime U-Factor: <Insert value> maximum.
14. Solar-Heat-Gain Coefficient: <Insert value> maximum.

15. Provide safety glazing labeling.

- C. Security Glazing[ **Type SG-9**]: [**Clear insulating security glazing**] [**Tinted insulating security glazing**] [**Reflective-coated, clear insulating security glazing**] [**Reflective-coated, tinted insulating security glazing**]. Outdoor lite is made of laminated glass, and indoor lite is made of glass-clad polycarbonate with spall-resistant film on inside face.
1. Basis-of-Design Product: **<Insert manufacturer's name; product name or designation>**.
  2. Detention Security Grade: [**Grade 1**] [**Grade 2**] [**Grade 3**] [**Grade 4**] in accordance with ASTM F1915 [**cold-temperature impact test**] [**warm-temperature impact test**] [**and torch and small blunt impactor test**].
  3. Forced-Entry Resistance, ASTM F1233 [**Class 1.0**] [**Class 1.1**] [**Class 1.2**] [**Class 1.3**] [**Class 1.4**] [**Class 1.5**] [**Class 2.0**] [**Class 2.1**] [**Class 2.2**] [**Class 2.3**] [**Class 2.4**] [**Class 2.5**] [**Class 2.6**] [**Class 2.7**] [**Class 2.8**] [**Class 3.0**] [**Class 3.1**] [**Class 3.2**] [**Class 3.3**] [**Class 3.4**] [**Class 3.5**] [**Class 3.6**] [**Class 3.7**] [**Class 3.8**] [**Class 3.9**] [**Class 3.10**] [**Class 4.0**] [**Class 4.1**] [**Class 4.2**] [**Class 4.3**] [**Class 4.4**] [**Class 4.5**] [**Class 4.6**] [**Class 4.7**] [**Class 4.8**] [**Class 4.9**] [**Class 4.10**] [**Class 4.11**] [**Class 4.12**] [**Class 4.13**] [**Class 5.0**] in accordance with ASTM F1233.
  4. Forced-Entry Resistance, HPW-TP-0500.03: [**Level I**] [**Level II**] [**Level III**] [**Level IV**] [**Level V**] in accordance with HPW-TP-0500.03.
  5. Ballistic Resistance, ASTM F1233: [**Class HG1**] [**Class HG2**] [**Class HG3**] [**Class HG4**] [**Class SMG**] [**Class R1**] [**Class R2**] [**Class R3**] [**Class R4-AP**] [**Class R5**] [**Class SH1**] [**Class SH2**] in accordance with ASTM F1233.
  6. Ballistic Resistance, UL 752: [**Level 1**] [**Level 2**] [**Level 3**] [**Level 4**] [**Level 5**] [**Level 6**] [**Level 7**] [**Level 8**] [**Level 1-SG**] [**Level 2-SG**] [**Level 3-SG**] [**Level 4-SG**] [**Level 5-SG**] [**Level 6-SG**] [**Level 7-SG**] [**Level 8-SG**] in accordance with UL 752.
  7. Blast Resistance:
    - a. Hazard Rating: [**No hazard**] [**Minimal hazard**] [**Very low hazard**] [**Low hazard**] [**Moderate hazard**] [**High hazard**] tested in accordance with ASTM F1642/1642M.
    - b. Performance Condition: [**1**] [**2**] [**3a**] [**3b**] [**4**] [**5**] in accordance with GSA-TS01.
    - c. Peak Pressure: **<Insert requirement>**.
    - d. Positive Phase Impulse: **<Insert requirement>**.
  8. Overall Unit Thickness: **<Insert dimension>**.
  9. Outdoor Lite: Laminated glass with [**two plies of heat-strengthened float glass**] [**three plies of heat-strengthened float glass**] [**two outer plies of heat-strengthened float glass and two inner plies of annealed float glass**].
    - a. Outer Ply Thickness: [**3 mm**] [**5 mm**] [**6 mm**] **<Insert dimension>**.
    - b. Core Ply Thickness: [**3 mm**] [**5 mm**] [**6 mm**] **<Insert dimension>**.
    - c. Inner Ply Thickness: [**3 mm**] [**5 mm**] [**6 mm**] **<Insert dimension>**.
    - d. Interlayer Thickness: [**0.030 inch (0.76 mm)**] [**0.060 inch (1.52 mm)**] [**0.090 inch (2.3 mm)**].
  10. Indoor Lite: Glass-clad polycarbonate faced with a **0.037-inch- (0.94-mm-)** thick, spall-resistant polyester film laminated to indoor face.



- a. Outer Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] float glass.
  - b. Single Core: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - c. Multiple Core:
    - 1) Outer Core Ply: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
    - 2) [Single Inner Core Ply] [Double Inner Core Plies]: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - d. Inner Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] float glass.
11. Interspace Content: [Air] [Argon].
  12. Interspace Dimension: <Insert dimension>.
  13. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
  14. Tinted Glass Location: [Outer] [Inner] ply of outdoor lite.
  15. Coating Color: [Gold] [Pewter] [Silver] <Insert color>.
  16. Coating Location: [Second] [Third] [Fifth] surface.
  17. Overall Visible Light Transmittance: <Insert number> percent minimum.
  18. Outdoor Visible Reflectance: <Insert number> percent maximum.
  19. Winter Nighttime U-Factor: <Insert value> maximum.
  20. Summer Daytime U-Factor: <Insert value> maximum.
  21. Solar-Heat-Gain Coefficient: <Insert value> maximum.
  22. Provide safety glazing labeling.
- D. Security Glazing[ **Type SG-10**]: [Low-E-coated, clear insulating security glazing] [Low-E-coated, tinted insulating security glazing]. Outdoor lite is made of laminated glass, and indoor lite is made of glass-clad polycarbonate with spall-resistant film on inside face.
1. Basis-of-Design Product: <Insert manufacturer's name; product name or designation>.
  2. Detention Security Grade: [Grade 1] [Grade 2] [Grade 3] [Grade 4] in accordance with ASTM F1915 [cold-temperature impact test] [warm-temperature impact test] [and] [torch and small blunt impactor test].
  3. Forced-Entry Resistance, ASTM F1233: [Class 1.0] [Class 1.1] [Class 1.2] [Class 1.3] [Class 1.4] [Class 1.5] [Class 2.0] [Class 2.1] [Class 2.2] [Class 2.3] [Class 2.4] [Class 2.5] [Class 2.6] [Class 2.7] [Class 2.8] [Class 3.0] [Class 3.1] [Class 3.2] [Class 3.3] [Class 3.4] [Class 3.5] [Class 3.6] [Class 3.7] [Class 3.8] [Class 3.9] [Class 3.10] [Class 4.0] [Class 4.1] [Class 4.2] [Class 4.3] [Class 4.4] [Class 4.5] [Class 4.6] [Class 4.7] [Class 4.8] [Class 4.9] [Class 4.10] [Class 4.11] [Class 4.12] [Class 4.13] [Class 5.0] in accordance with ASTM F1233.
  4. Forced-Entry Resistance, HPW-TP-0500.03: [Level I] [Level II] [Level III] [Level IV] [Level V] in accordance with HPW-TP-0500.03.
  5. Ballistic Resistance, ASTM F1233: [Class HG1] [Class HG2] [Class HG3] [Class HG4] [Class SMG] [Class R1] [Class R2] [Class R3] [Class R4-AP] [Class R5] [Class SH1] [Class SH2] in accordance with ASTM F1233.
  6. Ballistic Resistance, UL 752: [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8] [Level 1-SG] [Level 2-SG] [Level 3-SG] [Level 4-SG] [Level 5-SG] [Level 6-SG] [Level 7-SG] [Level 8-SG] in accordance with UL 752.

7. Blast Resistance:
  - a. Hazard Rating: [No hazard] [Minimal hazard] [Very low hazard] [Low hazard] [Moderate hazard] [High hazard] tested in accordance with ASTM F1642/1642M.
  - b. Performance Condition: [1] [2] [3a] [3b] [4] [5] in accordance with GSA-TS01.
  - c. Peak Pressure: <Insert requirement>.
  - d. Positive Phase Impulse: <Insert requirement>.
8. Overall Unit Thickness: <Insert dimension>.
9. Outdoor Lite: Laminated glass with [two plies of heat-strengthened float glass] [three plies of heat-strengthened float glass] [two outer plies of heat-strengthened float glass and two inner plies of annealed float glass].
  - a. Outer Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - b. Core Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - c. Inner Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - d. Interlayer Thickness: [0.030 inch (0.76 mm)] [0.060 inch (1.52 mm)] [0.090 inch (2.3 mm)].
10. Indoor Lite: Glass-clad polycarbonate faced with a 0.037-inch- (0.94-mm-) thick, spall-resistant polyester film laminated to indoor face.
  - a. Outer Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] float glass.
  - b. Inner Ply: [3 mm] [5 mm] [6 mm] <Insert dimension> [heat-strengthened] [chemically strengthened] float glass.
  - c. Single Core: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - d. Multiple Core:
    - 1) Outer Core Ply: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
    - 2) [Single Inner Core Ply] [Double Inner Core Plies]: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
11. Interspace Content: [Air] [Argon].
12. Interspace Dimension: <Insert dimension>.
13. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
14. Tinted Glass Location: Outer lite.
15. Low-E Coating: [Pyrolytic on second surface] [Pyrolytic on third surface] [Sputtered on second surface] [Sputtered on third surface].
16. Overall Visible Light Transmittance: <Insert number> percent minimum.
17. Winter Nighttime U-Factor: <Insert value> maximum.
18. Summer Daytime U-Factor: <Insert value> maximum.
19. Solar-Heat-Gain Coefficient: <Insert value> maximum.
20. Provide safety glazing labeling.

## 3.14 FIRE-RESISTANCE-RATED SECURITY GLAZING

- A. Glass Type[ **FRGL-1**]: [60] [90] [120]-minute, fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 250 deg F (121 deg C) temperature-rise limitation; 450 deg F (250 deg C) temperature-rise limitation for door vision areas; fire-resistance-rated laminated glass with intumescent interlayers.
- B. Glass Type[ **FRGL-2**]: [60] [90]-minute, fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 250 deg F (121 deg C) temperature-rise limitation; 450 deg F (250 deg C) temperature-rise limitation for door vision areas; fire-resistance-rated laminated glass with intumescent interlayers.

## 3.15 AIR-GAP SECURITY GLAZING SCHEDULE

- A. Security Glazing[ **Type SG-11**]: [Clear air-gap security glazing] [Tinted air-gap security glazing] [Clear reflective-coated air-gap security glazing] [Tinted reflective-coated air-gap security glazing]. Outdoor lite is made of laminated glass, and indoor lite is made of laminated polycarbonate.
1. Basis-of-Design Product: <Insert manufacturer's name; product name or designation>.
  2. Forced-Entry Resistance, ASTM F1233: [Class 1.0] [Class 1.1] [Class 1.2] [Class 1.3] [Class 1.4] [Class 1.5] [Class 2.0] [Class 2.1] [Class 2.2] [Class 2.3] [Class 2.4] [Class 2.5] [Class 2.6] [Class 2.7] [Class 2.8] [Class 3.0] [Class 3.1] [Class 3.2] [Class 3.3] [Class 3.4] [Class 3.5] [Class 3.6] [Class 3.7] [Class 3.8] [Class 3.9] [Class 3.10] [Class 4.0] [Class 4.1] [Class 4.2] [Class 4.3] [Class 4.4] [Class 4.5] [Class 4.6] [Class 4.7] [Class 4.8] [Class 4.9] [Class 4.10] [Class 4.11] [Class 4.12] [Class 4.13] [Class 5.0] in accordance with ASTM F1233.
  3. Forced-Entry Resistance, HPW-TP-0500.03: [Level I] [Level II] [Level III] [Level IV] [Level V] in accordance with HPW-TP-0500.03.
  4. Ballistic Resistance, ASTM F1233: [Class HG1] [Class HG2] [Class HG3] [Class HG4] [Class SMG] [Class R1] [Class R2] [Class R3] [Class R4-AP] [Class R5] [Class SH1] [Class SH2] in accordance with ASTM F1233.
  5. Ballistic Resistance, UL 752: [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8] [Level 1-SG] [Level 2-SG] [Level 3-SG] [Level 4-SG] [Level 5-SG] [Level 6-SG] [Level 7-SG] [Level 8-SG] in accordance with UL 752.
  6. Blast Resistance:
    - a. Hazard Rating: [No hazard] [Minimal hazard] [Very low hazard] [Low hazard] [Moderate hazard] [High hazard] tested in accordance with ASTM F1642/1642M.
    - b. Performance Condition: [1] [2] [3a] [3b] [4] [5] in accordance with GSA-TS01.
    - c. Peak Pressure: <Insert requirement>.
    - d. Positive Phase Impulse: <Insert requirement>.
  7. Overall Unit Thickness: <Insert dimension>.
  8. Outdoor Lite: Laminated glass with [two] [three] plies of [float glass] [heat-strengthened float glass] [fully tempered float glass] [chemically strengthened float glass].

- a. Outer Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - b. Core Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - c. Inner Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - d. Interlayer Thickness: [0.030 inch (0.76 mm)] [0.060 inch (1.52 mm)] [0.090 inch (2.3 mm)].
9. Indoor Lite: Laminated polycarbonate with [two] [three] [four] polycarbonate plies.
- a. Overall Unit Thickness: <Insert dimension>.
  - b. Outer and Inner Plies: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - c. [Core Ply] [Core Plies]: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - d. Interlayer Thicknesses: [0.025 inch (0.635 mm)] <Insert dimension>.
10. Air-Gap Dimension: <Insert dimension>.
11. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
12. Tinted Glass Location: [Outer] [Inner] ply of outdoor lite.
13. Coating Color: [Gold] [Pewter] [Silver] <Insert color>.
14. Coating Location: [Second] [Third] [Fifth] surface.
15. Overall Visible Light Transmittance: <Insert number> percent minimum.
16. Outdoor Visible Reflectance: <Insert number> percent maximum.
17. Winter Nighttime U-Factor: <Insert value> maximum.
18. Summer Daytime U-Factor: <Insert value> maximum.
19. Solar-Heat-Gain Coefficient: <Insert value> maximum.
20. Provide safety glazing labeling.
- B. Security Glazing[ Type SG-12]: [Low-E-coated, clear air-gap security glazing] [Low-E-coated, tinted air-gap security glazing]. Outdoor lite is made of laminated glass, and indoor lite is made of laminated polycarbonate.
1. Basis-of-Design Product: <Insert manufacturer's name; product name or designation>.
  2. Forced-Entry Resistance, ASTM F1233: [Class 1.0] [Class 1.1] [Class 1.2] [Class 1.3] [Class 1.4] [Class 1.5] [Class 2.0] [Class 2.1] [Class 2.2] [Class 2.3] [Class 2.4] [Class 2.5] [Class 2.6] [Class 2.7] [Class 2.8] [Class 3.0] [Class 3.1] [Class 3.2] [Class 3.3] [Class 3.4] [Class 3.5] [Class 3.6] [Class 3.7] [Class 3.8] [Class 3.9] [Class 3.10] [Class 4.0] [Class 4.1] [Class 4.2] [Class 4.3] [Class 4.4] [Class 4.5] [Class 4.6] [Class 4.7] [Class 4.8] [Class 4.9] [Class 4.10] [Class 4.11] [Class 4.12] [Class 4.13] [Class 5.0] in accordance with ASTM F1233.
  3. Forced-Entry Resistance, HPW-TP-0500.03: [Level I] [Level II] [Level III] [Level IV] [Level V] in accordance with HPW-TP-0500.03.
  4. Ballistic Resistance, ASTM F1233: [Class HG1] [Class HG2] [Class HG3] [Class HG4] [Class SMG] [Class R1] [Class R2] [Class R3] [Class R4-AP] [Class R5] [Class SH1] [Class SH2] in accordance with ASTM F1233.
  5. Ballistic Resistance, UL 752: [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8] [Level 1-SG] [Level 2-SG] [Level 3-SG] [Level 4-SG] [Level 5-SG] [Level 6-SG] [Level 7-SG] [Level 8-SG] in accordance with UL 752.
  6. Blast Resistance:

- a. Hazard Rating: [No hazard] [Minimal hazard] [Very low hazard] [Low hazard] [Moderate hazard] [High hazard] tested in accordance with ASTM F1642/1642M.
  - b. Performance Condition: [1] [2] [3a] [3b] [4] [5] in accordance with GSA-TS01.
  - c. Peak Pressure: <Insert requirement>.
  - d. Positive Phase Impulse: <Insert requirement>.
7. Overall Unit Thickness: <Insert dimension>.
8. Outdoor Lite: Laminated glass with [two] [three] plies of [float glass] [heat-strengthened float glass] [fully tempered float glass] [chemically strengthened float glass].
- a. Outer Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - b. Core Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - c. Inner Ply Thickness: [3 mm] [5 mm] [6 mm] <Insert dimension>.
  - d. Interlayer Thickness: [0.030 inch (0.76 mm)] [0.060 inch (1.52 mm)] [0.090 inch (2.3 mm)].
9. Indoor Lite: Laminated polycarbonate with [two] [three] [four] polycarbonate plies.
- a. Overall Unit Thickness: <Insert dimension>.
  - b. Outer and Inner Plies: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - c. [Core Ply] [Core Plies]: [0.118-inch (4.57-mm)] [0.177-inch (2.97-mm)] [0.236-inch (5.99-mm)] polycarbonate.
  - d. Interlayer Thicknesses: [0.025 inch (0.635 mm)] <Insert dimension>.
10. Air-Gap Dimension: <Insert dimension>.
11. Glass Tint Color: [Blue] [Blue-green] [Bronze] [Green] [Gray] <Insert color>.
12. Tinted Glass Location: [Outer] [Inner] ply of outdoor lite.
13. Low-E Coating: [Pyrolytic on second surface] [Pyrolytic on third surface] [Sputtered on second surface] [Sputtered on third surface].
14. Overall Visible Light Transmittance: <Insert number> percent minimum.
15. Winter Nighttime U-Factor: <Insert value> maximum.
16. Summer Daytime U-Factor: <Insert value> maximum.
17. Solar Heat-Gain Coefficient: <Insert value> maximum.
18. Provide safety glazing labeling.

END OF SECTION 088853