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Construction Specification Manual

Salt River Project

Technical Specification Index – October 2021

Division 8

Division	Title	Updated
DIVISION 8: DOORS & WINDOWS		
081113	HM Doors and Frames	Revised 08/21
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SECTION 08 11 13

HOLLOW-METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.
3. Integration of electrified hardware, access control systems, and security systems into door and frame assemblies.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: In accordance with ASTM International (ASTM) standards, sheet metals are only produced in decimal or fractional thicknesses. In keeping with ASTM nomenclature, NAAMM-HMMA 803, indicates that prior to 1970, sheet steel was referred to by gage. As such, ASTM and ANSI no longer list gage numbers in their standards.

1. Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8:

<u>Minimum Uncoated Thickness</u>	<u>Corresponding Gage (Discontinued)</u>
0.093 inch (2.3 mm)	Nominal 12 gage.
0.067 inch (1.7 mm)	Nominal 14 gage.
0.053 inch (1.3 mm)	Nominal 16 gage.
0.042 inch (1.0 mm)	Nominal 18 gage.
0.032 inch (0.8 mm)	Nominal 20 gage.
0.026 inch (0.6 mm)	Nominal 22 gage.

2. Sheet metal thicknesses in inches (IP) and millimeters (SI) are listed in the Section Text in accordance with NAAMM-HMMA 803. SDI uses the same thicknesses, which are included in the table above. The minimum thicknesses used are for base-metal sheets without coatings.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver to site in time for installation.

- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

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, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of removable stops, and glazing.
- C. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- D. Samples for Verification:
 - 1. Finishes: Submit for each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
 - 2. Fabrication: Prepare Samples approximately 8 by 10 inches (203 by 254 mm) to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- D. Field quality control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm having minimum 10 years documented experience in manufacturing hollow-metal doors and frames, with sufficient production capacity to produce required units.
- B. Fire Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and site storage. Do not use non-vented plastic.
 - 1. Provide additional protection to prevent damage to factory finished units.

- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.
- D. Upon delivery, inspect doors and frames for damage. Tool marks, rust, blemishes, and other damage on exposed surfaces is not acceptable. Remove and replace damaged items directed by Owner and replace with new items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products complying with requirements of one of the following:
 - 1. Amweld International, LLC.
 - 2. Ceco Door Products; an Assa Abloy Group company.
 - 3. Curries Company; an Assa Abloy Group company.
 - 4. Mesker Door Inc.
 - 5. Republic Doors and Frames.
 - 6. Steelcraft; an Allegion company.
- B. Source Limitations: Obtain hollow-metal doors and frames from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire protection ratings and temperature rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C. Provide metal labels permanently fastened on each door and frame assembly within size limitations established by the labeling authority having jurisdiction.
 - 1. Smoke and Draft Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. 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.

- B. Fire Rated, Borrowed Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Thermally Rated Door Assemblies: Fabricate doors and frames for thermal insulating assemblies and tested in accordance with ASTM C 518.
 - 1. Provide door assemblies with U-factor of not more than 0.40 degrees Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested according to ASTM C 518.
- D. Accessibility Requirements: Comply with applicable requirements.
 - 1. U.S. Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) 2010.
 - 2. ICC/ANSI A117.1 Accessible and Useable Building and Facilities.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A.
 - 1. Doors:
 - a. Type: Indicated in the Door Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic coated steel sheet, minimum thickness of 0.053-inch (1.3 mm), (formerly "16 gage").
 - d. Edge Construction: Model 2, fully welded (no intermittent welds permitted).
 - e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - f. Core: Manufacturer's option unless otherwise indicated.
 - g. Fire Rated Core: Vertical steel stiffener with insulation core for fire rated and temperature rise rated doors.
 - 2. Frames:
 - a. Materials: Metallic coated steel sheet, minimum thickness of 0.067-inch (1.7 mm), (formerly "14 gage").
 - b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.

2.4 EXTERIOR STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

- B. Maximum Duty Doors and Frames: SDI A250.8, Level 4; SDI A250.4, Level A..
1. Doors:
 - a. Type: Indicated in the Door Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic coated steel sheet, minimum thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), with minimum A60 (ZF180) coating.
 - d. Edge Construction: Model 2, fully welded (no intermittent welds permitted).
 - e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches (3.2 mm in 51 mm).
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: Kraft paper honeycomb.
 2. Frames:
 - a. Materials: Metallic coated steel sheet, minimum thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), with minimum A60 (ZF180) coating.
 - b. Construction: Full profile welded.
 3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of metallic coated steel sheet, minimum thickness of 0.053 inch (1.3 mm) (formerly "16 gage").
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020 inch (0.5 mm) thick, cold rolled steel sheet set into 0.032 inch (0.8 mm) (formerly "20 gage") thick steel frame.
 1. Sightproof Louver: Stationary louvers constructed with inverted V or inverted Y blades.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

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2.7 FRAME ANCHORS

- A. Jamb Anchors, General:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch (9.5 mm) diameter bolts with expansion shields or inserts, with pipe spacer.
- B. Masonry Type: Adjustable strap and stirrup or T shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) (formerly "18 gage"), thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
- C. Stud Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) (formerly "18 gage") thick. At metal stud partitions locate additional jamb anchor below the top hinge.
- D. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- E. Floor Anchors for Concrete Slabs with Underlayment: Adjustable type anchors with extension clips, allowing not less than 2-inch (51 mm) height adjustment. Terminate bottom of frames at top of underlayment.
- F. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.8 MATERIALS

- A. Cold Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153/A 153M.
- E. Power Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

- F. Mineral Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame spread and smoke developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with the following, as applicable:
 - 1. Requirements in Section 08 80 00 "Glazing."
 - 2. Requirements in Section 08 88 13 "Fire-Rated Glazing."
- H. Bituminous Coating: Cold applied asphalt mastic, compounded for 15 mil (0.4 mm) dry film thickness per coat. Provide inert type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.9 FABRICATION

- A. Fabricate hollow-metal doors and frames rigid and free from defects, warp, or buckle. Accurately form metal to required sized and profiles. Take field measurements as required for coordination with adjoining work. Where possible, fit and assemble units in manufacturer's plant. Clearly identify work which cannot be permanently factory assembled before shipment to assure proper assembly at site.
 - 1. Metallic Core Construction: Weld cores to both door face sheets.
 - 2. Nonmetallic Core Construction: Laminate core material to both door face sheets with waterproof adhesive.
- B. Remove tool marks and surface imperfections; dress smooth exposed faces of welded joints. Use of metallic filler to conceal manufacturing defects is not acceptable.
- C. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- D. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 - 2. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Grout Guards: Weld guards to frame at back of hardware mortises in grouted frames.
 - 4. Door Silencers: Except on weather stripped frames, drill stops to receive door silencers as follows.
 - a. Single Door Frames: Drill stop in strike jamb to receive three door silencers.

- b. Double Door Frames: Drill stop in head jamb to receive two door silencers.
 5. Mullions and Transom Bars: Join to adjacent members by welding.
- E. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface mounted door hardware. Offset reinforcement so faces of mortised hardware items are flush with door surfaces. Secure reinforcement by spot welding.
 2. Comply with BHMA A156.115 and SDI 250.6 for preparing hollow-metal doors and frames for hardware.
 - a. Hinges and Pivots: 0.167 inch (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 9 inches (229 mm).
 - b. Lock Front, Strike, and Flushbolt Reinforcement: 0.093 inch (2.3 mm) thick by size as required by hardware manufacturer.
 - c. Lock Reinforcement Units: 0.067 inch (1.7 mm) thick by size as required by hardware manufacturer.
 - d. Closer Reinforcements: 0.093 inch (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
 - 1) For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames as applicable.
 - e. Other Hardware Reinforcements: Required for adequate strength and anchorage; in lieu of reinforcement specified, hardware manufacturers recommended reinforcing units may be used.
 - f. Exit Device Reinforcements: 0.250 inch (6.35 mm) thick by 10 inches (245 mm) high by 4 inches (101 mm) wide centered on exit device case body, unless otherwise recommended by exit device manufacturer.
- F. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation with countersunk flat or oval head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

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- G. Plaster and Grout Guards and Removable Access Plates: Provide 0.016 inch (0.4mm) thick plaster guards or dust cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation. Provide removable access plates in the heads of frames to receive overhead concealed door closers.
- H. Electrical Requirements: Coordinate provisions with installation of electrical items including electronic hardware, security system components, and similar items having electrical requirements; arrange so wiring can be readily removed and replaced.
 - 1. Provide cutouts and reinforcements required for hollow-metal doors and frames to accept security system components.
 - 2. Doors with Electric Hinges and Pivots: Provide with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.
 - a. Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

2.10 STEEL FINISHES

- A. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with ANSI/SDI A250.3.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and conditions affecting performance of the Work.
- B. Examine roughing in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory applied finishes where spreaders are removed.

- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface mounted door hardware.

3.3 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Field apply corrosion resistant coating to backs of frames in contact with grout or plaster containing antifreeze agents.
 - 2. Set anchorage devices where required for securing frames to in place concrete or masonry construction. Set anchorage devices opposite each anchor location as specified and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.
 - 3. Fire Rated Openings: Install frames according to NFPA 80.
 - 4. Solidly pack mineral-fiber insulation inside frames.
- C. Frame Anchors:
 - 1. Floor Anchors: Install floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 2. Jamb Anchors:
 - a. Masonry Type: Locate anchors not more than 16 inches (400 mm) from top and bottom of frame. Space anchors not more than 32 inches (825 mm) o.c., to match coursing:
 - 1) Two anchors per jamb up to 60 inches (1530 mm) high.
 - 2) Three anchors per jamb from 60 to 90 inches (1530 mm to 2290 mm) high.
 - 3) Four anchors per jamb from 90 to 120 inches (2290 mm to 3060 mm) high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3060 mm) high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches (460 mm) from top and bottom of frame. Space anchors not more than 32 inches (815 mm) o.c.:
 - 1) Three anchors per jamb up to 60 inches (1530 mm) high.

- 2) Four anchors per jamb from 60 to 90 inches (1530 mm to 2290 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2290 mm to 2440 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2440 mm) high.
- c. Compression Type: Not less than two anchors in each frame.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches (150 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
3. Head Anchors: Two anchors per head for frames more than 42 inches (1065 mm) wide and mounted in metal stud partitions.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- D. Installation Tolerances: Adjust hollow-metal frames to specified tolerances:
1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- E. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified.
1. Non-Fire-Rated Hollow-metal Doors: Comply with SDI A250.8.
 2. Rated Assemblies: Install doors according to NFPA 80.
 3. Smoke Control Doors: Install doors according to NFPA 105.
- F. Glazing: Comply with installation requirements in applicable Division 08 glazing Sections and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat or oval head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.
- ### 3.4 FIELD QUALITY CONTROL
- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Owner and Architect.

- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- 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.

3.5 ADJUSTING

- A. Final Adjustments: Test and adjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or unacceptable.

3.6 CLEANING AND TOUCHUP

- A. Remove grout and other bonding material from hollow-metal work immediately after installation.
- B. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- C. Institute protective measures required throughout the remainder of the construction period to ensure that hollow-metal doors and frames will be without damage or deterioration, at time of Substantial Completion.

END OF SECTION

Project Name
Project Number

Deliverable
Issue Date

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HOLLOW-METAL DOORS AND FRAMES
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Last Updated:

August 2021

SECTION 08 14 24

PLASTIC-LAMINATE-FACED WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid core doors with plastic laminate faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.
3. Integration of electrified hardware, access control systems, and security systems into flush wood doors.

B. Related Requirements:

1. Section 08 80 00 "Glazing" for glass view panels in wood doors.

1.2 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. Door louvers.
5. Door trim for openings.
6. Factory-machining criteria.

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

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
4. Dimensions and locations of blocking for hardware attachment.
5. Dimensions and locations of mortises and holes for hardware.
6. Clearances and undercuts.

C. Samples for Initial Selection: Manufacturer's full line of colors for factory-finished metal louvers, metal lite frames, and metal astragals.

D. Samples for Verification:

1. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Include color, texture, and pattern of plastic laminate required.
3. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
4. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 1. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Test Reports: For results of hinge loading, cycle/slam, stile edge screw withdrawals, and stile edge split resistance for fire rated doors.
- C. Field Quality-Control Reports: Provide copies of Certificate of Compliance for fire rated door and egress door assemblies.
- D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. 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.
- B. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in heavy duty cardboard cartons prior to shipment from factory. Mark each door on top and bottom rail with opening number used on Shop Drawings using temporary, removable, or concealed markings.
 - 1. Protect wood doors during transit, storage, and handling to prevent damage, soiling, and deterioration.
 - 2. Store wood doors on a flat level surface in a dry, well ventilated, place.
 - 3. Keep wood doors a minimum of 3-1/2 inches off floor surface and protected by a protective covering under the bottom door and over the top door.
 - 4. Cover to protect wood doors from dirt, water and abuse but allow for air circulation under and around the stack.
 - 5. Do not store wood doors in direct sunlight.
- C. Handle wood doors with clean gloves. Lift and carry wood doors when moving around the site; do not drag wood doors across one another.
- D. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 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, wet work is complete, and HVAC system is operating and maintaining temperature between 60 degrees F and 90 degrees F (16 degrees C and 32 degrees C) and relative humidity between 25 and 55 percent during remainder of construction period.

1.8 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. Warping (bow, cup, or twist) more than 1/4- inch (6.4 mm) in a 42 inch by 84 inch (1067 mm by 2134 mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch (0.25 mm in a 76.2 mm) 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc., Division of Masonite.
 - 2. Eggers Industries, Division of VT Industries.
 - 3. Masonite.
 - 4. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- B. Smoke and Draft Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to 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 ANSI/WDMA I.S. 1A.
 - 1. The Contract Documents may contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.4 FLUSH WOOD DOORS WITH PLASTIC-LAMINATE FACES

- A. Interior Solid Core Doors:
 - 1. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
 - 2. ANSI/WDMA I.S. 1A Grade: Premium.
 - 3. Plastic Laminate Faces: High pressure decorative laminates complying with NEMA LD 3, Grade HGS.
 - 4. Colors, Patterns, and Finishes: As selected by Architect.
 - 5. Exposed Vertical and Top Edges:
 - a. For Doors with Woodgrain Laminates: Hardwood edges for staining to match faces.

PLASTIC-LAMINATE-FACED WOOD DOORS

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- b. For Doors with Solid Color Laminates: Hardwood edges for painting to match faces.
 - c. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - d. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.
 - 1) Finish steel edges and astragals with baked enamel, in color as selected by Architect from manufacturer's full range.
 - e. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw Holding Capability: 550 lbf (2440 N) per WDMA T.M. 10.
- B. Core for Non-Fire-Rated Doors:
- 1. ANSI A208.1, Grade LD-2 particleboard.
 - a. Blocking: Provide wood blocking in particleboard core doors as follows:
 - 1) Doors Indicated to Have Surface Closers: 5 inch (125 mm) top rail blocking.
 - 2) Doors Indicated to Have Concealed Closers: Not less than 6 inch (152 mm) top rail blocking.
 - b. Provide doors with structural composite lumber cores instead of particleboard cores for doors indicated to receive exit devices.
 - 2. WDMA I.S. 10 structural composite lumber:
 - a. Screw Withdrawal, Door Face: 550 lbf (2440 N).
 - b. Screw Withdrawal, Vertical Edge: 550 lbf (2440 N).
- C. Core for Fire-Rated Doors: Noncombustible mineral product as required to achieve fire-protection rating indicated on Drawings, and complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
- 1. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated:
 - a. Top Rail Blocking:
 - 1) Doors Indicated to Have Surface Closers: 5 inch (125 mm) top rail blocking.
 - 2) Doors Indicated to Have Concealed Closers: Not less than 6 inch (152 mm) top rail blocking.
 - b. 5 inch (125 mm) bottom rail blocking, in doors indicated to have protection plates.
 - c. 5 inch (125 mm) midrail blocking, in doors indicated to have armor plates.
 - d. 5 inch (125 mm) midrail blocking, in doors indicated to have exit devices.
 - 2. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.

2.5 LIGHT FRAMES AND LOUVERS

- A. Metal Frames for Light Openings in Fire Rated and Non-Rated Doors: Frame formed of 0.048 inch (1.2 mm) thick, cold rolled steel sheet; with baked enamel or powder coated finish.
 - 1. Color: As selected by Architect from manufacturer's full range.
 - 2. Frames for integration into fire-rated doors shall be approved for use in doors of fire protection rating indicated.

- B. Metal Louvers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Construction Products Group, Inc.
 - b. Advantage Lites and Louvers, an Allegion Company.
 - c. Anemostat Products; a Mestek company.
 - d. Pemko, an ASSA ABLOY Group Company.
 - e. L & L Louvers, Inc.
 - 2. Blade Type: Vision proof, inverted V.
 - 3. Metal and Finish: Hot dip galvanized steel, 0.040 inch (1.0 mm) (formerly "18 gage") thick, with baked enamel or powder coated finish.
 - a. Color: As selected by Architect from manufacturer's full range.

- C. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Activar Construction Products Group, Inc.
 - b. Advantage Lites and Louvers, an Allegion Company.
 - c. Anemostat Products; a Mestek company.
 - d. Pemko, an ASSA ABLOY Group Company.
 - e. L & L Louvers, Inc.
 - 2. Metal and Finish: Hot dip galvanized steel, 0.040 inch (1.0 mm) (formerly "18 gage") thick, with baked enamel or powder coated finish.
 - a. Color: As selected by Architect from manufacturer's full range.

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, 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 08 80 00 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames 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: Refer to Section 08 71 00 "Door Hardware" for installation.
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire rated doors according to NFPA 80.
 2. Install smoke and draft control doors according to NFPA 105.
- C. Job Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated.

2. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 3. Comply with NFPA 80 for fire rated doors.
 4. Bevel nonfire rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 5. Bevel fire rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- 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

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.
- B. Related Requirements:
 - 1. Applicable Division 23 Section for heating and air-conditioning duct access doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product including construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: Submit samples for each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.
- C. Product Schedule: For access doors and frames.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing and inspecting agency.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

1.4 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire protection and temperature rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - f. Williams Bros. Corporation of America (The).
2. Description: Face of door flush with frame, with concealed hinge and exposed flange for installation in masonry, tiled, and paneled walls.
3. Locations: Wall.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), factory primed.
6. Stainless Steel Sheet for Door: Nominal 0.075 inch (1.9 mm), (formerly "16 gage"), No. 4 finish.
7. Frame Material: Same material, thickness, and finish as door.
 - a. Provide masonry anchors for doors built into masonry walls.
8. Latch and Lock: Cam latch, screwdriver operated.

B. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acudor Products, Inc.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - f. Williams Bros. Corporation of America (The).
2. Description: Face of door flush with frame; with concealed hinge and concealed flange for gypsum board installation.
3. Locations: Wall and ceiling.
4. Door Size: Refer to Schedule at the end of PART 3.

5. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.067-inch (1.7 mm), (formerly "14 gage"), factory primed.
6. Stainless Steel Sheet for Door: Nominal 0.075 inch (1.9 mm), (formerly "16 gage"), No. 4 finish.
7. Frame Material: Same material, thickness, and finish as door.
8. Latch and Lock: Cam latch, screwdriver operated.

C. Exterior Flush Access Doors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Maxam Metal Products Limited.
 - e. MIFAB, Inc.
 - f. Nystrom, Inc.
 - g. Williams Bros. Corporation of America (The).
2. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch thick (50 mm thick) fiberglass insulation.
3. Locations: Wall.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Stainless Steel Sheet for Door: Nominal 0.075 inch (1.9 mm), (formerly "16 gage"), No. 2b finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch operated by handle, with separate mortise lock keyed to building keying system.

2.3 FIRE RATED ACCESS DOORS AND FRAMES

A. Fire Rated, Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - f. Williams Bros. Corporation of America (The).
2. Description: Door face flush with frame, with a core of mineral fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge, for installation in masonry, tiled, and paneled walls.
3. Locations: Wall.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Fire Resistance Rating: Not less than that of adjacent construction.

6. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.053-inch (1.3 mm), (formerly "16 gage"), factory primed.
7. Stainless Steel Sheet for Door: Nominal 0.048 inch (1.22 mm), (formerly "18 gage"), No. 4 finish.
8. Frame Material: Same material, thickness, and finish as door.
 - a. Provide masonry anchors for doors built into masonry walls.
9. Latch and Lock: Self closing, self-latching door hardware, operated by knurled knob.

B. Fire Rated, Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Larsens Manufacturing Company.
 - d. Milcor; Commercial Products Group of Hart & Cooley, Inc.
 - e. Nystrom, Inc.
 - f. Williams Bros. Corporation of America (The).
2. Description: Door face flush with frame, with a core of mineral fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: Refer to Schedule at the end of PART 3.
5. Fire Resistance Rating: Not less than that of adjacent construction.
6. Metallic Coated Steel Sheet for Door: Nominal thickness of 0.053-inch (1.3 mm), (formerly "16 gage"), factory primed.
7. Stainless Steel Sheet for Door: Nominal 0.048 inch (1.22 mm), (formerly "18 gage"), No. 4 finish.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self closing, self-latching door hardware, operated by knurled knob.

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Metallic Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

- A. Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
 - 2. For concealed flanges with plaster bead for full bed plaster applications, provide zinc coated expanded metal lath and exposed casing bead welded to perimeter of frames.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.
 - 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00.

2.6 FINISHES

- A. Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply lead and chromate free, universal primer immediately after surface preparation and pretreatment.
- E. Stainless Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - 2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

- a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Bright, Cold Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 SCHEDULE

- A. Wall and Ceiling Access Doors Locations:
 1. Where specifically scheduled or noted on Drawings.
 2. Where service access is required by Code or Authorities Having Jurisdiction.
 3. Where service access is required for serviceable, operable, adjustable or re-settable fire suppression, plumbing, HVAC, electrical, life safety, security, and communications systems items.
 4. Doors shall be installed as close as possible to serviceable, operable, adjustable or re-settable items, but in no case further than 12 inches distance away from item.
 5. All door locations shall be reviewed and coordinated with Owner prior to installation.
- B. Sizes: Provide the following unless otherwise indicated:
 1. Ceilings, Soffits, and Other Applications Requiring Personnel Access:
 - a. 24 inches by 24 inches.
 - b. Refer to access requirements in applicable Divisions 21 through 28 Sections.
 2. Ceilings, Soffits, and Other Applications Not Requiring Personnel Access:
 - a. 14 inches by 14 inches.

- b. Refer to access requirements in applicable Divisions 21 through 28 Sections.
 - 3. Plumbing Chase Walls: Minimum 14 inches by 14 inches at fixture chase wall.
 - a. Refer to access requirements in applicable Divisions 21 through 28 Sections.
 - 4. Exterior Walls: Minimum 14 inches by 14 inches.
 - 5. All Other Locations: Size as required to facilitate adequate access to equipment being serviced, adjusted, or maintained, but not less than 14 inches by 14 inches.
 - a. Refer to access requirements in applicable Divisions 21 through 28 Sections.
- C. Finish:
- 1. For access doors in painted walls and ceilings: Provide metallic coated steel sheet with factory primed finish for field painting.
 - 2. For access doors in restroom, toilet room, locker room, and sterile or food service area walls scheduled to receive tile finish, epoxy paint, or wall protection panels: Provide stainless steel.
 - 3. For access doors in Exterior walls: Provide stainless steel.

END OF SECTION

Project Name
Project Number

Deliverable
Issue Date

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ACCESS DOORS AND FRAMES
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Last Updated:

August 2021

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated exterior service doors, motor operated.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for steel angle track supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Curtain Slats: 10 inches (254 mm) long.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ACME Rolling Doors.
 - 2. Cookson Company.
 - 3. Cornell Iron Works, Inc.
 - 4. McKeon Rolling Steel Door Company, Inc.
 - 5. Overhead Door Corporation.
 - 6. Raynor.
 - 7. Wayne-Dalton Corp.
 - 8. Windsor Door.
- B. Source Limitations: Obtain each type of overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
- C. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Drawings.
 - 2. Testing: According to ASTM E330/E330M.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.
- D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

2.3 INSULATED EXTERIOR SERVICE DOORS

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis of Design: Model 627 "Stormtite" Insulated Heavy Duty Service Doors as manufactured by Overhead Door Corporation.
- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Insulated Door Curtain R-Value: 10.9 (1.91 sq. m/W).
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height, and 0.75-inch (19 mm) wide.
 - 1. Curtain Slats: Thickness as required to meet performance criteria, but not less than 18 gage (0.052 inch / 1.31 mm) galvanized steel.
 - 2. Insulation: Foamed-in-place, CFC-free polyurethane.
 - 3. Insulated-Slat Interior Facing: Metal.
 - 4. Gasket Seal: Manufacturer's standard continuous gaskets between slats.

- F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from galvanized steel and finished to match door.
- G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- H. Brackets:
 - 1. Hot rolled prime painted steel to support counterbalance, curtain, and hood.
- I. Hood: Minimum 24 gage galvanized steel with intermediate supports as required. Match curtain material and finish.
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
- J. Locking Devices: Interior slide bolt lock for padlock, with interlock switch.
- K. Electric Door Operator:
 - 1. Electric Motor: UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
 - 2. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.4 m) or lower.
 - 4. Motor Exposure: Interior.
 - 5. Motor Electrical Characteristics:
 - a. Horsepower: As determined by Manufacturer to suit grille size and weight, and performance and service requirements.
 - b. Voltage: 24 volts.
 - 6. Emergency Manual Operation: Chain-hoist operator.
 - 7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
 - 8. Control Station(s): Interior mounted.
- L. Curtain Accessories: Equip door with weatherseals and astragal.
- M. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 - 2. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer's full range.

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch (0.71 mm) and as required to meet requirements.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 3. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. For Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

2.7 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors and Sound Control Doors: Equip each door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
 - 1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.
- B. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.9 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
 - 1. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide

2.11 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets.
- D. Motors: Reversible-type motor for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
 - 1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

- a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Momentary-contact, three-button, key-operated control station with controls labeled "Open," "Close," and "Stop;" 24-volt circuit.
 - 1. For Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. For Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.12 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 08 33 26
OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-curtain overhead coiling grilles.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Closed-curtain grille with full-size components consisting of ribs and infill as required to illustrate each assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver until after wet work is complete and dry. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store materials in a dry, warm, ventilated weathertight location. Protect materials from exposure to moisture.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Clopay Corp.
 - 2. Cookson Company.
 - 3. Cornell Iron Works, Inc.
 - 4. McKeon Rolling Steel Door Company, Inc.
 - 5. Overhead Door Corporation.
- B. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling-grille manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

2.3 CLOSED-CURTAIN GRILLE ASSEMBLY

- A. Closed-Curtain Grille: Overhead coiling grille with a curtain having a series of horizontal ribs alternating with continuous horizontal infill panels secured by the ribs.
- B. Operation Cycles: Grille components and operators capable of operating for not less than 20,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Basis of Design: Model 671 as manufactured by Overhead Door Corporation.
- D. Grille Curtain Material: Stainless steel.
 - 1. Rib Spacing: Approximately 12 inches (300 mm) o.c.
 - 2. Inserts: Clear fire-retardant polycarbonate inserts or aluminum panels, as selected by Owner.
- E. Bottom Bar: Continuous doubled angles, fabricated from stainless steel and finished to match grille.
- F. Curtain Jamb Guides: Aluminum with exposed finish. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- G. Hood Material and Finish:
 - 1. Exposed to View: Match curtain material and finish.
 - 2. Concealed Above Ceiling: Galvanized steel.
 - 3. Shape: Round.
 - 4. Mounting: As indicated on Drawings.
- H. Locking Devices: Equip grille with slide bolt for padlock and chain lock keeper.
 - 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside and outside with cylinders.
- I. Electric Grille Operator:
 - 1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.

2. Operator Location: Top of hood or front of hood, as standard with manufacturer.
 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.4 m) or lower.
 4. Motor Exposure: Interior.
 5. Motor Electrical Characteristics:
 - a. Horsepower: As determined by Manufacturer to suit grille size and weight, and performance and service requirements.
 - b. Voltage: 24 volts.
 6. Emergency Manual Operation: Chain type.
 7. Obstruction-Detection Device: Automatic photoelectric sensor.
 8. Control Station: Interior mounted where indicated on Drawings.
- J. Curtain Accessories: Equip grille with astragal.
- K. Grille Finish:
1. Stainless-Steel Finish: No. 4 (polished directional satin).

2.4 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. Closed-Curtain Grilles: Fabricate curtain as a series of horizontal double-C ribs, spaced at regular intervals, that alternate with continuous horizontal infill panels secured by the ribs.
1. Stainless-Steel Grille Curtain: ASTM A666 or ASTM A240/A240M, Type 300 series.
 2. Plastic Panels: Fire-retardant polycarbonate sheet manufactured by the extrusion process; UV resistant; manufacturer's standard panel dimensions and thickness.
- B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.
1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
 2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.
1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.6 HOODS AND ACCESSORIES

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Galvanized Steel: Nominal 0.028-inch- (0.71-mm-) thick, hot-dip galvanized-steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.
 - 2. Stainless Steel: 0.025-inch- (0.64-mm-) thick, stainless-steel sheet, Type 304, complying with ASTM A666 or ASTM A240/A240M.
- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.
- C. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A36/A36M structural-steel tubes or shapes, hot-dip galvanized per ASTM A123/A123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock housing, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders:
 - a. Cylinder Housing: As standard with grille manufacturer.
 - b. Construction Cores: By Contractor.
 - c. Permanent Cores: By Owner.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.8 COUNTERBALANCE MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL GRILLE OPERATORS

- A. General: Equip grille with manual grille operator by grille manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for grille operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.10 ELECTRIC GRILLE OPERATORS

- A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.
- C. Grille Operator Location(s): Operator location indicated for each grille.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on top of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on coil side of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each grille assembly.

1. Electrical Characteristics: Minimum as indicated for each grille assembly. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.
1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure with key-operated lock.
- H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed 25 lbf (111 N).
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

- A. Mill Finish: Manufacturer's standard.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.14 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work. Examine locations of electrical connections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.

- B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Grilles: Install according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 3. Test grille opening when activated by detector, fire-alarm system, emergency-egress release, or self-opening mechanism as required. Reset grille-opening mechanism after successful test.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-grille Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper grille operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION

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OVERHEAD COILING GRILLES
08 33 26 - 10

Last Updated:

August 2021

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.
3. Aluminum-framed storefront framing for fixed windows.

B. Related Requirements:

1. Section 08 44 13 "Glazed Aluminum Curtain Walls" for exterior curtain wall systems.

1.2 PREINSTALLATION MEETINGS

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

1.3 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 aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Glazing.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.4 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Water penetration through fixed glazing and framing areas.
 - d. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Kawneer North America.
 2. Oldcastle BuildingEnvelope.
 3. Tubelite.
 4. United States Aluminum.
 5. YKK AP America Inc.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system and curtain wall system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: Design and size components of aluminum-framed entrances and storefronts to withstand loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with ASCE/SEI 7 to establish wind pressure based on the following criteria:
 - a. As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Wind Induced Interstory Drift: Accommodate design displacement of adjacent stories indicated.
 1. Design Displacement: As indicated on Drawings.
 2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.
 - J. Energy Performance: Certify and label energy performance according to NFRC as follows:
 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.25 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 65 as determined according to NFRC 500.
 - K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.
 - L. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
 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 (22.2 N).
 2. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 3. 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.

2.3 STOREFRONT SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Exterior Storefront Systems:
 - 1. Framing Construction: Thermally broken.
 - 2. Interior Vestibule Framing Construction: Nonthermal.
 - 3. Glazing System: Retained mechanically with gaskets on four sides.
 - 4. Maximum Frame Depth: 4 1/2 inches (114.3 mm).
 - 5. Sightline: 2 inches (50.8 mm).
 - 6. Glazing Plane: Front.
 - 7. Finish: Color anodic finish.
 - 8. Fabrication Method: Screw spline or shear block system.
 - 9. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 10. Steel Reinforcement: By manufacturer and as required by performance criteria.
 - 11. Basis-of-Design Product: Trifab 451T Framing System as manufactured by Kawneer.
- C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- E. Sill Flashing: Manufacturer's standard, thermally broken, continuous sill flashing or receptor piece, with end dams, where framing abuts adjacent construction.
- F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- G. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

- b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
- c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 WINDOW FRAMING SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Exterior Storefront Systems:
 - 1. Framing Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Frame Depth: 4 1/2 inches (114.3 mm).
 - 4. Sightline: 2 inches (50.8 mm).
 - 5. Glazing Plane: Front.
 - 6. Finish: Clear anodic finish and color anodic finish, as scheduled.
 - 7. Fabrication Method: Screw spline or shear block system.
 - 8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 9. Basis-of-Design Product: Trifab® VersaGlaze® 451/451T Framing System as manufactured by Kawneer.
- C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- E. Sill Flashing: Manufacturer's standard, thermally broken, continuous sill flashing or receptor piece, with end dams, where framing abuts adjacent construction.
- F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- G. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

- a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
- b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
- c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 2. Door Design: Wide stile; 5-inch nominal width .
 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.6 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware, General: Provide entrance door hardware indicated below for each entrance door to comply with requirements in this Section. Balance of hardware is specified in Section 08 71 00 "Door Hardware."
- B. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Silencers: BHMA A156.16, Grade 1.
- E. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.7 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

- D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with system components with which it comes in contact; recommended by storefront manufacturer for this use.
 - 1. Color: As selected by Architect.

2.8 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.9 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

- D. Storefront Framing: Fabricate components for assembly using shear-block system.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from manufacturer's complete line to match curtain wall system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.

- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Seal perimeter and other joints watertight unless otherwise indicated.
- G. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- H. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.
- I. Install components plumb and true in alignment with established lines and grades.

3.4 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."
- B. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

- A. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.

3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests on each building facade in areas directed by Architect.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

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SECTION 08 42 33
REVOLVING DOOR ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access-control revolving exterior door entrances.
2. Access-control interior full-height turnstiles.

B. Related Requirements:

1. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for adjacent aluminum entrance doors and storefront framing.
2. Section 08 44 13 "Glazed Aluminum Curtain Walls" for adjacent curtain wall framing.
3. Applicable Division 09 sections for finish flooring.
4. Applicable Division 28 sections for security and access control requirements.

1.2 COORDINATION

- A.** Coordinate floor construction to ensure finish tolerances are within range required by revolving door manufacturer's requirements. Furnish setting drawings, templates, and directions for installing anchorages that are to be embedded into concrete. Deliver these items to Project site in time for installation.
- B.** Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies and access-control system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for revolving door entrances.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For revolving door entrances.

1. Include plans, elevations, sections, attachment details, and floor transition and threshold details.
2. Indicate enclosures, speed-control units, and other components not in manufacturer's product data.

3. Indicate locations of activation and safety devices.
 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each exposed product and for each color specified.
1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (76 by 127 mm).
 2. Glass Samples: For each type of glass; 6 inches (150 mm) square.
- D. Qualification Data: For Installer.
- E. Product Test Reports: For each type of revolving door entrance, for tests performed by manufacturer and witnessed by a qualified testing agency.
- F. Sample Warranty: For manufacturer's warranties.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For revolving door entrances to include in emergency, operation, and maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver revolving door entrance glass, decorative metalwork, and other exposed elements in padded blankets or other approved protective wrapping.
- B. Protect finish surfaces from damage during handling and installation.
- 1.7 WARRANTY
- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of revolving door entrances that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Lateral deflection of glass lite edges in excess of 1/175 of their length or 3/4 inch (19 mm), whichever is less.
 - b. Excessive air leakage.
 - c. Faulty operation of speed-control unit and hardware.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period for Revolving Door Entrances: 12 months from date of Substantial Completion.
 3. Warranty Period for Speed-Control Units: Five years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
1. ASSA ABLOY, Besam Entrance Solutions.
 2. Boon Edam Tomsed Inc.
 3. Crane Revolving Door Company, Inc.
 4. Horton Automatics; a division of Overhead Door Corporation.
 5. International Revolving Door Co.
 6. Rush, C. J. Industries; a division of Stanley Security Solutions Inc.
- B. Obtain all components of revolving door entrances from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Revolving Door Entrance Standard: BHMA A156.27.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Air Infiltration: Maximum air leakage of 1.25 cfm/sq. ft. (6.4 L/s x sq. m) of wing area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

REVOLVING DOOR ENTRANCES

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1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Seismic Performance: Revolving door entrances shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- F. Regulatory Requirements: Wings shall be capable of collapsing into a book-fold position to provide minimum aggregate parallel width of 36 inches (914 mm) when breakaway force of no more than 130 lbf (572N) is applied within 3 inches (76 mm) of outer edges. Set maximum turning speed to comply with requirements of ANSI/BHMA A156.27.
- G. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
 1. Safety-Glass Labeling: Where safety-glass labeling is indicated, permanently mark glass with certification label of the SGCC, another certification agency acceptable to authorities having jurisdiction, or the manufacturer.
 - a. Label shall indicate manufacturer's name, type of glass, thickness, and safety-glass standard with which glass complies.

2.3 ACCESS-CONTROL REVOLVING DOOR ENTRANCES – EXTERIOR

- A. Access-Control Revolving Door Entrances: Manufacturer's standard four-wing access-control revolving door entrance, complete with center shaft, speed-control unit, wings, hardware, enclosure walls, canopy, glass and glazing, activation devices, safety devices, and accessories.
 1. Basis-of-Design Product: Besam RD4A Revolving Door, as manufactured by ASSA ABLOY, Besam Entrance Solutions.
 2. Unit Clearances:
 - a. Inside Diameter: 7'-0".
 - b. Height, Under Canopy: 7'-0".
 - c. Height, Canopy: 1'-0"
 3. Powered Speed-Control Unit:
 - a. Drive System: Overhead drive system with one 1/4 HP DC motor attached to the internal structural framing. The door shall be powered by a 110 VAC, 1-phase service. The motor shall utilize an internal angle encoder for constant monitoring of door position and a Frequency Controller to provide for the following characteristics:
 - 1) Compliant with BHMA/ANSI A156.10 & A156.27, and UL 325.
 - 2) Adjustment of rotation speed through a digital setting, not to exceed 10 rpm per code.
 - 3) Constant regulation of rotation speed.
 - 4) Adjustment of startup/run torque through a digital setting to minimize force required to stop door.
 - 5) Adjustment of stopping distance through a digital setting.
 - 6) Password-protected Security over Frequency Control settings.

- b. Drive Assembly: Positive braking and stopping shall be performed by electromagnetic brake assembly incorporated within the drive unit. The drive unit to provide the following characteristics:
 - 1) Remain locked at all times until unlocked by authorized signal from the access control device or emergency system.
 - 2) Lock immediately after an unauthorized signal from IRS sensor system or other incorporated system.
 - 3) Doorset shall lock immediately if the doorset is pushed in the opposite direction of travel and sound the alarm.
4. Controls: Microprocessor-based electronics utilizing a 2000-step Programmable Logic Controller (PLC) with the following characteristics:
 - a. RAM & ROM memory.
 - b. Self-diagnostics for quick detection of problem source.
 - c. Visual display of problem source.
5. Emergency Collapsing Mechanism: Precision-engineered door hangers and disks to allow the door wings to be collapsed under pressure and stored in a bookfold position. Hangers and disks are finished in black and provide tension to hold the door wings in position when the electric locking is released. Door wings shall be capable of being collapsed outward under pressure on the outer stile not to exceed 130 pounds.
 - a. Pivot: Floor mounted pivot under the center shaft shall provide smooth rotation.
 - b. Center Shaft: Extruded aluminum shaft with multi-point connections to the positioning system and pivot.
6. Options:
 - a. Fail-Secure. Revolving door remains locked; egress through side doors.
 - b. Remote control panel.
 - c. Card Reader mounting.
7. Activation Devices:
 - a. IRS Infrared Sensor System: Ceiling mounted infrared sensors capable of performing the following functions:
 - 1) Detecting the presence of a person within the restricted zone of the door and preventing unauthorized entry by stopping the door and sounding the alarm.
 - b. Activation: Activation by external card reader or other access control device that can provide a dry contact to the control box of the door. Card readers as specified in Section 28 13 00 "Access Control."
 - 1) Mounting: Surface mounted on enclosure frame where indicated on drawings, but not less than 2 per door unit.
8. Stile-and-Rail Wings: Manufacturer's standard with 1-3/4-inch- (45-mm-) thick tubular stile-and-rail members.
 - a. Stile Design: Narrow stile, 2-5/8-inch nominal width.
 - b. Rail Design: 3-inch (76-mm) nominal height.
 - c. Glass: Clear, fully tempered float glass.
 - 1) Thickness: 6 mm.

9. Enclosure Walls: Manufacturer's standard, with 1-3/4-inch- (45-mm-) thick tubular framing members.
 - a. Configuration: Curved.
 - b. Glass: Clear, fully tempered float glass.
 - c. Thickness: 6 mm.
10. Canopy: Manufacturer's standard ceiling, fascia, and framing with size, layout, materials, and exposed finishes matching enclosure walls unless otherwise indicated.
 - a. Metal: Fabricate from minimum 0.125-inch- (3.18-mm-) thick, aluminum sheet. Provide ceiling access panels for repairs to or maintenance of speed-control units.
 - 1) Finish: Match adjacent Curtainwall or Storefront.
 - b. Ceiling Lights: Manufacturer's standard, consisting of six recessed LED light fixtures within the ceiling of the revolving door entrance enclosure, complete with lamps and translucent lenses.
 - c. Canopy Roof: Manufacturer's standard constructions, with material and finish matching enclosure walls where visible.
11. Safety Devices: Manufacturer's standard safety devices as required to stop or slow rotation. Provide the following:
 - a. Emergency Stop Button: Momentary contact, red push-button switch to immediately stop wing rotation. Provide sign indicating "Emergency Stop."
 - 1) Mounting: As indicated on Drawings on right-hand side of opening.
 - b. Slow-Speed Operation Button: Momentary contact push-button switch or plate to slow wing rotation by reducing rpm by one half. Include sign indicating operation.
 - 1) Mounting: As indicated on Drawings on right-hand side on each side of opening.
 - c. Vertical Safety Strip: Compressible safety switch consisting of an impact-pressure-activated, internal-contact switch plate encapsulated in a flexible housing. Mount on enclosure walls at vertical edge of entry.
 - d. Horizontal Safety Strip: Compressible safety switch consisting of an impact-pressure-activated, internal-contact switch plate encapsulated in a flexible housing. Mount at bottom edge of each wing.
12. Security Devices:
 - a. Anti-Tailgating: Manufacturer's standard overhead sensors to monitor passage of authorized users.
 - b. Anti-Piggybacking: Manufacturer's standard overhead sensors to monitor passage of authorized users.
13. Signage: As required by ANSI/BHMA A156.27.
 - a. Application Process: Door manufacturer's standard process.
 - b. Provide sign materials with instructions for field application after glazing is installed.

B. Materials:

1. Extruded aluminum, ASTM B 221.
 - a. Main Extrusions and Tubing: Minimum wall thickness of 0.125 inch (3.2 mm); 6063-T6.
 - b. Center Shaft: 6061-T6.
2. Aluminum Sheets: Minimum thickness of 0.063, ASTM B 209.
3. Tempered Glass: 6 mm clear tempered, ANSI Z 97.1.
4. Weatherstripping: Manufacturer's standard to seal between door wings and drum, ASTM E 283.

C. Fabrication: Fabricate revolving door entrance components to designs, sizes, thicknesses, and configurations indicated with profiles that are sharp, straight, and free of defects or deformations. Accurately fit joints with ends coped or mitered to produce hairline joints free of burrs and distortion. Prefit all hardware at the factory. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.

1. Wings: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
 - a. Glaze wings at the factory. Comply with glazing requirements specified in this Section and in Section 08 80 00 "Glazing." Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."
 - b. Provide horsehair weather stripping to meet ASTM E 283; mortised into stiles and rails of wings, to be adjustable and replaceable without dismantling wings.
 - c. Welded Construction: Weld reinforcement firmly in place. Weld corners. Grind and polish welds to produce an invisible joint. Mechanically finish exposed surfaces after fabrication to eliminate surface blemishes caused by welding, rolling, bending, and forming.
 - d. Mechanically Joined Construction: Joints shall be tightly bolted together. Glass stops shall be snap-in type where possible.
 - e. Mechanically Joined Clad Construction: Joints shall be tightly bolted together to produce hairline joints. Finish material before fabrication. Carefully assemble to prevent welds or adhesives from blemishing finished surfaces. Glass stops shall be snap-in type where possible.
2. Enclosure Walls and Ceilings: Fabricate tubular and channel frame assemblies in configuration indicated, with welded or mechanical joints, according to manufacturer's standards and as specified. Provide subframes as required for a complete system to support required loads.
 - a. Exterior Framing: Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion of exterior units.

- D. Aluminum Finishes: Color anodic finish; color as selected by Architect.

2.4 ACCESS-CONTROL TURNSTILE ENTRANCES - INTERIOR

- A. Access-Control Turnstile Entrances: Manufacturer's standard three-wing access-control revolving door entrance, complete with center shaft, speed-control unit, wings, hardware, enclosure walls, canopy, polycarbonate and glazing, activation devices, safety devices, and accessories.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Boon Edam Tomsed Inc.; Turnlock 250 CSTG2, or a comparable product by one of the following:
 - a. Besam Entrance Solutions; ASSA ABLOY.
 - b. Crane Revolving Door Company, Inc.
 - c. Horton Automatics; a division of Overhead Door Corporation.
 - d. International Revolving Door Co.
 - e. Rush, C. J. Industries; a division of Stanley Security Solutions Inc.
 - 2. Unit Clearances:
 - a. Overall Diameter: 60 inches.
 - b. Height, Under Canopy: 6 feet 9 inches.
 - c. Height, Canopy: 8 inches.
 - d. Dead level Pad Size: Refer to manufacturer's written requirements.
 - e. Include Options:
 - 1) Remote release button.
 - 2) Home Position switch.
 - 3) Rotation detection switch.
 - 4) Card Reader Box.
 - 5) Electrical Key Bypass.
 - 3. Powered Speed-Control Unit: Provide an electric or electrohydraulic speed regulator to permit automatic rotation of wings. Unit shall fail-secure when power is off. Furnish power-operation equipment to suit current characteristics of building electrical service.
 - a. Location: Overhead.
 - 4. Activation Devices:
 - a. IRS Infrared Sensor System: Ceiling mounted infrared sensors capable of performing the following functions:
 - 1) Detecting the presence of a person within the restricted zone of the door and preventing unauthorized entry by stopping the door and sounding the alarm.
 - b. Activation: Activation of the Turnlock by external card reader or other access control device that can provide a dry contact to the control box of the door. Card readers as specified in Section 28 13 00 "Access Control."
 - 1) Mounting: Surface mounted on enclosure frame where indicated on drawings, but not less than 2 per door unit.

5. Wings/Rotor Arms: Manufacturer's standard with three wide polycarbonate panels 3/4" thick. Max open space is 7.5 inches.
 - a. Design: As indicated on Drawings.
 6. Enclosure Walls: Manufacturer's standard, with 1-3/4-inch- (45-mm-) thick tubular framing members.
 - a. Configuration: Curved.
 - b. In-fill Panels: Clear polycarbonate.
 - 1) Thickness: Manufacturer's standard, but not less than 6 mm.
 7. Canopy: Manufacturer's standard ceiling, fascia, roof, and framing with size, layout, materials, and exposed finishes matching enclosure walls unless otherwise indicated.
 - a. Metal: Fabricate from minimum 0.125-inch- (3.18-mm-) thick, aluminum sheet. Provide ceiling access panels for repairs to or maintenance of speed-control units.
 - b. Ceiling Lights: Manufacturer's standard, consisting of two recessed light fixtures within the ceiling of the revolving door entrance enclosure, complete with lamps and translucent lenses.
 - c. Canopy Roof: Manufacturer's standard constructions, with material and finish matching enclosure walls where visible.
 8. Safety Devices: Manufacturer's standard safety devices as required to stop or slow rotation. Provide the following:
 - a. Emergency Stop Button: Momentary contact, red push-button switch to immediately stop wing rotation. Provide sign indicating "Emergency Stop."
 - 1) Mounting: As indicated on Drawings, or on right-hand side of opening.
 - b. Slow-Speed Operation Button: Momentary contact push-button switch or plate to slow wing rotation by reducing rpm by one half. Include sign indicating operation.
 - 1) Mounting: As indicated on Drawings, or on right-hand side on each side of opening.
 - c. Vertical Safety Strip: Compressible safety switch consisting of an impact-pressure-activated, internal-contact switch plate encapsulated in a flexible housing. Mount on enclosure walls at vertical edge of entry.
 - d. Horizontal Safety Strip: Compressible safety switch consisting of an impact-pressure-activated, internal-contact switch plate encapsulated in a flexible housing. Mount at bottom edge of each wing.
- B. Materials: Extruded aluminum.
1. Main Extrusions and Tubing: Minimum wall thickness of 0.125 inch (3.2 mm).
 2. Cladding: Minimum 0.04 inch (1.0 mm) thick.

- C. Fabrication: Fabricate revolving turnstile entrance components to designs, sizes, thicknesses, and configurations indicated with profiles that are sharp, straight, and free of defects or deformations. Accurately fit joints with ends coped or mitered to produce hairline joints free of burrs and distortion. Prefit all hardware at the factory. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.
 - 1. Wings: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
 - a. Glaze wings at the factory. Comply with manufacturer's written glazing requirements.
 - b. Welded Construction: Weld reinforcement firmly in place. Weld corners. Grind and polish welds to produce an invisible joint. Mechanically finish exposed surfaces after fabrication to eliminate surface blemishes caused by welding, rolling, bending, and forming.
 - c. Mechanically Joined Construction: Joints shall be tightly bolted together. Glazing stops shall be snap-in type where possible.
 - 2. Enclosure Walls and Ceilings: Fabricate tubular and channel frame assemblies in configuration indicated, with welded joints, according to manufacturer's standards and as specified. Provide subframes as required for a complete system to support required loads.
 - a. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion of units.
- D. Aluminum Finishes: Color anodic finish; color as selected by Architect.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 2. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Steel: ASTM A 36/A 36M plate, shapes, and bars; or ASTM A 1008/A 1008M sheet.
- C. Fasteners: Manufacturer's standard, of same basic metal as fastened metal, unless otherwise indicated.
- D. Weather Stripping: Heavy-duty, single-piece rubber or combination of rubber and felt.
- E. Nonshrink, Nonmetallic Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.
- F. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from manufacturer's complete line to match adjacent storefront or curtain wall system, as applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Floor shall be dead level at any point within footprint of revolving door. Door shall be installed on finished floor only.

3.3 INSTALLATION

- A. Install revolving door entrances in accordance with manufacturer's written instructions and ANSI/BHMA A156.27, including signage, controls, wiring, and connections to building power supply.
 - 1. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight. Do not install damaged components.
 - 2. Where aluminum contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 3. Where aluminum contacts concrete or masonry, protect against corrosion by painting contact surfaces with corrosion-resistant coatings.
- B. Overhead-Mounted Speed-Control Unit: Insert pivot bearing in rough-in floor opening set on level bed of nonshrink, nonmetallic grout. Fill annular space between pivot bearing and sides of recess with nonshrink, nonmetallic grout. Mix and place grout to comply with grout manufacturer's written instructions.
- C. Connect speed-control unit to electrical power distribution system.
- D. Install revolving door entrances according to manufacturer's written instructions, plumb and true, without warp or rack of framing members and wings. Anchor securely in place.

1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 2. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the assembly to exterior.
 3. Cut and trim framing during installation only with approval of manufacturer.
 - a. Restore finish and remove and replace members, as directed, where cutting and trimming have impaired strength or appearance.
 - b. Do not install members that are warped, bowed, deformed, or otherwise damaged or defaced to such an extent as to impair strength or appearance. Remove and replace members that have been damaged during installation.
- E. Activation and Safety Devices: Adjust devices to provide detection field and functions in compliance with ANSI/BHMA A156.27.
- F. Sealants: Comply with requirements specified in Section 07 92 00 "Joint Sealants" to provide weathertight installation.
1. Set continuous sill members and flashings in full sealant bed.
 2. Seal perimeter of framing members with sealant.
- G. Signage: Apply signage as required by ANSI/BHMA A156.27.

3.4 ADJUSTING

- A. Adjust wings to provide an even, tight fit at contact points and weather stripping for smooth operation and weathertight closure. Adjust wings to operate smoothly and rotate evenly, with hardware and operators functioning properly.
1. Lubricate operating hardware and other moving parts.
 2. Adjust speed-control unit for specified rpm.
 3. Adjust pressure for collapse of wings for specified breakaway force.
- B. Readjust wings and speed-control units after three days' use by normal traffic. Lubricate hardware and other moving parts.

3.5 CLEANING AND PROTECTION

- A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
1. Comply with requirements in Section 08 80 00 "Glazing" for cleaning and maintaining glass.
- B. Limit construction traffic during remainder of construction period.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation.
 - 1. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 - 2. Include 24-hour-per-day, seven-day-per-week emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain revolving door entrances.

END OF SECTION

Project Name
Project Number

Deliverable
Issue Date

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REVOLVING DOOR ENTRANCES
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Last Updated:

August 2021

SECTION 08 44 13

GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conventionally glazed aluminum curtain wall system.

B. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain walls.
2. Section 07 92 00 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for entrance doors and coordinating finishes among aluminum framing.
4. Section 08 80 00 "Glazing" for curtain wall glazing.

1.2 PREINSTALLATION MEETINGS

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

1.3 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 glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.

1.4 INFORMATIONAL SUBMITTALS

- A. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Preconstruction Laboratory Mockup Testing Submittals:
 - 1. Testing Program: Developed specifically for Project.
 - 2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
 - 3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.
- C. Qualification Data: For Installer.
- D. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- E. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Testing shall be performed on mockups in accordance with requirements in "Field Quality Control" Article.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Special Assembly Warranty: Installer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Kawneer North America.
 2. Oldcastle BuildingEnvelope.
 3. Tubelite.
 4. United States Aluminum.
 5. YKK AP America Inc.
- B. Source Limitations: Obtain all components of curtain wall system and storefront system, including framing, entrances, and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.

- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans of greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- E. Structural: Test in accordance with ASTM E330/E330M as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
 2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters or water that is drained to exterior.
- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Exterior Curtain Wall System:
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Maximum Frame Depth: As required by design, but not less than 6 inches (152.4 mm).
 - 4. Sightline: 2 1/2 inches (63.5 mm).
 - 5. Glazing Plane: Front.
 - 6. Finish: Color anodic finish.
 - 7. Fabrication Method: Field-fabricated stick system.
 - 8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 9. Steel Reinforcement: By manufacturer and as required by performance criteria.
 - 10. Basis-of-Design Product: 1600 Wall System 1 Curtain Wall as manufactured by Kawneer.
- C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
 - 1. Include snap-on aluminum trim that conceals fasteners.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Entrance Door Systems: Comply with Section 08 41 13 "Aluminum-Framed Entrances and Storefronts".

2.4 GLAZING

- A. Glazing: Comply with Section 08 80 00 "Glazing."
- B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard compression-type, replaceable EPDM or extruded silicone.
 - 1. Color: Black.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with system components with which it comes into contact; recommended by curtain wall manufacturer for this use.

2.5 MATERIALS

- A. Sheet and Plate: ASTM B209 (ASTM B209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
- C. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
- D. Structural Profiles: ASTM B308/B308M.
- E. Steel Reinforcement:
 - 1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.
- F. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, ASTM A240/A240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
- F. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from manufacturer's complete line to match storefront system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions.

- B. Do not install damaged components.
- C. Fit joints to produce hairline joints free of burrs and distortion.
- D. Rigidly secure nonmovement joints.
- E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
- G. Seal joints watertight unless otherwise indicated.
- H. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

- A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

- A. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 ERECTION TOLERANCES

- A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).

- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of three tests in areas as directed by Architect.
 2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of three tests in areas as directed by Architect.
 3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.
- C. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Folding doors.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

B. Provide all labor, materials, equipment and services necessary to furnish and install all door hardware as indicated and specified.

1. Door hardware component parts required for a complete, functioning building, whether specifically specified or not, shall be provided.

1.2 REFERENCES

A. Reference to standards and/or specifications herein shall be interpreted to mean the latest revision unless noted otherwise. The following abbreviations appear in the specifications:

1. BHMA - Builders Hardware Manufacturers Association
2. NBHA - National Builders Hardware Association
3. DHI - Door & Hardware Institute

1.3 COORDINATION

A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.

1. Cast anchoring inserts into concrete.

B. 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.

- C. Security: Coordinate installation of conduit, door frame preparation, door hardware, keying, and access control with Owner's security consultant and SRP Security Department.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. 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. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
- B. Keying Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

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. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. 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 after or 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.

- D. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Manufacturer Certificates: Include a report that the product supplied meets the requirements of this Section, OSHA, and ADA.
- 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. Field quality-control reports.

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 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the performance of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).
- C. Hardware Supplier: Recognized builders' hardware supplier who has been furnishing specified hardware in the Project's immediate vicinity for a minimum of five years, and who is, or employs on a full-time basis, a registered member of the Door and Hardware Institute to properly detail work, order materials, and supervise installation.
 - 1. Supplier proposing to supply door hardware for this Project shall be a regular stocking distributor of the hardware it proposes to furnish.
 - 2. Hardware Supplier shall make periodic inspections of project (upon receipt of hardware at project, during installation and at completion of installation) so that at completion of the installation, can certify to the Owner that hardware is properly installed according to manufacturer's printed instructions.
 - 3. Hardware Supplier shall provide two copies of certification to the Owner within two weeks after installation of all hardware.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- 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.
 - 1. Include necessary screws, keys, instructions and installation templates for spotting mortising tools.
 - 2. Mark each container with heading number and number corresponding to Door Hardware Schedule.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
- B. 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. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) 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. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.
 - 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 (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. 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 (13 mm) 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 MATERIALS

- A. Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FG-G-111, FS FF-H-116, and FS FF-H-121.
 - 1. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

2.4 KEYING

- A. General: Provide padlocks and cylinders for locking functions as indicated.
 - 1. Owner will provide permanent cores and keys.
- B. Padlocks and cylinders shall be provided compatible with full size interchangeable core system (FSIC).
 - 1. Unless otherwise indicated, padlocks and cylinders shall be construction-keyed alike; furnish six construction keys. Construction key system shall be voided by use of a construction core control key.

2.5 MANUFACTURED UNITS

- A. Locksets:
 - 1. Mortise Series, Basis of Design Manufacturer: Schlage Lock Company.
 - 2. "L" Series (extra heavy duty) lever design to be 06 to match Rhodes (RHO), Roses to be "A" (2-1/8") size. All locksets to be equipped with "Figure 8" FSIC removable core, 6-pin tumblers. Furnish WBX for all locksets.
 - a. Fail Secure Electrified Doors Locking RX-L9092TEU
 - b. Classroom Function Doors Locking L9070T
 - c. Storeroom Function Doors Locking L9080T
 - d. Single-Occupant Toilets Locking L9456 L283-722
 - e. Passage Function Doors Locking L9010
- B. Rim Cylinders and Padlocks. Basis of Design Manufacturer shall be Schlage Lock Company. All cylinders to be equipped with "Figure 8" FSIC removable core, 6-pin tumblers.
 - 1. Rim Cylinder, Housing Only 20-079
 - 2. Mortise Cylinder, Housing Only 20-094
 - 3. FSIC Keyed Construction Cores 23-030-ICX
- C. Exit Devices: Rim type with lever and cylinder for outside operation. Exit devices to be listed with UL under Life Safety Section. Acceptable Manufacturer: Von Duprin 99. All exit devices to comply with ADA.
 - 1. Single door: 99
 - 2. Double doors: 99 x KR*954 Series Mullion

- D. Door Closers: Cast iron body with finish and equipped with three operation valves. All closers sized by the Installing Contractor. Parallel arm application preferred. All wood doors to be equipped with sex nuts and bolts. Acceptable Manufacturers: LCN 4040XP w/ 3077 arms, 62PA shoe.
- E. Kickplates: 16 inches high by 1-1/2 inches L.D.W. for single doors, 16 inches high by 1-inch L.D.W. on all pairs of doors without mullions. Materials to be stainless steel, brass, or bronze, .050 thick.
- F. Push Plates: 4 inches by 16 inches; 0.050 inches thick, bevel edge.
- G. Door Pulls: Ives 8303 with plate.
- H. Door Stops:
 - 1. Interior:
 - a. Wall: Ives WS401CCV Cast Wall Stop.
 - b. Floor: Ives FS439 Universal floor stop.
 - 2. Exterior:
 - a. Floor: Ives FS444 Heavy Duty Floor Stop.
- I. Thresholds:
 - 1. Architectural Aluminum Doors: National Guard 425, finish to match finish of architectural aluminum.
 - a. Other Acceptable Manufacturers: Pemko, Reese, or Zero International.
 - 2. Butt Glazed Doors: National Guard Type 4 x 713, finish to match finish of hardware.
 - a. Other Acceptable Manufacturers: Pemko, Reese, or Zero International.
 - 3. All Other Doors: National Guard 425, finish to match finish of architectural aluminum.
 - a. Other Acceptable Manufacturers: Pemko, Reese, or Zero International.
 - 4. Provide vinyl reducer where threshold is installed at resilient flooring.
- J. Door Sweeps: National Guard, Model 319EV with 1/2 full notch by width of door.
 - 1. Other acceptable manufacturers are Pemko, Reese, or Zero International.
- K. Automatic Door Bottoms: Reese 521 Series.
 - 1. Other acceptable manufacturers are National Guard, Pemko, or Zero International.
- L. Weatherstripping: Pemko 303 Series, with silicone seal. Provide at head and jambs.
 - 1. Other acceptable manufacturers are National Guard, Reese, or Zero.
- M. Silencers: All frames to receive three silencers for single door frames and two each for pairs of doors.

- N. Hinges: 5 knuckle ball bearing, standard weight, with non-removable pin (NRP) at locking doors, full mortise. Provide 1-1/2 pairs for all doors, sized per manufacturer's recommendations, or as indicated below. Manufacturers: Stanley FBB179 Series; or Ives 5BB1 Series.
 - 1. Doors 1-3/4" thick and up to 36" wide to have Standard Weight 4-1/2" butts.
 - 2. Doors 1-3/4" thick, 37" to 48" wide to have Heavy Weight 5" butts.
 - 3. All butts finish sized in width to clear all trim.
- O. Flush Bolts: Manual Latching, with 1/2- inch rod; Basis of Design Ives FB457 Series.
- P. Astragals: National Guard 139SP. Do not notch.

2.6 FINISHES

- A. General: Designations used in schedules and elsewhere to indicate hardware finishes are those listed in "Materials and Finishes Standard 1301" by the BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standard, but in no case less than specified for the applicable units of hardware by referenced standards.
- C. Provide finishes which match those established by the BHMA.
- D. Provide hardware manufacturer's standard finish to match the following:
 - 1. Exterior Doors: Dark Bronze (613, 643, 695, 710, DKB).
 - 2. Interior Doors: Satin Chrome / Stainless Steel (626, 628, 630, 652, 689, 719).
- E. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated.
 - 1. Reduce differences in color and textures as much as commercially possible where the basic metal or metal forming process is different for individual units of hardware exposed at the same door or opening.
 - 2. In general, match items to the manufacturer's standard finish for the latch and lockset (or push-pull units if no latch locksets) for color and texture.
- F. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- G. 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.

2.7 COMPONENTS

- A. Hardware to conform to the published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- B. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (under any condition) screws to match the hardware finish, or if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
- C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the Work.

2.8 MAINTENANCE TOOLS

- A. Furnish a complete set of specialized tools as needed for Purchaser's continued adjustment, maintenance and removal and replacement of builders' hardware.

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 Doors and 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. Custom Steel Doors and Frames: HMMA 831.
 3. 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 the attachment substrate as necessary for proper installation and operation.
 2. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- C. All hardware shall be installed by qualified installers skilled in this type of work, and the installation of the hardware shall in no manner detract from the appearance of the doors. Faulty workmanship shall be cause for rejection of doors.
- D. Where manufacturers specify certain requirements for installing door hardware, such requirements shall be adhered to by the installer.
- E. Do not install surface mounted items until finishes have been completed on the substrate.
- F. Install all hardware without marring or damaging hardware or other work. Replace all marred or damaged work. Adjust for easy operation.
- G. 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 (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Remove temporary construction cores to allow for Owner installation of permanent cores, unless otherwise directed by Owner.
- I. Install closers and other hardware as scheduled.
1. Provide extra support blocking for all interior and exterior applied hardware.
- J. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."
- K. 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.
- L. 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.

M. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

N. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Engage a qualified independent Architectural Hardware Consultant to perform inspections and prepare inspection reports.

1. Independent Architectural Hardware Consultant shall 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.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. 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. Approximately six months after the acceptance of hardware, perform Maintenance Services. Installer, accompanied by representative of the latch and lock manufacturer, shall return to the Project and readjust every item of hardware.
- C. Consult with and instruct Owner's personnel in any recommended additions to the maintenance procedures.
- D. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units.
- E. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware within two weeks after the service maintenance is complete.

3.8 DEMONSTRATION

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

3.9 HARDWARE SCHEDULE

Hardware Schedule prepared by Hardware Consultant to be inserted here

END OF SECTION

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low-energy door operators for swinging doors.

1.2 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- D. For automatic door terminology, see BHMA A156.19 for definitions of terms.

1.3 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
- B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For automatic door operators.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.

2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of automatic door operator. For each operator for fire-rated door assemblies, certify that operator is listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.
- B. Field quality-control reports.
- C. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project and who employs a Certified Inspector.
 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Faulty or sporadic operation of automatic door operator, including controls.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide DORMA Automatics; ED400-IG or comparable product by one of the following:
1. Besam Entrance Solutions; Subsidiary of ASSA ABLOY Entrance Systems.
 2. Horton Automatics; a division of Overhead Door Corporation.
 3. LCN Closers; an Allegion plc company.
 4. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 5. Stanley Access Technologies, LLC; Div. of Stanley Security Solutions.
- B. Source Limitations: Obtain automatic door operators, including activation and safety devices, from same manufacturer as for hardware in Section 08 71 00 "Door Hardware."

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
 2. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of 30 lbf./sq. ft..
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation-and safety-device wiring, and manual operation including spring closing when power is off.
- C. Concealed Floor-Mounted Case:
1. Case shall be mounted beneath the door leaf and jamb area utilizing a standard 2 3/4-inch or 3 3/4-inch pivot setback. Heavy-duty pivot shall incorporate 1200 pound rated, sealed thrust bearings in 1" steel bearing plate. Bottom door arm (push or pull type) shall mount within bottom rail of swing door. Drive transfer between converter and operator shall be manufacturer's standard chain drive with tensioner.
 - a. Case shall not impede manual operation of swing door.
 - b. Case shall not impede ANSI compliance of operator.
 - c. Case shall not impede operation of automatic door operator.

2. Case shall be sheet steel (ASTM-A-570 Grade A) formed and riveted type with galvanized coating (A568/A568M). Cement case shall incorporate a vinyl gasket at the perimeter of the cement can cover, and a shaft seal as a water and moisture barrier. Unit accommodates threshold floors, stone floors, and other floor conditions.
 - a. Case shall be encased below grade as detailed on shop drawings, utilizing (quick-set or pour-stone or equal) setting cement. A minimum 3/8" of setting cement shall be placed at all exterior vertical surfaces and along the entire bottom surface. Allow setting cement to cure as required by cement product manufacturer prior to installing door leaf.
 - b. Case shall be field bored to accept liquid-tight conduit connections for electric power service and signal wires. Conduit, conduit connections, electric power service and signal wire to unit is furnished and installed by others as specified in electrical specification section.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 LOW-ENERGY DOOR OPERATORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
 1. Opening Force if Power Fails: Not more than 15 lbf (67 N) required to release latch if provided, not more than 30 lbf (133 N) required to manually set door in motion, and not more than 15 lbf (67 N) required to fully open door.
 2. Entrapment-Prevention Force: Not more than 15 lbf (67 N) required to prevent stopped door from closing or opening.
- C. Configuration:
 1. Traffic Pattern: One or two way as indicated on Drawings.
 2. Operator Mounting: Overhead concealed.
- D. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 1. Adjustable opening and closing speed.
 2. Adjustable opening and closing force.
 3. Adjustable backcheck.

4. Adjustable hold-open time from zero to 30 seconds.
 5. Adjustable time delay.
 6. Adjustable acceleration.
 7. Obstruction recycle.
 8. On-off/hold-open switch to control electric power to operator.
- H. Activation Device: Push-plate switch., key switch, or card reader on one or both sides of door to activate door operator.
- I. Exposed Finish: Class I color anodic finish.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extrusions: ASTM B 221 (ASTM B 221M).
 2. Sheet: ASTM B 209 (ASTM B 209M).
- B. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

- A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
1. Configuration: Square push plate with 4-by-4-inch (100-by-100-mm) junction box.
 - a. Mounting: Recess mounted.
 2. Push-Plate Material: Stainless steel.
 3. Message: International symbol of accessibility and "Push to Open."
- C. Key Switch: Recess-mounted, door control switch with key-controlled actuator; enclosed in 2-by-4-inch (50-by-100-mm) junction box. Provide faceplate engraved with text indicating switch functions. Provide lock cylinder with LFIC housing compatible with permanent core system. Construction cores by Contractor; permanent cores will be furnished by Owner.
1. Faceplate Material: Stainless steel.
 2. Mounting: Recess mounted, semiflush in wall.

- D. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 FABRICATION

- A. Factory fabricate automatic door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.
- C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.7 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
 - 1. Application Process: Operator manufacturer's standard process.
 - 2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As selected by Architect from manufacturer's complete line to match adjacent storefront or curtain wall system, as applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
 - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 - 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- C. Access-Control System: Connect operators to access-control system as specified in Division 28 Section "Access Control."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

- A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- C. Automatic door operators will be considered defective if they do not pass tests and inspections.

- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust operators on exterior doors for weathertight closure.
- B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 - 2. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing tapes.
6. Miscellaneous glazing materials.

B. Related Requirements:

1. Section 05 73 13 "Glazed Decorative Metal Railings" for glazing in railings.
2. Section 08 42 33 "Revolving Door Entrances" for glass in revolving door entrances.
3. Section 08 88 13 "Fire-Rated Glazing."

1.2 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 in accordance with ASTM C1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 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.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Glass: Include structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 2. Glazing Compounds: Include functional and environmental characteristics, and special application requirements.
- B. Glass Samples for Verification: If requested by Owner, furnish for each type of glass product other than clear monolithic vision glass; 6 inches (150 mm) square.
 1. Tinted glass.
 2. Laminated glass.
 3. Insulating glass.
 4. Spandrel glass.
- 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. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
- B. Qualification Data: For Installer.
- C. Certificates: Submit glass and glazing manufacturer's certifications that materials meet Specification requirements and are compatible with each other.
- D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.
- B. Fabricator 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.
- C. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver glass to job in original containers bearing manufacturer's label indicating quality of contents of each package.
- B. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- C. Do not remove labels until glass has been installed. Keep glass free from contamination by materials capable of staining glass. Do not apply marking materials to either side of glass.

1.9 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 (4.4 deg C).
 - 2. Do not install glazing materials when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.10 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: 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: Five 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 obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. AGC Glass Company North America, Inc.
2. Guardian Industries Corp.
3. Oldcastle BuildingEnvelope™.
4. Pilkington North America.
5. Saint-Gobain.
6. Viracon, Inc.
7. Vitro Glass.

B. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

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 01 40 00 "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 E 1300.
 - 1. Wind Loads: Design and size components of glazing systems to withstand loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with ASCE/SEI 7 to establish wind pressure based on the following criteria:
 - a. Basic Wind Speed: As indicated on Drawings.
 - b. Importance Factor: As indicated on Drawings.
 - c. Exposure Category: As indicated on Drawings.
 - 2. Seismic Loads: As indicated on Drawings.
 - 3. Design Snow Loads: As indicated on Drawings.
 - 4. Other Design Loads: As prescribed by IBC Chapter 24 and ASTM E1300.
 - 5. Probability of Breakage for Sloped Glazing: For glass sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 - 6. 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.
 - 7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is required, 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 6 mm thick.
 - 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 (W/sq. m x K).
 - 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. NGA Publications: "Laminated Glazing Reference Manual" and "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 TM-3000: "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
 5. IGMA TM-3100: "Voluntary Guidelines for the Identification of Visual Obstructions in the Air Space of Insulating Glass Units."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. 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 shall be considered a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness: 6 mm.
- E. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- F. Strength:
1. 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.
 2. 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.
 3. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 FLOAT GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3 (glazing select), Class 1 clear or Class 2 (tinted, heat-absorbing and light-reducing).

- B. Ultraclear Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1, complying with other requirements specified and with low-iron content and visible light transmission not less than 91 percent.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Guardian Industries Corp.; Ultrawhite®.
 - b. Pilkington North America; Optiwhite®.
 - c. Virto Architectural Glass; Starphire®.
- C. Glass Types:
 - 1. Type 0A – Clear.
 - 2. Type 0B – Tinted.
 - a. Color: As selected by Architect from manufacturer’s complete line.
 - 3. Type 0C – Ultraclear.

2.5 HEAT-STRENGTHENED GLASS

- A. Heat-Strengthened Glass: ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind HS (heat-strengthened), Condition A (uncoated).
- B. Glass Types:
 - 1. Type 1A – Clear.
 - 2. Type 1B – Tinted.
 - a. Color: As selected by Architect from manufacturer’s complete line.
 - 3. Type 1C - Ultraclear.

2.6 FULLY TEMPERED GLASS

- A. Fully Tempered Glass: ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind FT (fully tempered), Condition A (uncoated).
- B. Glass Types:
 - 1. Type 2A – Clear.
 - 2. Type 2B – Tinted.
 - a. Color: As selected by Architect from manufacturer’s complete line.
 - 3. Type 2C – Ultraclear.

2.7 COATED GLASS – HEAT-STRENGTHENED

- A. Coated Heat-Strengthened Glass: ASTM C 1376 and ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind HS (heat-strengthened), Condition C (other coated glass).

1. Provide Low-E coating on #2 (inner) surface of a **[clear] [tinted]** glass, outer-lite paired with an inner lite-of clear glass in an insulated unit configuration, result in comparable appearance characteristics. *(Select Clear or Tinted above)*

B. Glass Types:

1. Type 3A – Clear.
2. Type 3B – Tinted:
 - a. Color: As selected by Architect from manufacturer’s complete line.

2.8 COATED GLASS – FULLY TEMPERED

- A. Fully Tempered Glass: ASTM C 1376 and ASTM C 1048, Type I (transparent glass, flat), Quality-Q3 (glazing select), Class 1 (clear) or Class 2 (tinted, heat-absorbing and light-reducing), Kind FT (fully tempered), Condition C (other coated glass).

1. Provide Low-E coating on #2 (inner) surface of a **[clear] [tinted]** glass, outer-lite paired with an inner lite-of clear glass in an insulated unit configuration, result in comparable appearance characteristics. *(Select Clear or Tinted above)*

B. Glass Types:

1. Type 4A – Clear.
2. Type 4B – Tinted:
 - a. Color: As selected by Architect from manufacturer’s complete line.

2.9 GLASS – CERAMIC-COATED

- A. Ceramic-Coated Spandrel Glass: ASTM C 1048, Kind HS (heat-strengthened), Condition B (spandrel glass, one surface ceramic coated), Class 1 (clear), Quality q3 (glazing select) with a ceramic coating on #3 (inner) surface of insulated glass unit, and on #2 surface of single-pane unit. *(Select applicable Glass Kind below)*

B. Glass Kind: **[Heat Strengthened] [Fully Tempered]**.

1. Type 5A-1 – Clear. 100% opaque ceramic coating.
 - a. Color: As selected by Architect from manufacturer’s complete line.

C. Glass Kind: **[Heat Strengthened] [Fully Tempered]**.

1. Type 5A-2 – Clear: Simulated acid-etch ceramic frit.
 - a. Color: As selected by Architect from manufacturer’s complete line.

D. Glass Kind: **[Heat Strengthened] [Fully Tempered]**.

1. Type 5A-3 – Clear: Clear: Simulated sandblast ceramic frit.
 - a. Color: As selected by Architect from manufacturer’s complete line.

2.10 FIRE-RATED GLASS As specified in Section 08 88 13.

2.11 TRANSPARENT MIRROR

- A. Coated Float Glass: Provide coated glass complying with the following:
1. Coated Tinted Float-Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3, Class 2 (tinted), Kind FT (fully tempered) float glass.
 2. Pyrolytic-Coating: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.
 3. Type 6A:
 - a. Thickness: 1/4-inch (6.0 mm).
 - b. Tint Color: Manufacturer's standard Gray.
 - c. Visible Transmittance: 11 percent.
 - d. Visible Reflectance, Coated Side: 68 percent.
 - e. Visible Reflectance, Glass Side: 16 percent.
- B. Acceptable Products:
1. Pilkington; "Mirrorpane™."
 2. Saint Gobain; "SpyGlass."

2.12 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. Laminate glass with polyvinyl butyral interlayer or ionomeric polymer interlayer, as scheduled, 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. Glass Type 7-1: *(Insert applicable glass type from Type 1 through Type 5 above)*
1. Outer Lite: Type: _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.
 2. Interlayer: **[Polyvinyl butyral] [ionoplast interlayer]**. *(Select Type)*
 - a. Thickness: As required to comply with performance requirements, but not less than 0.030
 - b. Color: Clear.
 3. Inner Lite: Type _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.
- C. Glass Type 7-2: *(Insert applicable glass type from Type 1 through Type 5 above)*
1. Outer Lite: Type: _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.
 2. Interlayer: **[Polyvinyl butyral] [ionoplast interlayer]**. *(Select Type)*

- a. Thickness: As required to comply with performance requirements, but not less than 0.060
 - b. Color: Clear.
 - 3. Inner Lite: Type _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.
- D. Glass Type 7-3: *(Insert applicable glass type from Type 1 through Type 5 above)*
- 1. Outer Lite: Type: _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.
 - 2. Interlayer: **[Polyvinyl butyral] [ionoplast interlayer].** *(Select Type)*
 - a. Thickness: As required to comply with performance requirements, but not less than 0.060
 - b. Color: Clear.
 - 3. Inner Lite: Type _____.
 - a. Thickness: As required by structural loads, but not less than 6 mm.

2.13 INSULATED GLASS

- A. Insulated Glass: Sealed units of glass lites separated by dehydrated air spaces complying with ASTM E 2188, ASTM E 2189, and ASTM E 2190, with the following indicated requirements:
- 1. For types, classes, kinds, and conditions of each glass lite refer to specified glass types.
 - 2. Sealing System: Dual seal, primary and secondary using manufacturer's standard sealants.
 - 3. Spacer: Aluminum with mill or clear anodized finish.
 - 4. Air Space Width: Nominal 1/2" measured perpendicularly from surfaces of glass lites at unit edge.
- B. Glass Types: *(Insert applicable glass type from Types 1 through 5 and 7 above)*
- 1. Type 8-1:
 - a. Outer Lite: Type: _____.
 - b. Inner Lite: Type: _____.
 - 2. Type 8-2:
 - a. Outer Lite: Type: _____.
 - b. Inner Lite: Type: _____.
 - 3. Type 8-3:
 - a. Outer Lite: Type: _____.
 - b. Inner Lite: Type: _____.
 - 4. Type 8-4:
 - a. Outer Lite: Type: _____.
 - b. Inner Lite: Type: _____.
 - 5. Type 8-5:
 - a. Outer Lite: Type: _____.
 - b. Inner Lite: Type: _____.

2.14 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. 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 C 920, 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; Dow Corning® 790 Silicone Building Sealant.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2700 SilPruf LM.
 - c. Pecora Corporation; 890NST.
 - d. Tremco Incorporated; Spectrem 1.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; Dow Corning® 795 Silicone Building Sealant.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf SCS200.
 - c. Pecora Corporation; 895NST.
 - d. Tremco Incorporated; Spectrem 2.

2.15 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.16 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Heat-Strengthened and Fully-Tempered Glass:
 1. Fabrication Process: By horizontal (roller-hearth) process.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).
 4. Fabrication Tolerances:
 - a. Optical Distortion Tolerance: Using a LightSentry measurement system or equal, measure each pane of monolithic heat-strengthened glass against the following criteria and reject those that do not comply:
 - 1) Roller Wave Criteria: Maximum 0.004 inches at center and 0.008 inches at edges from peak to valley.
 - b. Overall Bow and Warp Tolerance: Examine each pane of heat-treated glass to detect any lights which exceed half of the maximum bow and warp tolerances in any direction as listed in ASTM C1048, Table 2 and reject those that do not comply.
 5. Orientation: Orient roller-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - a. If width of any glass units indicated on Drawings exceeds fabrication limits, roller-wave distortion shall be oriented in a consistent direction for the entire project.

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 (1270 mm).

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 (3-mm) 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.
- L. Tempered Glazing:
 - 1. Do not cut, seam, nip or abrade tempered glass.
 - 2. Set tempered glass with tong marks completely concealed or in as inconspicuous a location as possible.
 - 3. Provide tempered glass in hazardous locations:
 - a. Ingress and egress doors.
 - b. Operable or inoperable panels adjacent to a door in building and within same wall plane as door whose nearest vertical edge is within 24" of door in closed position and whose bottom edge is less than 60" above floor or walking surface.
 - c. Fixed panels which have glazed area in excess of 9 sq. ft. and lowest edge is less than 18" above finished floor level or walking surface within 36" of such glazing where panels are not protected with horizontal member not less than 1-1/2" in width located between 24" and 36" above walking surface.
 - d. Other locations indicated, and where required by building code.

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.
 - 1. 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 GLAZING SCHEDULE

- A. Interior Glazing: *(Insert additional Types as required)*
 1. Typical interior windows where safety glazing not required: Type 1A.
 2. Typical interior windows where safety glazing is required: Type 2A.
 3. Fire-Rated Assemblies: Fire-rated glazing as specified in Section 08 88 13.
- B. Exterior Glazing: *(Insert additional Types as required)*
 1. Typical vision glazing where safety glazing not required: Type_____.
 2. Typical vision glazing where safety glazing is required: Type _____.
 3. Typical spandrel glazing where safety glazing not required: Type _____.
 4. Typical spandrel glazing where safety glazing is required: Type_____.

END OF SECTION

SECTION 08 87 33
DECORATIVE GLAZING FILM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Decorative light control and privacy film applied to glass surfaces.

1.2 ACTION SUBMITTALS

- A. Product Data: Submit for each product specified indicating:
 - 1. Preparation and installation instructions and recommendations.
 - 2. Storage and handling recommendations.
- B. Samples: For each type of film specified, two (2) samples, 12 inches square.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's installation instructions and recommendations.
- B. Qualification Data: For film installer.
- C. Warranty: Submit sample special warranty specified in this Section.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of film to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that has a minimum of 5 years of documented experience manufacturing films similar to that used for this project.
- B. Installer Qualifications: A firm that is authorized by film manufacturer to install film in accordance with guidelines set forth by the manufacturer.
- C. Mockups: Build mockups to verify selections made under sample submittals and to evaluate surface preparation techniques and application workmanship.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before start of final unit of Work.
5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in manufacturer's protective packaging.
- B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install films until spaces are enclosed and weathertight, wet-work in space is completed and nominally dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Lighting: Do not install wall covering until a lighting level of not less than 15 foot-candles (160 lux) is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the surface film manufacturer for full drying or curing.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace films that deteriorate within specified warranty period. Deterioration of film is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning film contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass.
 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Decorative Films, LLC.
2. LLumar Films.
3. Solar Gard Window Films.
4. 3M Company.
5. Vista Window Films

2.2 PERFORMANCE REQUIREMENTS

- A. Scratch Resistance: Decorative films shall average less than 12 percent increase in haze when tested according to ASTM D1044 using a Teledyne Taber Abrader using CS10F Type III wheels each loaded to 0.5 kg for 100 cycles in a 70 percent vacuum.
 1. Scratch resistance testing shall be performed by an independent third party agency.
- B. Peel Strength: >2720 (>6) grams/inch of width when tested in accordance with ASTM D3330.
- C. Surface Burning Characteristics: Provide films that have Flame Spread Index of 0 and Smoke Developed Index of 30 or less when tested in accordance with ASTM E84.
- D. Provide decorative films that do not have a masking sheet.

2.3 GLAZING SURFACE FILMS

- A. Decorative Film: Optically clear adhesive backed polyester window film, 2-mil- (0.05-mm) minimum thickness, with the following attributes:
 1. Pressure-sensitive, clear adhesive back for adhering to substrate
 2. Repositionable.
 3. Releasable protective backing.
 4. Usage: Interior.
- B. Basis of Design Product: Refer to Interior Finish Schedule on Drawings.

2.4 GLAZING FILM ACCESSORIES

- A. General: Provide accessories either manufactured by or acceptable to film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements and for conditions affecting performance of the Work, including glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Acclimate film materials by removing them from packaging in the installation areas not less than 24 hours before installation.
- C. Clean substrates thoroughly prior to installation.
- D. Prepare substrates using methods recommended by film manufacturer to achieve the best results for the substrate under project conditions.
- E. Protect window frames and surrounding surfaces to prevent damage during installation.

3.3 INSTALLATION

- A. General: Comply with film manufacturers' written installation instructions and recommendations applicable to products and applications indicated, except where more stringent requirements apply.
- B. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.
- C. If seamed, make seams non-overlapping.
- D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.
- E. Custom cut to the glass with neat, square corners and edges to within 1/8-inch of the window frame.
- F. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as much water as possible during installation.
- G. Trim edges for pattern match, and tight closure at seams and edges. Butt seams.

- H. Perform final squeegee pass over the entire pane using a long blade with an extended handle design, as recommended by film manufacturer.

3.4 CLEANING AND PROTECTION

- A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by film manufacturer.
- C. Replace films that cannot be cleaned.
- D. Protect installed products until completion of project.
- E. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

Project Name
Project Number

Deliverable
Issue Date

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SECTION 08 88 13
FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Fire-Protection-Rated Glazing: Glazing in rated doors and openings up to 180 minutes, limited in size, and not capable of blocking radiant heat.

Fire-Protection-Rated Glazing: Tested for use in a fire door assembly or fire window.

Generally available for 20, 45, 60, 90, 120, and 180 minutes. If used in door openings of 60, 90, 120, or 180 minutes, maximum size is limited to 100 sq. in. (Not all available products are available in all ratings).

- B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat; used in rated wall and door applications 45 - 120 minutes without size limitations.

Fire-Resistance-Rated Glazing: Tested the same as a wall assembly and can be used in fire-resistance-rated walls. Generally available for 45, 60, 90, and 120 minutes. Size is limited only by size that was used in the tested and approved assembly.

- C. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

- D. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

- A. Product Data: Technical data for each type of product including recommended installation and cleaning procedures.

- B. Sustainable Design submittals.
- C. Glass Samples: If requested by Owner, furnish for each type of fire-rated glass product; 6 inches (150 mm) square.
- D. Glazing Schedule: List glass types and thickness for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Submit manufacturer's product certificates for glass and glazing products indicating compliance with requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Entity having minimum 5 years documented experience who employs glass installers certified under the National Glass Association's Certified Glass Installer Program.
- B. Regulatory Requirements:
 - 1. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 listed and labeled by UL for fire ratings indicated, based on testing according to NFPA 252.
 - a. Indicate on label, the name of the manufacturer, test standard, if glazing is for use in fire doors or other fire rated openings, if glazing passes hose stream test, if glazing has a temperature rise rating of 450 degrees F, and the fire resistance rating in minutes.

1.7 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. Store glass under cover at site and protect from edge and surface damage.
 - 2. Do not remove factory applied labels until glass has been installed. Keep glass free from contamination and staining.
 - 3. Do not apply marking materials to glass.

1.8 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. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 degrees F (4.4 degrees C).

1.9 WARRANTY

- A. Laminated Glass: Written warranty signed by manufacturer in which the manufacturer agrees to replace to replace laminated glass units that deteriorate within specified warranty period.
 - 1. 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.
 - 2. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 PERFORMANCE REQUIREMENTS

- A. 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. Rating of fire-rated glazing systems shall match that of the assembly in which they are installed, as evidenced by test reports from a testing agency acceptable to authorities having jurisdiction.

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: Laminated Glazing Reference Manual and Glazing Manual.
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1. As a minimum, provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission *Safety Standard for Architectural Glazing Materials*, published in the Code of Federal Regulations) and ANSI Z97.1.
- C. Laminated Glass: ASTM C 1172. 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.

2.4 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, regardless if glazing has passed the hose stream test; whether or not glazing meets 450 degrees F (250 degrees C) temperature rise limitation; and the fire resistance rating in minutes.
- C. Fire-Protection-Rated Laminated Ceramic Glazing: Laminated glass made from two plies of ultraclear, ceramic glass; 8 mm total thickness; and complying with 16 CFR 1201, Category II.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGC Glass Company North America, Inc.
 - b. SAFTI FIRST Fire Rated Glazing Solutions.
 - c. Schott North America, Inc.
 - d. Technical Glass Products.
 - e. Vetrotech Saint-Gobain.

2.5 FIRE-RESISTANCE-RATED GLAZING

- A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

- B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.
- C. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.
- D. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, [clear] [ultraclear] float glass; with intumescent interlayers; complying with 16 CFR 1201, Category II.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pilkington North America.
 - b. SAFTI FIRST Fire Rated Glazing Solutions.
 - c. Technical Glass Products.
 - d. Vetrotech Saint-Gobain.

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 C 920, 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - 2. Colors of Exposed Glazing Sealants: Selected by Architect.
- C. 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 C 1281 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.

- D. 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.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. 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 C 1330, 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-Resistance-Rated 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, 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 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

- 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 site and legally dispose offsite. 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 (1270 mm).
 - 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 (3 mm) 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. Apply heel bead of elastomeric sealant.
- G. 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 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 contaminating substances 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 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.

END OF SECTION