

## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Solid-core doors with wood-veneer faces.
- 2. Factory finishing flush wood doors.
- 3. Factory fitting flush wood doors to frames and factory machining for hardware.

- B. Related Requirements:

- 1. Section 087100 "Door Hardware" for hardware sets in flush wood doors.
- 2. Section 088000 "Glazing" for glass view panels in flush wood doors.
- 3. Section 088813 "Fire-Resistant Glazing" for glass view panels in flush wood doors.
- 4. Section 099100 "Painting" for field finishing doors.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:

- 1. Door core materials and construction.
- 2. Door edge construction
- 3. Door face type and characteristics.
- 4. Factory finishing specifications.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
2. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
3. Dimensions and locations of blocking for hardware attachment.
4. Dimensions and locations of mortises and holes for hardware.
5. Clearances and undercuts.
6. Requirements for veneer matching.
7. Doors to be factory finished and application requirements.
8. Fire-protection rating for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
  - a. Provide Samples for each species of veneer and solid lumber required.
  - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

## 1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer's Certification: A certification that manufacturer that has been in continuous door manufacturing for the last 10 years.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
  1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

- 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Delamination of veneer.
    - b. Warping (bow, cup, or twist) more than 1/4-inch in a 42-by-84-inch section.
    - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Algoma Hardwoods, Inc.
  - 2. Eggers Industries.
  - 3. Marshfield Door Systems, Inc.
  - 4. Mohawk Flush Doors, Inc.; a Masonite company.
  - 5. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- B. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
  - 2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  - 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
- C. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

## 2.3 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
  - 1. Provide Labels indicating that doors comply with requirements of grades specified.
  - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

## 2.4 SOLID-CORE FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Doors:
  - 1. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
  - 2. Grade: Custom.
  - 3. Faces: Grade A.
    - a. Species: Red oak
    - b. Cut: Rift cut.
    - c. Match between Veneer Leaves: Slip match.
    - d. Assembly of Veneer Leaves on Door Faces: Running match.
  - 4. Exposed Vertical Edges: Applied wood edges of same species as faces and covering edges of crossbands - edge Type D.
- B. Particleboard-Core Doors:
  - 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
  - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
    - a. 5-inch top-rail blocking, in doors indicated to have closers.
    - b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    - c. 5-inch mid-rail blocking, in doors indicated to have exit devices.
- C. Mineral-Core Doors:
  - 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
  - a. 5-inch top-rail blocking.
  - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
  - c. 5-inch mid-rail blocking, in doors indicated to have armor plates.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
4. Construction: Five (5) plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

## 2.5 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
  1. Wood Species: Same species as door faces.
  2. Profile: Flush rectangular beads.
  3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated on Drawings.

## 2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
  1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
  1. Locate hardware to comply with DHI-WDHS-3.
  2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
  3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.

4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
  5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

## 2.7 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  2. Finish faces, all four edges, edges of cutouts, and mortises.
  3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated on Drawings to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:
1. Grade: Custom
  2. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
  3. Staining: As selected by Architect from manufacturer's full range.
  4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.
  5. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire-rated doors and frames in accordance with NFPA 80.
  2. Install smoke- and draft-control doors in accordance with NFPA 105.
- C. Job-Fitted Doors:
1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
    - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
  2. Machine doors for hardware.
  3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  4. Clearances:
    - a. Provide 1/8-inch at heads, jambs, and between pairs of doors.
    - b. Provide 1/8-inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
    - c. Where threshold is shown or scheduled, provide 1/4-inch from bottom of door to top of threshold unless otherwise indicated.
    - d. Comply with NFPA 80 for fire-rated doors.
  5. Bevel non-fire-rated doors 1/8-inch in 2 inches at lock and hinge edges.
  6. Bevel fire-rated doors 1/8-inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
  - 1. Provide inspection of installed Work through AWI's Quality Certification Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
  - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

### 3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes commercial door hardware for the following:
  - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Requirements:
  - 1. Section 081416 "Flush Wood Doors"
  - 2. Section 088000 "Glazing"
  - 3. Section 099100 "Painting"
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series
  - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies

### 1.3 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For electrified door hardware.
  - 1. Include diagrams for power, signal, and control wiring.
  - 2. Include details of interface of electrified door hardware and building safety and security systems.
- C. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
  - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch-long Samples for other products.
    - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
  2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- F. Door Hardware Schedule: Prepared by or under the supervision of hardware supplier. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
  3. Content: Include the following information:
    - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
    - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    - d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    - e. Fastenings and other installation information.
    - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
    - g. Mounting locations for door hardware.
    - h. List of related door devices specified in other Sections for each door and frame.
- G. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of electrified door hardware.
  - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Sample Warranty: For special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hardware: Provide two (2) additional sets of each hardware product.
  - 2. Electrical Parts: Provide two (2) additional sets of each electrical part.

## 1.9 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum five (5) years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum three (3) years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum five (5) years documented experience supplying both

mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site. Do not store electronic access control hardware, software, or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- A. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software, and related accessories directly to Owner.

#### 1.11 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### 1.12 WARRANTY

- A. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or

workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of the hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  4. Electrical component defects and failures within the systems operation.
- B. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- C. Special Warranty Periods:
1. Ten (10) years for mortise locks and latches.
  2. Five (5) years for exit hardware.
  3. Twenty-five (25) years for manual surface door closer bodies.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke and Draft Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch water gauge of water.

- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design".
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
  - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
  - 5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

## 2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
  - 1. Door Hardware is scheduled in Part 3.

## 2.4 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: BHMA A156.26; Grade 1-600 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible, and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
  - 1. Bommer Industries (BO).
  - 2. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
  - 3. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.5 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
  - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  - 2. Furnish dust proof strikes for bottom bolts.
  - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  - 5. Acceptable Manufacturers:
    - a. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
  - 1. Acceptable Manufacturers:
    - a. Door Controls International (DC).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.6 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  - 1. Mortise Type: Threaded cylinders with rings/ cams to suit hardware application.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  - 5. Keyway: Match Facility Standard.

- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
  - 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
  - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  - 3. Existing System: Key locks to Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
  - 1. Change Keys per Cylinder: Three (3).
  - 2. Master Keys (per Master Key Level/Group): Five (5).
  - 3. Construction Keys (where required): Ten (10).
- G. Construction Keying: Provide construction master keyed cylinders.
- H. Key Registration List (Bitting List):
  - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  - 2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.7 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
  - 1. Acceptable Manufacturers:
    - a. Corbin Russwin Hardware (RU) – ML2002 Series.
    - b. Sargent Manufacturing (SA) – 8200 Series.
    - c. Schlage (SC) – L9000 Series.

## 2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
  5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Acceptable Manufacturers:
    - a. Corbin Russwin Hardware (RU) – DC6000 Series.
    - b. LCN Closers (LC) - 4040 Series.
    - c. Sargent Manufacturing (SA) - 351 Series.
    - d. Norton Door Controls (NO) - 7500 Series.

## 2.9 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs

of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Acceptable Manufacturers:
  - a. Hiawatha, Inc. (HI).
  - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
  - c. Trimco (TC).

## 2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  1. Acceptable Manufacturers:
    - a. Hiawatha, Inc. (HI).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

- a. Rixson Door Controls (RF).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Sargent Manufacturing (SA).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
  - 1. National Guard Products (NG).
  - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
  - 3. Reese Enterprises, Inc. (RE).

## 2.12 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
  - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  - 2. Fire-Rated Applications:
    - a. Wood or Machine Screws: For the following:
      - 1) Hinges mortised to doors or frames
      - 2) Strike plates to frames.
      - 3) Closers to doors and frames.
    - b. Steel Through Bolts: For the following unless door blocking is provided:
      - 1) Surface hinges to doors.
      - 2) Closers to doors and frames.
      - 3) Surface-mounted exit devices.
  - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
  - 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

## 2.13 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

### 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as directed by Owner.
  - 2. Furnish permanent cores to Owner for installation.
- F. Key Control System:
  - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
  - 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
  - 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
  - 1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- H. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate

removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

- I. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
  - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.

3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

### 3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation and operating items as necessary to restore proper function and finish.
- B. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

### 3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

### 3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

### 3.9 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
  1. MK - McKinney
  2. RO - Rockwood

3. SA - Sargent
4. BE - Best Access Systems
5. NO - Norton
6. PE - Pemko

C. Hardware Sets:

<b>Set HW-1</b>				
1	Continuous Hinge	MCK-25HD	CL	MK
1	Classroom Lock	47H-7-R-15-R w/ Strike Package	626	BE
1	Permanent Core	compatible w/ facility's existing Key System	626	BE
1	Door Closer	7500 / P7500	689	NO
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO
1	Door Stop	400 / 441CU	US26D	RO
1	Gasketing	S773BL		PE
3	Filler Plate	size as required		RO

Notes: Modify frame as required to accept new strike plate.

<b>Set HW-2</b>				
1	Continuous Hinge	MCK-25HD	CL	MK
1	Storeroom Lock	45H-7-D-15-R w/ Strike Package	626	BE
1	Permanent Core	Compatible with Existing Key System	626	BE
1	Door Closer	7500 / P7500	689	NO
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO
1	Door Stop	400 / 441CU	US26D	RO
1	Gasketing	S773BL		PE
3	Filler Plate	Size as Required		RO

Notes: Modify frame as required to accept new strike plate.

<b>Set HW-3</b>				
1	Continuous Hinge	MCK-25HD	CL	MK
1	Surface Vert Rod Exit	FL 2208 LD x V 4908A x S300 (Rim & Top Strike) w/ Top Rod Only	626	BE
1	Permanent Core	Compatible with Existing Key System	626	BE
1	Door Closer	7500 / P7500	689	NO
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO
1	Gasketing	S773BL		PE
1	Astragal	S772BL		PE
1	Filler Plate	Size as Required		RO
1	Magnetic Door Holder	Compatible with Existing Fire Alarm System		

Notes: Modify frame as required to accept new strike plate.

<b>Set HW-4</b>				
1	Continuous Hinge	MCK-25HD	CL	MK
1	Service Lock	45H-7-L-15-R w/ Strike Package	626	BE
1	Permanent Core	Compatible with Existing Key System	626	BE
1	Door Closer	7500 / P7500	689	NO
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO
1	Door Stop	400 / 441CU	US26D	RO
1	Gasketing	S773BL		PE
3	Filler Plate	Size as Required		RO

Notes: Modify frame as required to accept new strike plate.

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## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Glass for doors
  - 2. Glass for glazed curtain walls, and sloped glazing.
  - 3. Glazing sealants and accessories.

#### 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

#### 1.4 COORDINATION

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

#### 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

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 glazing during and after installation.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.
  1. Tinted glass.
  2. Coated glass.
  3. Laminated glass.
  4. Insulating glass.
  5. Structural glass.
- C. Glazing Accessory Samples: For sealants.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For glass.
- C. Product Test Reports: For tinted glass, coated glass, laminated glass, insulating glass, structural glass, and glazing sealants, for tests performed by a qualified testing agency.
  1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.
- E. Sample Warranties: For special warranties.

## 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

## 1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
  - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching 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 glass, tape sealants, gaskets, and glazing channel substrates.
  - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
  - 4. Schedule enough 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 glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 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 are below 40 deg F.

#### 1.12 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are 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.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass 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.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass.; products or comparable products by one of the following:
  - a. Guardian Industries Corp.; SunGuard.
  - b. Oldcastle Building Envelope™.
  - c. Viracon, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
  - 1. Obtain tinted glass from single source from single manufacturer.
  - 2. Obtain reflective-coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.
  - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    - a. Wind Design Data: Refer to 2015 IBC Code Section 1603.1.4.
  - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.

- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
  - 2. For laminated-glass lites, properties are based on products of construction indicated.
  - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
  - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product 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. GANA Publications: "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Ultraclear Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.
- C. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.
- D. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- E. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. 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 to comply with interlayer manufacturer's written instructions.

2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:
1. Polyvinyl butyral interlayer.
  2. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
  3. Ionomeric polymer interlayer.
  4. Cast-in-place and cured-transparent-resin interlayer.
  5. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

## 2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.
1. Sealing System: Dual seal, with polyisobutylene and silicone primary and secondary sealants.
  2. Perimeter Spacer: Aluminum with mill or clear anodic finish.
  3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.7 GLAZING SEALANTS

- A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, 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 glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
  4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Dow Corning Corporation; 790.
  - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
  - c. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 290.
  - d. Pecora Corporation; 890NST.
  - e. Sika Corporation; SikaSil WS-290.
  - f. Tremco Incorporated; Spectrem 1.

## 2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
  1. AAMA 804.3 tape, where indicated.
  2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  3. 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.

## 2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass 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. Neoprene with a Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended by sealant or glass manufacturer.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended by sealant or glass manufacturer.

E. Edge Blocks:

1. Neoprene with a Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended by sealant or glass 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.

## 2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units 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.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, 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 systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-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 glass 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 leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair 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 glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. 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 system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings 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 by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, 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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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 right before each glazing unit is installed.
- F. Center glass lites 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.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass 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 glass lites 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 glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites 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 glass. Seal gasket joints with sealant recommended 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 glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. 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 glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass 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 come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 LOW-E COATED INSULATED GLASS SCHEDULE

- A. Glazing Type CCL, as indicated on drawings: Low-E-coated, clear insulating laminated glass.
1. Basis-of-Design Product: Vitro Architectural Glass, Solarban 60.
  2. Overall Unit Thickness: 1 inch.
  3. Outdoor Lite: Low-E-coated, clear laminated glass with two (2) plies of heat-strengthened float glass.
    - a. Minimum Thickness of Each Glass Ply: 3 mm.
    - b. Interlayer Thickness: 0.030 inch.
  4. Interspace Content: Air.
  5. Indoor Lite: Clear laminated glass with two (2) plies of heat-strengthened float glass.
    - a. Minimum Thickness of Each Glass Ply: 3 mm.
    - b. Interlayer Thickness: 0.030 inch.
  6. Low-E Coating: Sputtered on second surface.
  7. Winter Nighttime U-Factor: 0.29 maximum.
  8. Summer Daytime U-Factor: 0.27 maximum.
  9. Visible Light Transmittance: 70 percent minimum.
  10. Solar Heat Gain Coefficient: 0.37 maximum.
- B. Glazing Type SS, as indicated on drawings: Clear insulating laminated sloped structural glass.
1. Basis-of-Design Product: Vitro Architectural Glass, Solarban 60.

2. Overall Unit Thickness: 1 5/16 inch.
3. Outdoor Lite (Exterior Unit): Low-E-coated, clear laminated glass with two (2) plies of heat-strengthened float glass.
  - a. Minimum Thickness of Each Glass Ply: 3 mm.
  - b. Interlayer Thickness: 0.030 inch.
4. Outdoor Lite (Interior Unit): Clear laminated glass with two (2) plies of heat-strengthened float glass.
  - a. Minimum Thickness of Each Glass Ply: 3 mm.
  - b. Interlayer Thickness: 0.030 inch.
5. Outdoor Light Interlayer Thickness between Exterior and Interior Units: 0.60 inch.
6. Interspace Content: Air.
7. Indoor Lite: Clear laminated glass with two (2) plies of heat-strengthened float glass.
  - a. Minimum Thickness of Each Glass Ply: 3 mm.
  - b. Interlayer Thickness: 0.030 inch.
8. Low-E Coating: Sputtered on second surface.
9. Winter Nighttime U-Factor: 0.29 maximum.
10. Summer Daytime U-Factor: 0.27 maximum.
11. Visible Light Transmittance: 60 percent minimum.
12. Solar Heat Gain Coefficient: 0.37 maximum.

END OF SECTION 088000

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## SECTION 088813 - FIRE-RESISTANT GLAZING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-protection-rated glazing.

#### 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

#### 1.4 COORDINATION

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

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and glass testing agency.
- B. Product Certificates: For each type of glass and glazing product, from manufacturer.
- C. Sample Warranties: For special warranties.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

## 1.10 WARRANTY

- A. Manufacturer's Special Warranty on Double Glazing Units with Clear Gel Fill: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of double-glazing units with clear gel fill is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is the leakage of gel fill from units, air bubbles within units, or obstruction of vision by contamination or deterioration of gel.
  - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

### 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: "Glazing Manual."
- B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

### 2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.
- C. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

- D. Laminated Glass: ASTM C1172. 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 as needed to comply with requirements.
  - 3. Interlayer Color: Clear unless otherwise indicated.

## 2.5 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
  - 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
- B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.
- C. Double Glazing Units with Clear Gel Fill:
- D. Double glazing units made from two lites of uncoated, fully tempered, ultraclear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent gel; and complying with 16 CFR 1201, Category II.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide SAFTI FIRST Fire Rated Glazing Solutions; SuperLite II-XL or equal.
  - 2. Glass rating based on wall or door rating.

## 2.6 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
  - 1. Sealants shall have a VOC content of 250 g/L or less.
  - 2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with non-porous surfaces; with or without spacer rod as recommended in writing by tape and glass 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.

## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. 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.
- C. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

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

### 3.3 GLAZING, GENERAL

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass, and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. 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 system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side 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 by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, 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 right before each glazing unit is installed.
- F. Center glass lites 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.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass 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 glass lites 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.
- D. 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 glass lites and glazing stops to maintain glass face clearances. 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 glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash-away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass 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 come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 FIRE-PROTECTION-RATED GLAZING SCHEDULE

- A. Glazing Type 'FR, as indicated on drawings: 20-minute, 45-minute and 60-minute fire-protection-rated glass with
  - 1. Glass: Types as scheduled on Drawings.
  - 2. Characteristics: Double glazing units with clear gel fill.
  - 3. Temperature-Rise Limitation: 450 deg F.

END OF SECTION 088813

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