

SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies steel doors, steel frames and related components.
- B. Terms relating to steel doors and frames as defined in ANSI/SDI A250.7 and as specified.

1.2 RELATED WORK

- A. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- C. Door Hardware: Section 08 71 00, DOOR HARDWARE.

1.3 TESTING

- A. Perform testing with an independent testing laboratory.

1.4 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT, for project local/regional materials, recycled content requirements.
- B. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers Literature and Data:
 - 1. Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

2. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Intertek Testing Services or Factory Mutual fire rating requirements.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Schedule: Provide a schedule 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 SHIPMENT

- A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.
- B. Fasten temporary steel spreaders across the bottom of each door frame.

1.7 STORAGE AND HANDLING

- A. Store doors and frames at the site under cover.
- B. Protect from rust and damage during storage and erection until completion.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society for Testing and Materials (ASTM):

A653/A653M-11	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A1008/A1008M-12a	Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardened
C665-12	Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
E136-12	Behavior of Materials in a Vertical Tube Furnace at 750 degrees C
- C. Builders Hardware Manufacturers Association (BHMA):

ANSI/BHMA A156.115-06	American National Standard for Hardware Preparation in Steel Doors and Steel Frames
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- D. FM Global:
Approval Guide
- E. Intertek Testing Services (ITS):
Certifications Listings Latest Edition
- F. National Fire Protection Association (NFPA):
80-10 Fire Doors and Fire Windows
105-13 Standard for the Installation of Smoke Door Assemblies
and Other Opening Protectives.
- G. Steel Door Institute (SDI):
ANSI/SDI A250.6-03(R09) Recommended Practice for Hardware Reinforcing on
Standard Steel Doors and Frames
ANSI/SDI A250.7-1997 Nomenclature for Standard Steel Doors and Steel Frames
ANSI/SDI A250.8-03(R08) Recommended Specifications for Standard Steel Doors
and Frames
ANSI/SDI A250.11-2012 Recommended Erection Instructions for Steel Frames
- H. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B.
- B. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.
- C. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- D. Prime Paint: Paint that meets or exceeds the requirements of A250.8.
- E. Grout: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- F. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- G. Mineral-Fiber Insulation: ASTM C665, 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 E136 for combustion characteristics.

2.2 FABRICATION GENERAL

A. General:

1. Follow ANSI A250.8 for fabrication of steel doors, except as specified otherwise. Doors to receive hardware specified in Section 08 71 00, DOOR HARDWARE. Tolerances must comply to SDI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
2. Close top edge of exterior doors flush and seal to prevent water intrusion.
3. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.

B. Smoke Doors and Frames:

1. Close top and vertical edges flush.
2. Provide seamless vertical edges.
3. Provide clearance at head, jamb and sill as specified in NFPA 80.

C. Fire Rated Doors and Frames (Labeled):

1. Conform to NFPA 80 when tested by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual for the class of door or door opening shown.
2. Permanently attach metal fire rated labels to doors, with raised or incised markings of approving laboratory.

2.3 CLASSIFICATION AND PERFORMANCE

A. Standard Duty Doors: ANSI/SDI A250.8, Level 1, physical performance Level C, Model 2, of size(s) and design(s) indicated and core construction as required by the manufacturer.

1. Provide at all typical interior locations not covered in B below.

B. Heavy Duty Doors: ANSI/SDI A250.8, Level 2, physical performance Level B, Model 2, with core construction as required by the manufacturer/ for interior doors and for exterior doors, of size(s) and design(s) indicated.

1. Where vertical stiffener cores are required, the space between the stiffeners to be filled with mineral board insulation.
2. Provide Level 2 at all typical exterior locations and interior locations where adjoining spaces serve maintenance or service functions.

C. Extra Heavy Duty Doors: ANSI/SDI A250.8, Level 3, physical performance Level A, Model 2 with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated.

1. Where vertical stiffener cores are required, the space between the stiffeners to be filled with mineral board insulation.
 2. Provide Level 3 where indicated.
- D. Maximum Duty Doors: ANSI/SDI A250.8, Level 4, physical performance Level A, Model 2 with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated.
1. Where vertical stiffener cores are required, the space between the stiffeners to be filled with mineral board insulation.
 2. Provide Level 4 where indicated.

2.4 METAL FRAMES

- A. General: SDI Level 2, formed frames to sizes and shapes indicated.
1. Frames for Labeled Fire Rated Doors:
 - a. Comply with NFPA 80; tested by Underwriters Laboratories, Inc., Intertek Testing Services, or Factory Mutual.
 - b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide labels of metal or engraved stamp, with raised or incised markings.
 2. Type: Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets; grind welds smooth.
- B. Reinforcement and Covers:
1. ANSI/SDI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.
 2. Provide mortar guards securely fastened to back of hardware reinforcements.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- C. Glazed Openings and Panel Opening:
1. Integral stop on exterior, corridor, or secure side of door.
 2. Design rabbet width and depth to receive glazing material or panel shown or specified.
- D. Anchors: Provide anchors to secure the frame to adjoining construction; steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 1.2 mm thick (18 gage).
1. Wall Anchors: Provide at least three anchors for each jamb. For frames which are more than 2285 mm (7.5 feet) in height, provide one additional anchor for each jamb for each additional 760 mm (2.5 feet) or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 5 mm (3/16 inch) diameter steel wire; adjustable or T-shaped.
 - b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding.
2. Floor Anchors: Provide floor anchors drilled for 10 mm (3/8 inch) anchor bolts at bottom of each jamb member.

2.5 TRANSOM PANELS

- A. Fabricate panels as specified for flush doors.
- B. Fabricate bottom edge with rabbet stop to fit top of door where no transom bar occurs.

2.6 LOUVERS

- A. Interior Louvers: Stationary, sightproof, and lightproof // type
 1. Provide detachable moldings on room or non-security side of door; on security side of door, moldings to be integral part of louver.
 2. Form louver frames of 0.9 mm thick (20 gage) steel and louver blades of a minimum 0.6 mm (24 gage).
- B. Exterior Louvers: Inverted "Y" type with minimum of 35 percent net-free opening.
 1. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly.
 2. Form louvers of hot-dip galvanized steel of same gage as door facings.
 3. Provide louvers with steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 7 by 7 per 10 mm or 7 by 6 per 10 mm (18 by 18 or 18 by 16 inch) mesh, for insect screens. Determine net-free louver area before screening.

2.7 HARDWARE PREPARATION

- A. Provide minimum hardware reinforcing gages as specified in SDI A250.6.
- B. Drill and tap doors and frames to receive finish hardware.
- C. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI A250.8 and SDI A250.6; for additional requirements refer to ANSI/BHMA A156.115.
- D. Drill and tap for surface-applied hardware at the project site.
- E. Build additional reinforcing for surface-applied hardware into the door at the factory.
- F. Punch door frames, with the exception of frames that will have weatherstripping or gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of

single doors and one silencer for each leaf at heads of double doors; set lock strikes out to provide clearance for silencers.

2.8 SHOP PAINTING

- A. ANSI/SDI A250.8.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Plumb, align and brace frames securely until permanent anchors are set, in accordance with SDI A250.11.
1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
 2. Use wood spreaders at bottom of frame if the shipping spreader is removed.
 3. Protect frame from accidental abuse.
 4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
 5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.
- B. Floor Anchors:
1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts.
 2. Power actuated drive pins may be used to secure frame anchors to concrete floors.
- C. Jamb Anchors:
1. Anchors in Masonry Walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are built.
 2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls. Solidly pack mineral-fiber insulation inside frames in stud partitions.
 3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
 4. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where sub-frames or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to sub-frame or rough buck with machine screws on both faces.
- D. Install anchors for labeled fire rated doors to provide rating as required.

- E. Hang doors in accordance with clearances specified in SDI/DOOR A250.8.
- F. Install fire doors and frames, including hardware, in accordance with NFPA 80.
- G. Install fire rated and frames in accordance with NFPA 80.

3.2 INSTALLATION OF HARDWARE

- A. Install hardware as specified in this Section and Section 08 71 00, DOOR HARDWARE.
- B. After erection and glazing, clean and adjust hardware.

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SECTION 08 14 00 INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior flush doors and stile and rail doors with prefinish and prefit option.

1.2 RELATED WORK

- A. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- B. Overhead doors including loading docks: Section 08 33 00, COILING DOORS AND GRILLES.
- C. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- D. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, INTERIOR WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- E. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Metal louvers: Section 08 90 00, LOUVERS AND VENTS.

1.3 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project local/regional materials, recycled content, certified wood requirements.
- B. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Veneer sample 200 mm (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.
- C. Shop Drawings:

1. Show every door in project and schedule location in building.
2. Indicate type, grade, finish and size; include detail of glazing louvers sound gasketing and pertinent details.
3. Provide information concerning specific requirements not included in the manufacturer's literature and data submittal.

D. Manufacturer's Literature and Data:

E. Laboratory Test Reports:

1. Screw holding capacity test report in accordance with WDMA T.M.10.
2. Split resistance test report in accordance with WDMA T.M.5.
3. Cycle/Slam test report in accordance with WDMA T.M.7.
4. Hinge-Loading test report in accordance with WDMA T.M.8.

1.5 WARRANTY

- A. Doors are subject to terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty to be as follows:
1. For interior doors, manufacturer's warranty for lifetime of original installation.

1.6 DELIVERY AND STORAGE

- A. Factory seal doors and accessories in cardboard packages; keep packaging intact during delivery and storage.
- B. Label package for door opening where used.
- C. Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- D. Store doors flat on level raised platforms in clean, dry, well-ventilated area protected from sunlight and weather; cover but allow for air circulation.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Window and Door Manufacturers Association (WDMA):
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| I.S.1A-11 | Architectural Wood Flush Doors |
| I.S.4-09 | Water-Repellent Preservative Non-Pressure Treatment for Millwork |

I.S.6A-11	Architectural Wood Stile and Rail Doors
T.M.5-90(2009)	Split Resistance Test Method
T.M.7-08	Cycle-Slam Test Method
T.M.8-08	Hinge Loading Test Method
T.M.10-08	Screwholding Test Method

C. National Fire Protection Association (NFPA):

80-13	Protection of Buildings from Exterior Fire
252-12	Fire Tests of Door Assemblies

PART 2 - PRODUCTS

2.1 FLUSH DOORS

A. General:

1. Meet requirements of WDMA I.S.1-A, solid core.
2. Adhesive: Type II.
3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.

B. Face Veneer:

1. In accordance with WDMA I.S.1-A.
2. One species throughout the project unless scheduled or otherwise shown.
3. For Transparent Finishes: Premium Grade, rotary cut, white Birch.
 - a. Grade: Custom (Grade A).
 - b. Match face veneers for doors for uniform effect of color and grain at joints.
 - c. Provide door edges of same species as door face veneer, except maple may be used for stile face veneer on birch doors.
 - d. On doors required to have transparent finish on one side and paint finish on other side; use veneers as required for transparent finish on both sides.
4. For painted finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay; do not use Lauan.

C. Wood for stops, louvers, muntins and moldings of flush doors required to have transparent finish:

1. Solid Wood of same species as face veneer, except maple may be used on birch doors.
2. Glazing:
 - a. On non-labeled doors use applied wood stops nailed tight on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on centers.

- b. Use stainless steel or dull chrome plated brass screws for exterior doors.
- 3. Wood Louvers:
 - a. Door manufacturer's standard product, fabricated of solid wood sections.
 - b. Wood Slats: Not less than 5 mm (3/16 inch) thick.
 - c. Stiles routed out to receive slats.
 - d. Secure louvers in prepared cutouts with wood stops.
- D. Stiles and Rails:
 - 1. Option for wood stiles and rails:
 - a. Composite material having screw withdrawal force greater than minimum performance level value when tested in accordance with WDMA T.M.10.
 - 2. Rabbeted transom meeting rail edges match face veneers of doors. Bottom rail of transom panel match face veneer on non-rabbeted meeting rail edge.
- E. Fire Rated Wood Doors:
 - 1. Performance Criteria for Stiles of doors utilizing standard mortise leaf hinges:
 - a. Hinge Loading: WDMA T.M.8. Average of 10 test samples for Extra Heavy Duty doors.
 - b. Direct Screw Withdrawal: WDMA T.M.10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
 - c. Cycle Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with WDMA T.M.7.
 - 2. Additional Hardware Reinforcement:
 - a. Provide fire rated doors with hardware reinforcement blocking.
 - b. Size of lock blocks as required to secure hardware specified.
 - c. Top, bottom, and intermediate rail blocks must measure not less than 125 mm (five inches) by full core width.
 - d. Reinforcement blocking in compliance with manufacturer's labeling requirements.
 - e. Mineral material similar to core is not acceptable.
 - 3. Other Core Components: Manufacturer's standard as allowed by the labeling requirements.
 - 4. Provide steel frame approved for use in labeled doors for vision panels.
 - 5. Provide steel astragal on pair of doors.

2.2 STILE AND RAIL DOORS

- A. Meeting requirements of WDMA I.S.6A.
- B. Grade: Premium.

C. Door Panels:

1. Grain of face of panels parallel with longest dimensions of panel.
2. Flat Panels: Veneered composite core, not less than 6 mm (5/8 inch) thick.
3. Raised Panels: Unless otherwise shown, thickness of raised panels not less than the following:
 - a. For 35 mm (1-3/8 inch) and 45 mm (1-3/4 inch) thick doors: 28 mm (1-1/8 inch) thick panels.
 - b. For 57 mm (2-1/4 inch) thick doors: 41 mm (1-5/8 inch) thick panels.
4. Where armor plate is required in connection with paneled doors, provide panels with plywood fillers, glued in place, and finished.

D. Stops and Molds:

1. Solid sticking both sides, of same material as stiles and rails, coped at intersections.
2. Glazed openings applied wood stops nailed on interior side of door.

F. Louvers: Size as shown.

2.3 PREFITTING

- A. Flush doors may be factory machined to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
- B. Factory fitting to conform to specification for shop and field fitting, including factory application of sealer to edge and routings.

2.3 FACTORY FINISHING

- A. Grade: Premium.
- B. Finish: System 9, UV curable, acrylated epoxy, polyester, or urethane or System 10, UV curable, water based.
- C. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
- D. Sheen: Satin.
- E. Use stain when required to produce the finish specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 IDENTIFICATION MARK

- A. Provide on top edge of door.
- B. Provide as a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.
- C. Include one of the following additional requirements:

1. An identification mark or a separate certification including name of inspection organization.
2. Identification of standards for door, including glue type.
3. Identification of veneer and quality certification.
4. Identification of preservative treatment for stile and rail doors.

PART 3 - EXECUTION

3.1 DOOR PREPARATION

- A. Factory Preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.
- B. Clearances between Doors and Frames and Floors:
 1. Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
 2. Maximum clearance at bottom of sound rated doors, light-proofed doors, doors to operating rooms, and doors designated to be fitted with mechanical seal: 10 mm (3/8 inch).
- C. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.
- D. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (two inches) of door thickness undercut where shown.
- E. Immediately after fitting and cutting of doors for hardware, seal cut edges of doors with two coats of water resistant sealer.
- F. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.
- G. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.
- H. Apply a steel astragal to meeting stile of active leaf of pair of doors or double egress smoke doors.

3.2 INSTALLATION

- A. Hardware: See Section 08 71 00, DOOR HARDWARE.
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 DOOR PROTECTION

- A. As door installation is completed, place cardboard shipping container over door and tape in place.
- B. Provide protective covering over knobs and handles in addition to covering door.
- C. Maintain covering in good condition until removal is approved by COTR.

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SECTION 08 31 13 ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies access doors or panels.

1.2 RELATED WORK

- A. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- B. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.
- C. Locations of access doors for duct work cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Indicate each type of access door, showing construction, location and installation details.
- C. Manufacturer's Literature and Data: Access doors, each type.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Welding Society (AWS):
D1.3/D1.3M (2008) Structural Welding Code Sheet Steel
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series Metal Finishes Manual
- D. National Fire Protection Association (NFPA):
80-13 Fire Doors and Windows
- E. Underwriters Laboratories, Inc. (UL):
Fire Resistance Directory

PART 2 - PRODUCTS

2.1 FABRICATION, GENERAL

- A. Fabricate components to be straight, square, flat and in same plane where required.
 - 1. Slightly round exposed edges and without burrs, snags and sharp edges.

2. Make exposed welds continuous and ground smooth.
3. Weld in accordance with AWS D1.3.
- B. Provide number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.
- C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

2.2 ACCESS DOORS, FIRE RATED

- A. Meet requirements for "B" label 1-1/2 hours with maximum temperature rise of 120 degree C (250 degrees F).
- B. Comply with NFPA 80 and have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening.
- C. Door Panel: Form of minimum 0.9 mm (0.0359 inch) thick steel sheet, insulated sandwich type construction.
- D. Frame: Form of minimum 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.
 1. Weld exposed joints in flange and grind smooth.
 2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
- E. Automatic Closing Device: Provide automatic closing device for door.
- F. Hinge: Continuous steel hinge with stainless steel pin.
- G. Lock:
 1. Self-latching, with provision for fitting flush a standard screw-in type lock cylinder. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
 2. Provide latch release device operable from inside of door. Mortise case in door.

2.3 ACCESS DOORS, FLUSH PANEL

- A. Door Panel:
 1. Form of minimum 1.9 mm (0.0747 inch) thick steel sheet.
 2. Reinforce to maintain flat surface.
- B. Frame:
 1. Form of minimum 1.5 mm (0.0598 inch) thick stainless steel sheet of depth and configuration to suit material and type of construction where installed.

2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
3. Weld exposed joints in flange and grind smooth.

C. Hinge:

1. Concealed spring hinge to allow panel to open 175 degrees.
2. Provide removable hinge pin to allow removal of panel from frame.

D. Lock:

1. Self-latching device with cylinder lock; match facility keying system.

2.4 FINISH

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.

2.6 SIZE

- A. Provide minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.

PART 3 - EXECUTION

3.1 LOCATION

- A. Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.
- B. Use fire rated doors in fire rated partitions and ceilings.
- C. Use flush panels in partitions and gypsum board or plaster ceilings, except lay-in acoustical panel ceilings or upward access acoustical tile ceilings.

3.2 INSTALLATION, GENERAL

- A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.
- B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.
- C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.
- D. Set recessed panel access doors recessed so that face of surrounding materials will finish on the same plane, when finish in door is installed.

3.3 ANCHORAGE

- A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.
- B. Provide type, size and number of anchoring devices suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.
- C. Anchors for fire rated access doors must meet requirements of applicable fire test.

3.4 ADJUSTMENT

- A. Adjust hardware so that door panel will open freely.
- B. Adjust door when closed so door panel is centered in the frame.

- - - E N D - - -

**SECTION 08 33 00
COILING DOORS AND GRILLES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies coiling doors of sizes shown, complete as specified.

1.2 RELATED WORK

- A. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.
- B. Field painting: Section 09 91 00, PAINTING.
- C. Electric devices and wiring: DIVISION 26, ELECTRICAL.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS

- A. Provide coiling door products of manufacturers regularly engaged in manufacturing items of type specified.
- B. Install items under direct supervision of manufacturer's representative or trained personnel.

1.4 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIRMENTS, for project local/regional materials, recycled content requirements.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Include each type of door showing details of construction, accessories and hardware, electrical and mechanical items supporting brackets for motors, location, and ratings of motors, and safety devices.
 - 2. Provide wiring diagrams for motors and controls, including wiring diagram for door, showing electrical interlock of motor with manually operated dead lock, electrical rough-in.
- C. Manufacturer's Literature and Data:
 - 1. Brochures or catalog cuts; each type door or grille.
 - 2. Manufacturer's installation procedures and instructions.
 - 3. Maintenance instructions and parts lists.
- D. Certificates:

1. Attesting doors, anchors and hardware will withstand the horizontal loads specified.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society for Testing and Materials (ASTM):
- | | |
|---------------|--|
| A36/A36M-12 | Structural Steel |
| A167-99(2009) | Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip |
| A653/A653M-11 | Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| B209-10 | Aluminum and Aluminum-Alloy Sheet and Plate |
| B221-13 | Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes |
- C. Master Painters Institute (MPI):
- | | |
|------------|---------------------------------|
| MPI #35-13 | Exterior Bituminous Coating |
| MPI #76-13 | Quick Drying Alkyd Metal Primer |
- D. National Electrical Manufacturers Association (NEMA):
- | | |
|-----------------|---|
| ICS 1-00(R2008) | Industrial Control and Systems General Requirements |
| ICS 2-00(R2005) | Industrial Control, and Systems, Controllers, Contactors, and Overload Relays |
| ICS 6-93(R2006) | Industrial Control and Systems Enclosures |
| MG 1-11 | Motors and Generators |

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Steel: Comply with ASTM A653 for forming operation; ASTM A36 for structural sections.
- B. Stainless Steel: ASTM A167, Type 302 or 304.
- C. Aluminum, Plate and Sheet: ASTM B209/B209M.
- D. Aluminum, Extruded: ASTM B221/B221M.
- E. Alkyd Metal Primer: MPI No. 76.
- F. Bituminous Coating: MPI No. 35.

2.2 DESIGN REQUIREMENTS

- A. Coiling doors to be spring counter balanced, overhead coiling type, inside face mounted with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position.
- B. Design doors, hardware, and anchors to withstand a horizontal or wind pressure of 958 Pa (20 psf) of door area without damage.
- C. Provide motor operators with manual emergency mechanical operators.
- D. Operation Cycles: Door components and operators capable of operating for not less than 10,000 cycles; 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.
- D. Where doors in excess of 7.4 m² (80 sf) are indicated to be manually operated, make provision in the design and construction to permit future installation of electric-power operation.

2.3 FABRICATION

- A. Coiling Door Curtains:
 - 1. Form of interlocking slats of aluminum in shapes standard with the manufacturer, except that slats for exterior doors to be flat type.
 - 2. Thickness of aluminum slats as follows:
 - a. For doors less than 4500 mm (15 feet wide): 1 mm (0.040 inch).
 - b. For doors from 4530 mm (15 feet 1 inch) to 6300 mm (21 feet wide): 1.45 mm (0.057 inch).
 - c. For doors wider than 6330 mm (21 feet 1 inch): 1.65 mm (0.064 inch).
- B. Endlocks and Windlocks:
 - 1. Manufacturer's stock design of galvanized malleable iron or galvanized steel or stamped cadmium steel for doors//or grilles.
 - 2. Provide ends of each slat for exterior doors and each alternate slat for grilles and interior doors with endlocks.
 - 3. Provide windlocks at ends of at least every sixth slat. Windlocks must prevent curtain from leaving guide because of deflection from wind pressure or other forces.
- C. Bottom Bar:
 - 1. Two angles of equal weight, one on each side, standard extruded aluminum members not less than 3 mm (0.125 inch) thick.
 - 2. Bottom bar designed to receive weather-stripping and safety device, and be securely fastened to bottom of curtain.

D. Barrel and Spring Counterbalance:

1. Curtain to coil on a barrel supported at end of opening on brackets and be balanced by helical springs.
2. Barrel fabricated of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of curtain, to limit deflection with curtain rolled up, not to exceed 1 in 400 (0.03 inch per foot) of span.
3. Close ends of barrel with cast iron plugs, machined to fit the opening.
4. Within the barrel, install an oil-tempered, helical, counter balancing steel spring, capable of producing sufficient torque to assure easy operation of the door curtain from any position.
5. At least 80 percent of the door weight must be counter balanced at any position.
6. Spring-tension must be adjustable from outside of bracket without removing the hood or motor operator.

E. Brackets:

1. Steel plate designed to form end closure and support for hood and the end of the barrel assembly.
2. End of barrel or shaft to screw into bracket hubs fabricated of cast iron or steel.
3. Equip bracket hubs or barrel plugs with pre-lubricated ball bearings, shielded or sealed.

F. Hoods:

1. Aluminum, not less than 1 mm (0.040 inch) thick.
2. Form hood to fit contour of end brackets.
3. Reinforce at top and bottom edges with rolled beads, rods or angles. Hoods more than 3600 mm (12 feet) in length must have intermediate supporting brackets.
4. Fasten to brackets with screws or bolts and provide for attachment to wall with bolts.
5. Provide a weather baffle at the lintel or inside the hood of each exterior door to minimize seepage of air through the hood enclosure.

G. Guides:

1. Manufacturer's standard formed sections or angles of aluminum.
 - a. Aluminum sections not less than 5 mm (0.1875 inch) thick.
2. Form a channel pocket of sufficient depth to retain the curtain in place under the horizontal pressure specified, and prevent ends of curtain from slipping out of guide slots.

3. Flare top sections for smooth entry of curtain to vertical sections facilitating entry of curtain.
4. Provide stops to limit curtain travel above top of guides.
5. Provide guide of aluminum with replaceable wear strips to prevent metal to metal contact.
6. Mounting brackets to provide closure between guides and jambs.

H. Weather-stripping:

1. Motor Operated Doors: Provide bottom bar safety device as combination compressible seal and safety device specified in paragraph, ELECTRIC MOTOR OPERATORS.
2. At exterior doors, provide replaceable sweep type continuous vinyl or neoprene weather seals on guides and across head on exterior to seal against wind infiltration.

I. Locking:

1. Cylinder locks to receive standard screw in cylinders furnished under Section, 08 71 00, DOOR HARDWARE.
2. For motor operated doors, provide manufacturer's standard cylinder dead lock type locking device on the inside, key operated from both sides, interlocked with motor to prevent motor from operating when locks are activated.

2.4 ELECTRIC MOTOR OPERATORS

A. Provide operators complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation including emergency manual operator.

B. Design:

1. Design the operator so that the motor may be removed without disturbing the limit-switch timing and without affecting the emergency manual operators.
2. Make provision for emergency manual operation of door by chain-gear mechanism.
3. Arrange the emergency manual operating mechanism so that it may be immediately put into and out of operation from the floor with an electrical or mechanical device, which will disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged, and its use cannot affect the timing of the limit switches, in case of electrical failure.
4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:

1. Conform to NEMA MG1, suitable for operation on current of the characteristics indicated, and operate at not more than 3600 rpm. // Single-phase motors must not have commutation or more than one starting contact. Motor enclosures to be the drip proof type of NEMA TENV type.
2. High starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from any position, and produce a door travel speed of not less than 0.66 foot or more than one foot per second, without exceeding the rated capacity.

D. Controls:

1. Conform to NEMA ICS 1 and 2.
2. Control enclosures to be NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures may be Type 1.
3. Place remote control switches minimum 1500 mm (5 feet) above the floor line, and located so that the operator will have complete visibility of the door at all times.
4. Provide each door motor with an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations shown.
5. Use key activated switches on exterior requiring constant pressure to operate.
6. Use three-button type, push button switch on interior, unless noted to be key activated, with the buttons marked, OPEN, CLOSE, and STOP.
 - a. The OPEN and STOP buttons to be of the type requiring only momentary pressure to operate. The CLOSE button to be of the type requiring constant pressure to maintain the closing motion of the door. When the door is in motion, and the STOP button is pressed, the door must stop instantly and remain in the stop position; from the stop position, the door may then be operated in either direction by the OPEN or Close buttons.
 - b. Push buttons to be full-guarded to prevent accidental operation.
7. Provide limit switches to automatically stop the doors at their fully open and closed positions. Positions of the limit switches must be readily adjustable.
8. Safety Device:
 - a. The bottom bar of power-operated doors to have a fail-safe safety device that will immediately stop and reverse the door in its closing travel upon contact with an obstruction in the door opening, or upon failure of the device, or any component

of the device, or any component of the control system, and cause the door to return to its full open position. The door closing circuit to be electrically locked out and the door manually operable until the failure or damage has been corrected.

- b. Do not use safety device as a limit switch.
 - c. Safety device connecting cable to motor to be flexible "Type SO" cable and spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.
9. Transformer: Provide a control transformer in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.
10. Provide electrical components conforming to NFPA 70.

2.7 FINISHES

- A. Aluminum: Finish exposed metal surfaces as follows:
 - 1. Mill finish, as fabricated.
 - 2. AA-C22A41 medium matte, with clear anodic coating, Class I Architectural, 0.7 mils thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install doors in accordance with approved shop drawings and manufacturer's instructions.
- B. Locate anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories accurately.
- C. Securely attach guides to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, near each end and spaced not over 600 mm (24 inches) apart.
- D. Locate control switches where shown.
- E. Install all electric devices and wiring as specified in DIVISION 26 - ELECTRICAL, and DIVISION 28 - ELECTRONIC SAFETY AND SECURITY.

3.2 REPAIR

- A. Repair prime painted zinc-coated surfaces and bare zinc-coated surfaces that are damaged by the application of galvanizing repair compound. Spot prime all damaged shop prime painted surfaces including repaired prime painted zinc-coated surfaces.
- B. Lubricate coiling doors and properly adjust and demonstrate to operate freely.

3.3 PROTECTION

- A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze or other metals not compatible with aluminum by one of the following:

1. Paint the dissimilar metal with a prime coat of Zinc-Molybdate or other suitable primer, followed by two coats of aluminum paint.
 2. Place an approved caulking compound, or a non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
- B. Paint aluminum in contact with or built into mortar, concrete, plaster or other masonry materials with a coat of bituminous paint.
- C. Paint aluminum in contact with wood or other absorptive materials, that may repeatedly become wet, with a coat of bituminous paint or two coats of aluminum paint.

3.4 INSPECTION

- A. Upon completion, doors to be weathertight and doors free from warp, twist, or distortion.

--- E N D ---

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies aluminum entrance work including storefront construction, hung doors, and other components to make a complete assembly.

1.2 RELATED WORK

- A. Glass and Glazing: Section 08 80 00, GLAZING.
- B. Hardware: Section 08 71 00, DOOR HARDWARE.
- C. Automatic Door Operators: Section 08 71 13, LOW ENERGY POWER ASSIST DOOR OPERATORS.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- C. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
- D. Shapes and thickness of framing members sufficient to withstand a design wind load of not less than 1.4 kilopascals (30 pounds per square foot) of supported area with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65 (applied to overall load failure of the unit).
- E. Provide glazing beads, moldings, and trim of not less than 1.25 mm (0.050 inch) nominal thickness.

- F. Air Infiltration: When tested in accordance with ASTM E283, air infiltration not to exceed 2.63 x 10⁻⁵ cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.
- G. Air Exfiltration: When tested in accordance with ASTM E283, air exfiltration not to exceed 0.045 cfm/ft of crack at a static air pressure differential of 1.57 psf (75 Pa).
- H. Water Penetration: When tested in accordance with ASTM E331, there must be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

1.4 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIRMENTS, for project local/regional materials, recycled content requirements.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Provide 1/2 scale drawings showing plan layout and elevations indicating construction, anchorage, reinforcement, installation details, hardware, and operational clearances.
 - 1. Must be prepared by a qualified engineer; structural analysis data and shop drawings to be signed and sealed by professional engineer.
 - 2. For entrance doors, include hardware schedule and indicate operating hardware types and locations.
- C. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Manufacturer's Literature and Data:
 - 1. Doors and Windows, each type.
 - 2. Entrance and Storefront construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes and installation instructions for each type of aluminum frame storefront system indicated.
- E. Samples:
 - 1. Provide two samples of powder coat finish aluminum of each color specified or indicated showing finish and maximum shade range for units with factory-applied

color finishes including samples of hardware and accessories involving color selection.

F. Manufacturer's Certificates:

1. State that aluminum has been given specified thickness of anodizing.
2. Indicate manufacturer's qualifications specified.
3. Submit written certification, signed by entrance and storefront system manufacturer, attesting that the entrance and storefront system installed conforms to the requirements specified in the "Performance Requirements" article and that the manufacturer's standard system has been tested in accordance with specified tests, meeting all specified requirements.

G. Entrance Door Hardware Schedule: Prepared by or under the 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.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer which has successful experience with installation of the same or similar units required for this project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports and calculations. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.
- C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.
- D. Approval by Contracting Officer is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated under Part 2 – Products. Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup for one major storefront elevation. Mockup may become part of the final work upon approval by Architect and Owner.
- G. Pre-Installation Conference: Convene a meeting on site, after submittals are received and approved but before any work, to review drawings and specifications, submittals, schedule, manufacturer instructions, site logistics and pertinent matters of coordination, temporary protection, governing regulations, tests and inspections; participants to include COTR and all parties whose work is effected or related to the work of this section.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.
- B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

1.9 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of project.

1.10 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Architectural Manufacturer's Association (AAMA):
 - 2604-11 High Performance Organic Coatings on Architectural Extrusions and Panels
 - 2605-11 Superior Performance Organic Coatings on Architectural Extrusions and Panels

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series Metal Finishes Manual

D. American National Standards Institute (ANSI):

ICC/ANSI A117.1-03 Guideline for Accessible and Usable Buildings and
Facilities-Providing Accessibility and Usability for
Physically Handicapped People

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

A36/A36M-12 Carbon Structural Steel

A123/A123M-12 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel
Products

A153/A153M-09 Zinc Coating (Hot Dip) on Iron and Steel Hardware

A1008/A1008M-12a Steel, Sheet, Cold-Rolled, Carbon, Structural, High-
Strength Low-Alloy, High-Strength Low-Alloy with
Improved Formability, Solution Hardened, and Bake
Hardenable

A1011/A1011M-12b Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength Low-Alloy with
Improved Formability, and Ultra-High Strength

B209-10 Aluminum and Aluminum-Alloy Sheet and Plate

B221-13 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Profiles, and Tubes

E283-04(2012) Rate of Air Leakage Through Exterior Windows, Curtain
Walls, and Doors Under Specified Pressure Differences
Across the Specimen

E330-02(2010) Structural Performance of Exterior Windows, Doors,
Skylights and Curtain Walls by Uniform Static Air Pressure
Difference

E331-00(2009) Water Penetration of Exterior Windows, Curtain Walls, and
Doors by Uniform Static Air Pressure Difference

F468-12 Nonferrous Bolts, Hex Cap Screws, Socket Head Cap
Screws, and Studs for General Use

F593-13 Stainless Steel Bolts, Hex Cap Screws, and Studs

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

- A. Basis of Design for aluminum framed entrances and storefronts to be Kawneer Trifab 601T (thermal) Storefront System of nominal 2 inch x 6 inch system dimensions or approved equal. Comparable products by other manufacturers will be considered where of comparable configuration, performance and compliance with all applicable requirements of this section. Comply with section 01 33 23 – Shop Drawings, Product Data and Samples for submission of alternative manufacturer products. Finish to be solvent-free powder coatings to meet the standards of AAMA 2605 unless otherwise noted.

2.2 MATERIALS GENERAL

- A. Aluminum, ASTM B209 and B221: Alloy and temper recommended by manufacturer for strength, corrosion resistance and application of required finish and not less than 0.070 inch wall thickness at any location for the main frame and complying with ASTM B 221; 6063-T6 alloy and temper.
- B. Steel Reinforcement: Nonmagnetic stainless steel, or zinc-coated steel or iron. Provide sufficient strength to withstand design pressure indicated.
 - 1. Structural Shapes, Plates, and Bars: ASTM A36.
 - 2. Cold-Rolled Sheet and Strip: ASTM A1008.
 - 3. Hot-Rolled Sheet and Strip: ASTM A1011.
- C. Thermal Break: Manufacturer standard low conductive material retarding heat flow in the framework, where insulating glass is scheduled.
- D. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
- E. Anchors, Clips and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
- F. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A123 or ASTM A153.
- G. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

- H. Tolerance: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.4 ENTRANCE DOORS

- A. Manufacturers standard glazed doors for manual swing.
- B. Doors: 44 mm (1-3/4 inches) overall thickness with minimum 3 mm (0.125 inch) thick extruded aluminum tubular rail and style member.
- C. Door Design: 89 mm (3-1/2 inch) wide style
- D. Glazing Stops and Gaskets: Square, snap on, extruded aluminum stops and preformed gaskets.
- E. Provide non-removable stops on outside of door.

2.5 PROTECTION OF ALUMINUM

- A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
 1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint. Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.
 2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
 3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.6 FRAMES

- A. Fabricate window and transom frames with a minimum of 3 mm (0.125 inch) thick extruded aluminum.
- B. Provide integral stops and glass rebates and applied snap-on type trim.

- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.
- D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.

2.7 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to minimize distortion or discoloration of finish.
- C. Framing Members: Fabricate components that, when assembled, have the following characteristics:
 - 1. Sharp, straight profiles free of defects and deformations.
 - 2. Accurately fitted joints with ends coped or mitered. Make joints flush, hairline and weatherproof.
 - 3. Provide means to drain water passing joints, condensation within framing members, and moisture migrating within the system to the exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Allow for thermal expansion and mechanical movements of glazing and framing to maintain required glazing edge clearances. Allow for thermal expansion between all system materials.
 - 6. Provisions for field replacement of glazing.
 - 7. Conceal all fasteners, anchors and connection devices from view to greatest extent possible.

2.8 REINFORCEMENT FOR BUILDERS HARDWARE

- A. Fabricate from stainless steel plates.
- B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.
- C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.
- D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

2.9 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Finish exposed aluminum surfaces as follows:
 - 1. Coated Aluminum:
 - a. Variation of more than 50 percent of maximum shade range approved will not be accepted in a single window or in adjacent windows and mullions on a continuous series.

- b. AMP 501 and 505.
- c. Fluorocarbon Finish: AAMA 2605, superior performing organic coating. Color to be (White) finish to match adjacent existing facilities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural supports, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and other offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
 - 3. Metal Surfaces: Dry, clean, free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.
- B. Allowable Installation Tolerances: Install work level, plumb, square and true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- D. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing; anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable.

- C. Use aluminum clips for internal connections of adjoining frame sections.
- D. Where work is installed within masonry or concrete openings, place no parts other than built-in anchors and provision for operating devices located in the floor, until after the masonry or concrete work is completed.
- E. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
- F. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- G. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating to the exterior.
- G. Install hardware specified under Section 08 71 00, DOOR HARDWARE.
- I. Install hung door operators specified under Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS if required.

3.3 FIELD QUALITY CONTROL

- A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected at no additional cost to Owner.
 - 1. Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
 - a. Air Infiltration Test: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).
- B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING

- A. After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

3.5 PROTECTION, CLEANING AND REPAIRING

- A. Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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SECTION 08 51 13 ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Aluminum windows of type and size shown, complete with hardware, related components and accessories.
- B. Types:
 - 1. Fixed Aluminum Framed Windows set within Aluminum Framed Storefront System or stand alone in other construction.

1.2 DEFINITIONS

- A. Accessories: Mullions, staff beads, casings, closures, trim, moldings, panning systems, sub-sills, clips anchors, fasteners, weather-stripping, insect screens mechanical operators, and other necessary components required for fabrication and installation of window units.
- B. Uncontrolled Water: Water not drained to the exterior, or water appearing on the room side of the window.

1.3 RELATED WORK

- A. Storefront: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Glazing: Section 08 80 00, GLAZING.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design aluminum framed window systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural-Test Performance: Provide aluminum framed windows tested according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, units do not evidence deflection exceeding specified limits.
 - 2. When tested in at 150 percent of positive and negative wind-load design pressures, units, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

- C. Shapes and thickness of framing members sufficient to withstand a design wind load of not less than 1.4 kilopascals (30 pounds per square foot) of supported area with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65 (applied to overall load failure of the unit).
- D. Provide glazing beads, moldings, and trim of not less than 1.25 mm (0,050 inch) nominal thickness.
- E. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration not to exceed 2.63 x 10⁻⁵ cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.
- F. Air Exfiltration: When tested in accordance with ASTM E 283, air exfiltration not to exceed 0.045 cfm/ft of crack at a static air pressure differential of 1.57 psf (75 Pa).
- G. Water Penetration: When tested in accordance with ASTM E 331, there must be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

1.5 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project local/regional materials, recycled content requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum framed window units and materials to the site in packages or containers; labeled for identification with manufacturer's name, brand and contents.
- B. Store aluminum framed window units and material in weather-tight and dry storage facility.
- C. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.

1.5 QUALITY ASSURANCE

- A. Approval by contracting officer is required of products or service of proposed manufacturers and installers.
- B. Approval will be based on submission of certification by Contractor that:

1. Manufacturer Qualifications: Manufacturer capable of providing aluminum framed window units that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
 2. Installer Qualifications: Installer has technical qualifications, experience, trained personnel and facilities to fabricate and/or install units of the same or similar type as required for the project and other projects of similar size and scope.
- C. Provide each type of window produced from one source of manufacture.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed window units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's written approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Quality Certified Labels or Certificate:
1. Architectural Aluminum Manufacturers Association, "AAMA label" affixed to each window indicating that identical windows have been tested and meet the requirements specified herein for conformance to AAMA/WDMA/CSA 101/I.S.2/A440 including test size, and minimum condensation resistance factor (CRF), and resistance to forced entry.
 2. Certificates instead of label with copy of recent test report (not more than 4 years old) from an independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA 101/I.S.2 for type of window specified.
- E. Energy Efficiency:
1. Thermal Transmittance: Provide windows and curtain walls with a U-factor maximum in accordance with NFRC 100.
 2. U-Value: 0.35 Btu/sq. ft. x h x degree F (W/sq. m x K).
 3. Solar Heat-Gain Coefficient: Provide windows with a whole-window SHGC maximum of 0.32 determined according to NFRC 200 procedures.
 4. Visible Light Transmittance: 0.51 percent.
 5. Color of Tint: Clear.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effect and set quality standards for material and execution.

1. Build mockup for one major aluminum window unit and one aluminum window unit to be inserted into aluminum framed storefront system. Mockup may become part of the final work upon approval by Architect and Owner.
- G. Pre-Installation Conference: Convene a meeting on site, after submittals are received and approved but before any work, to review drawings and specifications, submittals, schedule, manufacturer instructions, site logistics and pertinent matters of coordination, temporary protection, governing regulations, tests and inspections; participants to include COTR and all parties whose work is effected or related to the work of this section.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of aluminum framed window unit openings by field measurements before fabrication and indicate field measurements in Shop Drawings.

1.7 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Provide ½ scale drawings showing plan layout and elevations indicating construction, anchorage, reinforcement, installation details, hardware, and operational clearances and other related items.
1. Must be prepared by a qualified engineer; structural analysis data and shop drawings to be signed and sealed by professional engineer.
 2. Include glazing details and standards for factory glazed units.
- C. Delegated-Design Submittal: For aluminum framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for the preparation.
- D. Manufacturer's Literature and Data:
1. Windows, each type.
 2. Window construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes and installation instructions for each type of aluminum framed window unit indicated.
- D. Manufacturer's Certificates:
1. State that aluminum has been given the specified thickness of anodizing.
 2. Indicate manufacturers and installers qualifications specified.

3. Submit written certification, signed by aluminum framed window manufacturer, attesting that the window units installed conforms to the requirements specified in the "Performance Requirements" article and that the manufacturer's standard system has been tested in accordance with specified tests, meeting all specified requirements.

E. Test Reports:

1. Copies of test reports as specified in paragraph QUALITY ASSURANCE.

- F. Samples: Provide two samples of anodized aluminum of each color specified or indicated showing finish and maximum shade range for units with a factory-applied color finishes including samples of hardware and accessories involving color selection.

1.8 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

C. American Architectural Manufacturers Association (AAMA):

101/I.S.2/A440-08	Windows, Doors, and Unit Skylights
505-09	Dry Shrinkage and Composite Performance Thermal Cycling Test Procedures
2604-10	High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels
2605-11	Superior Performing Organic Coatings on Architectural Aluminum Extrusions and Panels

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

A653/A653M-11	Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-dip Process
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E. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series	Metal Finishes Manual
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F. National Fenestration Rating Council (NFRC):

NFRC 100-10	Determining Fenestration Product U-Factors
NFRC 200-10	Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

G. U.S. Department of Energy (DoE): www.energystar.gov

PART 2- PRODUCTS

2.1 BASIS OF DESIGN

A. Basis of Design for aluminum framed window units to be Kawneer EnCore Thermal Storefront System of nominal 1-3/4 inch x 4-1/2 inch system dimensions or approved equal. Aluminum window units not installed as part of an aluminum framed entrances and storefront as specified in section 08 41 13, manufacturer to provide accessory 2 inch x 6 inch aluminum perimeter frame for each aluminum window unit where indicated, otherwise units to be installed as independent units. Comparable products by other manufacturers will be considered where comparable configuration, performance and compliance with all applicable requirements of this section and compatible with aluminum framed storefront system as specified in Section 08 41 13 - Aluminum Framed Entrance and Storefronts. Comply with section 01 33 23 – Shop Drawings, Product Data and Samples for submission of alternative manufacturer products. Finish to be solvent-free powder coat to meet the standards of AAMA 2605 unless otherwise noted.

2.2 MATERIALS

- A. Aluminum Extrusions; Sheet and Plate: AAMA 101/I.S.2. Alloy and temper recommended by aluminum window unit manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070 inch wall thickness at any location for the main frame and complying with ASTM B 221; 60663-T6 alloy and temper.
- B. Steel Reinforcement: Nonmagnetic stainless steel or zinc-coated steel or iron. Provide sufficient strength to withstand design pressure indicated.
1. Structural Shapes, Plates, and Bars: ASTM A36.
 2. Cold-Rolled Sheet and Strip: ASTM A1008.
 3. Hot-Rolled Sheet and Strip: ASTM A1011.
- C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
- D. Anchors, Clips and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other

suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

Supplemental accessory 2 inch x 6 inch aluminum perimeter frame members to be manufacturer's standard component compatible with specified aluminum window unit system or approved equal. Supplemental accessory perimeter frame, where required, is added to enhance the aluminum window unit frame profile and unit aesthetics.

- E. Concrete and Masonry Inserts: Hot-dipped galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A123 or ASTM A153.
- F. Sealant: For sealants required within fabricated units, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- G. Tolerance: Reference to tolerances for wall thickness and other cross-sectional dimensions of window unit members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.4 PROTECTION OF ALUMINUM

- A. Isolate aluminum from contact with dissimilar materials other than stainless steel, white bronze, or zinc by any of the following:
 - 1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint. Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.
 - 2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
 - 3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.5 FRAMES

- A. Fabricate window and transom frames with a minimum of 3 mm (0.125 inch) thick extruded aluminum.

- B. Provide integral stops and glass rebates and applied snap-on type trim.
- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.
- D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.
- E. Supplemental accessory 2 inch x 6 inch perimeter aluminum frame members to be manufacturer's standard component compatible with specified or approved aluminum window unit system. The supplemental accessory perimeter frame to be installed with individual aluminum window units not installed within aluminum framed entrances and storefront units.

2.6 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to minimize distortion or discoloration of finish.
- C. Framing Members: Fabricate components that, when assembled, have the following characteristics:
 - 1. Sharp, straight profiles free of defects and deformations.
 - 2. Accurately fitted joints with ends coped or mitered. Make joints flush, hairline and weatherproof.
 - 3. Provide means to drain water passing joints, condensation within framing members, and moisture migrating within the system to the exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Allow for thermal expansion and mechanical movements of glazing and framing to maintain required glazing edge clearances. Allow for thermal expansion between all system materials.
 - 6. Provisions for field replacement of glazing.
 - 7. Conceal all fasteners, anchors and connection devices from view to greatest extent possible.

2.7 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Finish exposed aluminum surfaces as follows:
 - 1. Coated Aluminum:
 - a. Variation of more than 50 percent of maximum shade range approved will not be accepted in a single window or in adjacent windows and mullions on a continuous series.

- b. AMP 501 and 505.
 - c. Fluorocarbon Finish: AAMA 2605, superior performing organic coating. Coating color to be (White) to match adjacent existing facilities.
- C. Hardware: Finish hardware exposed when window is in the closed position; match window color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural supports, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
- 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and other offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
 - 3. Metal Surfaces: Dry, clean, free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.
- B. Allowable Installation Tolerances: Install work level, plumb, square and true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (eight feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

- D. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing; anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable.
- C. Use aluminum clips for internal connections of adjoining frame sections.
- D. Where work is installed within masonry or concrete openings, place no parts other than built-in anchors and provision for operating devices located in the floor, until after the masonry or concrete work is completed.
- E. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
- F. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- G. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating to the exterior.

3.3 FIELD QUALITY CONTROL

- A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected at no additional cost to Owner.
 - 1. Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
 - a. Air Infiltration Test: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², whichever is greater.
 - b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).
- B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.4 ADJUST AND CLEAN

- A. Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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SECTION 08 71 00 DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Door hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

- A. Caulking: Section 07 92 00, JOINT SEALANTS.
- B. Application of Hardware: Section 08 14 00, INTERIOR WOOD DOORS, Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, Section 08 33 00, COILING DOORS AND GRILLES, Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS//.
- C. Painting: Section 09 91 00, PAINTING.
- D. Electrical: Division 26, ELECTRICAL.

1.3 GENERAL

- A. All hardware must comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.
- B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).
- C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. Instead of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.
- D. Make hardware for application on metal and wood doors and frames to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- E. The following items to be of the same manufacturer, if possible, except as otherwise specified:
 - 1. Mortise locksets.

2. Hinges for hollow metal and wood doors.
3. Surface applied overhead door closers.
4. Exit devices.

1.4 SUSTAINABILITY REQUIREMENTS

A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIRMENTS, for project local/regional materials, recycled content requirements.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

- C. Samples and Manufacturers' Literature:
1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association must be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.
 2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.
- D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates must be accompanied by copies of reports as referenced. The testing must have been conducted in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

1.6 DELIVERY AND MARKING

A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item

of hardware and deliver to COTR for reference purposes. Tag must identify items by Project Specification number and manufacturer's catalog number. These items will remain on file in COTR's office until all other similar items have been installed in project, at which time the COTR will deliver items on file to Contractor for installation in predetermined locations on the project.

1.7 INSTRUCTIONS

- A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters "HW" followed by a number. Each number designates a set of hardware items applicable to a door type.
- B. Keying: Establish a new Great Grandmaster key for this project. Provide removable core type key system as previously described. The manufacturer must furnish code pattern listings so keys may be reproduced by code. Design the new key system with the capacity to relock the existing station and also provide for 25 percent expansion capability beyond this requirement. Submit a keying chart for approval showing proposed keying layout and listing expansion capacity.
 - 1. Keying information will be furnished to the Contractor by the COTR.
 - 2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify COTR immediately when and to whom keys or keying information is supplied. Return all such keys to the COTR.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-13	Butts and Hinges
A156.2-11	Bored and Pre-assembled Locks and Latches
A156.3-01	Exit Devices
A156.4-08	Door Controls (Closers)
A156.5-10	Auxiliary Locks and Associated Products
A156.6-10	Architectural Door Trim

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| A156.8-10 | Door Controls-Overhead Stops and Holders |
| A156.13-12 | Mortise Locks and Latches |
| A156.15-11 | Release Devices-Closer Holder, Electromagnetic and Electromechanical |
| A156.16-02 | American National Standard for Auxiliary Hardware |
| A156.18-12 | Materials and Finishes |
| A156.21-09 | Thresholds |
| A156.22-12 | Door Gasketing and Edge Seal Systems |
| A156.23-10 | Electromagnetic Locks |
| A156.24-12 | Delayed Egress Locking Systems |
| A156.26-12 | Continuous Hinges |
| A156.31-01 | Electric Strikes and Frame Mounted Actuators |
- C. American Society for Testing and Materials (ASTM):
- | | |
|---------|----------|
| F883-09 | Padlocks |
|---------|----------|
- D. Builders Hardware Manufacturers Association (BHMA):
- Certified Products Directory 2014
- E. National Fire Protection Association (NFPA):
- | | |
|--------|-----------------------------|
| 80-13 | Fire Doors and Fire Windows |
| 101-12 | Life Safety Code |
- F. Underwriters Laboratories, Inc. (UL):
- Building Materials Directory

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. ANSI A156.1. Provide the following types of butt hinges for the types of doors listed, except where otherwise specified:
1. Exterior Doors: Type A2112 for doors 900 mm (3 feet) wide or less and Type A2111 for doors over 900 mm (3 feet) wide. Provide hinges for exterior doors with non-removable pins.
 2. Interior Doors: Type 8112 for doors 900 mm (3 feet) wide or less and Type A8111 for doors over 900 mm (3 feet) wide.
- B. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.

2.2 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: Extruded-aluminum, pin-less, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
- B. ANSI/BHMA A156.26, Grade 1-600.
 - 1. Listed under Category N in BHMA's "Certified Product Directory."

2.3 DOOR CLOSING DEVICES

- A. Provide closing devices of one manufacturer //for each type specified.//

2.4 OVERHEAD CLOSERS

- A. Conform to ANSI A156.4, Grade 1 and the following:
 - 1. 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
 - 2. Hold-open feature, where specified.
 - 3. Size Requirements: Size closers in accordance with manufacturer's recommendations or provide multi-size closers, sizes 1 through 6.
 - 4. Material of closer must be cast aluminum.
 - 5. Steel or malleable iron arm and brackets.
 - 6. Provide with full size cover.
 - 7. Adjustable hydraulic back-check and separate valves for closing and latching speed.

2.5 DOOR STOPS

- A. Conform to ANSI A156.16.
- B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
- C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.
- D. Substitute floor stops Type L02141 or L02161 as appropriate, when wall bumpers would not provide an effective door stop.
- E. Where drywall partitions occur, use floor stops, Type L02141 or L02161.
- F. Provide stop Type L02011 or L02181, as applicable for exterior doors.
- G. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.

- H. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.

2.6 FLOOR DOOR HOLDERS

- A. Conform to ANSI Standard A156.16. Provide extension strikes for Types L01301 and L01311 holders where necessary.

2.7 LOCKS AND LATCHES

- A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over must have beveled fronts. Lock cylinders must have not less than seven pins. Cylinders for all locksets to be removable core type. Provide cylinders with construction removable cores and construction master keys. Cylinder to be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Lever or lockset must not require disassembly to remove core from lockset. All locksets or latches on double doors with fire label to have latch bolt with 19 mm (3/4 inch) throw. Provide temporary keying device or construction core of allow opening and closing during construction and prior to the installation of final cores.
- B. In addition, locks and latches must comply with following requirements:
 1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13; Series 1000, minimum Grade 2. Locks and latchsets to be furnished with curved lip strike and wrought box. Lock function F02 to be furnished with emergency tools/keys for emergency entrance. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.
 2. Cylindrical Lock and Latch Sets: Levers must meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets to be series 4000 Grade I. Knobs for series 4000 lock and latch sets to have 57 mm (2-1/4 inch) diameters. Where two turn pieces are specified for lock F76, turn piece on inside knob must lock and unlock inside knob, and turn piece on outside knob must unlock outside knob when inside knob is in the locked position. (This function is intended to allow emergency entry into these rooms without an emergency key or any special tool.)
 3. Auxiliary locks specified under hardware sets must conform to ANSI A156.5.

2.8 ELECTROMAGNETIC LOCKS

- A. ANSI/BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."
1. Type: Full exterior or full interior, as required by application indicated.
 2. Strength Ranking: 1000 lbf.
 3. Inductive Kickback Peak Voltage: Not more than 53 V.
 4. Residual Magnetism: Not more than 0 lbf to separate door from magnet.

2.9 KEYS

- A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each
Cylinder lock change key blanks	10 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	1 key

2.10 KICK-MOP PLATES

- A. Conform to ANSI Standard A156.6.
- B. Provide protective plates as specified below:
1. Kick-mop plates and armor plates to be metal, Type J100 series, color as required.
 2. Provide kick-mop plates for both sides of each door, except where noted as not required. Kick-mop plates to be 200 mm (8 inches) high. On push side of doors where jamb stop extends to floor, make combination kick-mop plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors to have plates 25 mm (1 inch) less than width of each door. Extend all other combination kick-mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick mop plates to butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.
 3. Kick-mop plates are not required on following door sides:
 - a. Exterior side of exterior doors;
 - b. Closet side of closet doors;
 - c. Storage side of doors to or from storage spaces; and

- d. Both sides of aluminum entrance doors.

2.11 EXIT DEVICES

- A. Conform to ANSI Standard A156.3, Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim to have lever handles similar to locksets, unless otherwise specified.
- B. Exit devices for fire doors must comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.12 FLUSH BOLTS (LEVER EXTENSION)

- A. Conform to ANSI A156.16, Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors. Modify flush bolts to fit stiles of aluminum doors on double-acting doors.
- B. Face plates for cylindrical strikes to be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).
- C. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.

2.13 DOOR PULLS WITH PLATES

- A. Conform to ANSI A156.6. Pull plate 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Cut plates of door pulls for cylinders, or turn pieces where required.

2.14 PUSH PLATES

- A. Conform to ANSI A156.6. Metal, Type J302, 200 mm (8 inches) wide by 350 mm (14 inches) high. Provide plastic Type J302 plates 100 mm (4 inches wide by 350 mm (14 inches) high) where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.15 COMBINATION PUSH AND PULL PLATES

- A. Conform to ANSI 156.6, Type J303; stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), rounded top and bottom edges. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Mount pull in down direction.

2.16 THRESHOLDS

- A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, install thresholds in a bed of sealant with machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.

- B. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.

2.17 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Conform to ANSI A156.22. Air leakage must not to exceed 0.50 CFM per foot of crack length (0.000774m³/s/m).

2.18 PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES

- A. ASTM F883, size 50 mm (2 inch) wide chain; furnish extended shackles as required by job conditions. Provide padlocks, with key cylinders, for each door in following areas as noted.
- B. Key padlocks as follows:
 - 1. Chain Link Fence Gates.
 - 2. Roof Access and Scuttles: Engineer's set.
 - 3. Coiling Doors.

2.19 FINISHES

- A. Exposed surfaces of hardware to have ANSI A156.18 finishes as specified below. Provide finishes on all hinges, pivots, closers, thresholds, etc. as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.
- B. 626 or 630: Surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes:
 - 1. Hinges - Exterior Doors: 630.
 - 2. Hinges - Interior Doors: 630.
 - 3. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
 - 4. Thresholds: Mill finish aluminum.
 - 5. Other primed steel hardware: 652.

2.20 BASE METALS

- A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	Base Metal
652	Steel
626	Brass or bronze
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

- A. For new buildings locate hardware on doors at heights specified below unless otherwise noted and in compliance with ADA accessibility requirements:
- B. Hardware Heights from Finished Floor:
 - 1. Exit devices centerline of strike (where applicable): 1000 mm (40-5/16 inches).
 - 2. Locksets and latch sets centerline of strike: 1000 mm (40-5/16 inches).
 - 3. Deadlocks centerline of strike: 1200 mm (48 inches).
 - 4. Centerline of door pulls: 1000 mm (40 inches).
 - 5. Push plates and push-pull: 1250 mm (50 inches) to top of plate.
 - 6. Push-pull latch: 1000 mm (40-5/16 inches) to centerline of strike.
 - 7. Centerline of deadlock strike: 840 mm (33 inches) when used with push-pull latch.
 - 8. Locate other hardware at standard commercial heights.
 - 9. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

- A. Equip and mount closer devices, including those with hold-open features, to provide maximum door opening permitted by building construction or equipment. Closers to be mounted regular arm. Where closers are mounted on doors, mount with sex nuts and bolts; foot fastened to frame with machine screws.
- B. Substitute parallel arm or top jamb mounting for regular arm mounting where the following conditions occur:
 - 1. Where door swing, in full open position, would be limited to less than 90 degrees due to partition construction and closer location.
 - 2. Where door to room opens outward into corridor.
 - 3. Where exterior doors open outward.
- C. Hinge Size Requirements:

Door Thickness	Door Width	Hinge Height
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)
35 mm (1-3/8 inch) (hollow core wood doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

- D. Provide hinge leaves sufficiently wide to allow doors to swing clear of door frame trim.

E. Where new hinges are specified for new doors in existing frames or existing doors in new frames, provide sizes of new hinges matching sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by COTR. Existing hinges cannot be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

F. Hinges Required Per Door:

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

G. Fastenings: Suitable size and type to suit with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather must be of nonferrous metal.

H. After locks have been installed; show in presence of COTR that keys operate their respective locks in accordance with keying requirements. (Send keys, Master Key level and above by Registered Mail to the Cemetery Director along with the bitting list. Also send a copy of the invoice to the COTR for the records.) Installation of locks which do not meet specified keying requirements will be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

A. Installer to provide letter to COTR that upon completion, installer has visited the Project and has accomplished the following:

1. Re-adjust hardware.
2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
3. Identify items that have deteriorated or failed.
4. Submit written report identifying problems.

3.4 HARDWARE SETS

- A. Following sets of hardware correspond to hardware symbols shown on drawings. Where hardware set for a single door is specified for a pair of doors; equip each leaf of such pair of doors with set noted. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.

HARDWARE SETS – ADMINISTRATION BUILDING	
<p><u>HW 1</u> (Public Entrance and Exit) Lockset (F04) Power Operator Continuous Hinge or Pivots Magnetic Lock</p> <p>Normal Daytime Operation: Power operated doors (swinging or horizontal sliding) Door activated by motion sensor on interior and exterior</p> <p>After Hours Operation: Power operated doors (swinging or horizontal sliding) Door activated from exterior by card reader or remote release Door activated by motion sensor on interior</p>	<p><u>HW 2</u> (Telecom Rooms, Elect Closets and IT Service Closets) Lockset (F07) Card Reader Continuous Hinge Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Latchbolt released by key outside and lever inside</p>
<p><u>HW 3</u> (Lobby to Building Interior) Lockset (F04) Card Reader Closer Continuous Hinge Electric Strike Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Card reader releases electric strike Inside lever retracts latchbolt at all times</p>	<p><u>HW 4</u> (Records Storage Closet, including FAX) Lockset (F07) Card Reader Closer Continuous Hinge Electric Strike Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Card reader releases electric strike Inside lever retracts latchbolt at all times</p>

HARDWARE SETS – MAINTENANCE/STORAGE BUILDING	
<p><u>HW 5</u> (Pedestrian Entrance) Lockset (F04) Closer Continuous Hinge Mortise Lock</p> <p>Operation at all Times: Outside lever rigid when locked by mechanical device Outside lever free when unlocked by mechanical device Inside lever retracts latchbolt at all times</p>	<p><u>HW 6</u> (Vehicular Entrance) Manual (push button) on interior</p> <p>Operation at all Times: Push button activate motorized door operator or provides access to manual operator</p> <p>Remainder of hardware by overhead door manufacturer</p>
<p><u>HW 7</u> (Equip and Supply Storage Rooms) Lockset (F07) Closer Continuous Hinge Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Latchbolt released from outside by combination lock Inside lever retracts latchbolt at all times</p>	<p><u>HW 8</u> (Telecom Rooms and Elect Closets from Corridor) Lockset (F07) Continuous Hinge Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Latchbolt released by key outside and lever inside</p>

HARDWARE SETS – PUBLIC INFORMATION CENTER	
<p><u>HW 9</u> (Public Entrance and Exit)</p> <p>Lockset (F04) Power Operator Continuous Hinge or Pivots Magnetic Lock</p> <p>Normal Daytime Operation: Power operated doors (swinging or horizontal sliding) Door activated by motion sensor on interior and exterior</p> <p>After Hours Operation: Power operated doors (swinging or horizontal sliding) Door activated from exterior by card reader or remote release Door activated by motion sensor on interior</p>	<p><u>HW 10</u> (Telecom Rooms and Elect Closets)</p> <p>Lockset (F07) Continuous Hinge Flush Bolts Mortise Lock</p> <p>Operation at all Times: Outside lever always rigid Latchbolt released by key outside and lever inside</p>

HARDWARE SETS - MISCELLANEOUS	
<p><u>HW 11</u> (Office)</p> <p>Lockset (F04) Cylinder Butts as required Stop Silencers</p>	<p><u>HW 12</u> (Storage)</p> <p>Lockset (F07) Cylinder Butts as required Stop Silencers</p>
<p><u>HW 13</u> (Toilet – Privacy)</p> <p>Lockset (F19) with accessible thumbturn Cylinder Butts as required Stop Silencers Mop Plate (Interior)</p>	<p><u>HW 14</u> (Exterior Entry – Single)</p> <p>Lockset (F12) Cylinder Closer Butts as required Stop Threshold Weatherstrip Door Bottom Seal Lock Guard Silencer</p>

HARDWARE SETS - MISCELLANEOUS	
<p><u>HW 15</u> (Exterior Toilet – Single) Mortise Deadlock (F18) Cylinder Butts as required Closer Door pull Push plate Closer Stop Threshold Weatherstrip Door Bottom Seal Silencers Mop Plate (Interior)</p>	<p><u>HW 16</u> (Exterior Service – Pair) Lockset (F07) Cylinder Butts as required Flushbolts Dustproof Strike and Plate Stop Threshold Weatherstripping Astragal Door Bottom Seals Head Rain Drip Lockguard Silencers</p>
<p><u>HW 17</u> (Corridor) Lockset (F05) Butts as required Stop Silencers</p>	<p><u>HW 18</u> (Communications) Lockset (F14) Cylinder Butts as required Closer Stop Silencers</p>
<p><u>HW 19</u> (Exterior Storage) Lockset (F07) Cylinder Butts as required Stop Threshold Weatherstripping Door Bottom Seal Lockguard Silencers</p>	<p><u>HW 20</u> (Service Pair) Lockset (F07) Cylinder Butts as required Flushbolt Dustproof Strike and Plate Stop Threshold Silencers</p>

HARDWARE SETS - MISCELLANEOUS	
<p><u>HW 21</u> (Exterior Entry Pair) Lockset (F12) Cylinder Butts as required Flushbolts Dustproof Strike and Plate Stop Threshold Weatherstripping Astragal Door Bottom Seals Head Rain Drip Lock Guard Silencers</p>	<p><u>HW 22</u> (Wire Mesh Doors) 2 Cylinders</p>
<p><u>HW 23</u> (Overhead Doors) 2 Padlocks (Keyed to building master key system) Remainder of hardware by overhead door manufacturer</p>	<p><u>HW 24</u> (Exterior Entry Aluminum/Glass – Single) Geared Hinge Closer Deadlock Cylinder Accessible Thumb-turn Exit Device Push Pull Threshold Remainder of hardware and weatherstripping by door manufacturer</p>
<p><u>HW 25</u> (Exterior Entry Aluminum/Glass Pair) Geared Hinges Closers Deadlocks (Floor Mount) Exit Device Cylinders Pulls Threshold Remainder of Hardware and weatherstripping by door manufacturer</p>	<p><u>HW 26</u> (Public Restroom) Continuous Hinge Door Pull Push Plate Closer Stop Silencers Mop Plate (Interior)</p>

--- E N D ---

**SECTION 08 71 13
LOW ENERGY POWER ASSIST DOOR OPERATORS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies low energy power assisted automatic operation of swing doors.
Provide complete door operator system including operator, controls, door arm and operator enclosure (header and cover).

1.2 RELATED WORK

- A. Sealants: Section 07 92 00, JOINT SEALANTS.
- B. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- C. Door hardware: Section 08 71 00, DOOR HARDWARE.
- D. Glass and glazing of doors and frames: Section 08 80 00, GLAZING.
- E. Electric general wiring, connections and equipment requirements: Division 26, ELECTRICAL.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. Power assisted door operators, controls and other equipment must be products of a manufacturer regularly engaged in manufacturing such equipment for a minimum of three years.
- B. Use one manufacturer of automatic door equipment throughout the building project.

1.4 WARRANTY

- A. Power assisted door operators, controls and other related equipment are subject to the terms of the "Warranty of Construction", FAR clause 52.246-21, except that the warranty period to be two years instead of one year.

1.5 MAINTENANCE MANUALS

- A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article titled "INSTRUCTIONS," furnish two copies of maintenance manuals and instructions on automatic door operators.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submit manufacturer's literature and data describing operators, power units, controls, door hardware and safety devices.
- C. Shop Drawings:

1. Show location of controls and safety devices in relationship to each automatically operated door; this includes templates, wiring diagrams, fabrication details, anchorage and other information to providers of related work to coordinate the proper installation of the door operators.
2. Include wiring or interface requirements for security devices such as card reader, remote release, fire alarm systems, if applicable.

1.7 DESIGN CRITERIA

- A. Power assisted automatic door equipment to accommodate normal traffic as well as the weight of the doors.
- B. Equipment: UL approved and comply with applicable codes.
- C. Motors: Rated minimum 1/8 horsepower; single phase and 115 volts.
- D. Electrical Wiring: Provide wiring so that only a single power supply is required; equipment and wiring as specified in Division 26, ELECTRICAL.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Association of Automatic Door Manufacturers (AAADM).
- C. American National Standards Institute (ANSI):

ICC/ANSI A117.1-03	Guideline for Accessible and Usable Buildings and Facilities-Providing Accessibility and Usability for Physically Handicapped People
ANSI 156.19-07	Power Assist and Low Energy Power Operated Doors

PART 2 - PRODUCTS

2.1 OPERATORS

- A. Automatic door operators must be for commercial doors, electromechanical and surface mounted above the door to the header or transom bar. Generate the opening force with a permanent magnet DC motor driving a combination spiral bevel/spur gear reducer and transmitted to the door through an arm linkage.
 1. Opening speed must be adjustable and feature dual backcheck control allowing adjustment of backcheck speed and position.
 2. Provide closing by spring force generated with a metal compression spring; the spring must reduce manual opening force to not more than 67 N (15 lbf). The

- minimum diameter of spring wire cannot be less than 0.007mm (172 in.). Under the specified design load of the door, the spring must be capable of performing 2,000,000 cycles before fracture.
3. Control the door in the closing cycle with adjustable closing speed and fixed latch speed.
 4. The doors must be operated manually at any time without damage to the operator or components.
- B. Provide operators with checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle. Operators must recycle doors instantaneously to full open position from any point in closing cycle when control switch is reactivated.
- C. Operator to be swinging type enclosed in housing. Operator to open door by energizing motor; stopping by electrically reducing voltage and stalling motor against mechanical stop. Door to close by means of spring energy; control close force by gear system and motor being used as dynamic break without power. System must operate as manual door control in event of power failure. Opening and closing speeds must be adjustable:
1. Swing Operator Housing: Aluminum extrusions with enclosed end caps for application to frame systems. Provide structural sections fabricated of 6063-T5 aluminum alloy, with a minimum thickness of 3.7 mm (0.146 inch).
 2. Swing Power Operator: Completely assembled and sealed unit including helical gear drive transmission, mechanical spring and bearings in cast aluminum case and filled with special lubricant for extreme temperature conditions. Attach a "DC" shunt-wound permanent magnet motor with sealed ball bearings to transmission system. Rubber mount complete unit with provisions for easy maintenance and replacement - without removing door from pivots or frame.
 3. Connecting hardware for swing overhead concealed type power operator to have drive arm attached to door with a pin linkage rotating in a self-lubricating bearing and adjustable slide block, traveling in an interconnected track and top pivot assembly. Fabricate top track and pivot assembly of steel. Door must not pivot on shaft of operator.
 4. Electrical Control: Provide operator with a self-contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator. Provide plug-in type relays for individual replacement; provide connecting harnesses with interlocking plugs. Include

time delay for normal cycle. Provide swing door control with safe-swing circuit and optional switching to automatically limit power - slows door when approached from the doors swing area.

5. On pairs of doors, allow either door to be opened manually without the other door opening.

2.2 MICROPROCESSOR CONTROLS

- A. Provide system including a multi-function microprocessor control providing adjustable hold open time (1 – 30 sec.), LED indications for actual position unknown, system status, open obstruction shutdown, activation signal, safety mat/sensor signal, Stop-and-Hold signal, and mode selector switches providing a means for easy field selection of the following functions: push-to-operate, latch assist and stack pressure. Control must be capable of receiving activation signals from any device with normally open dry contact output.
 1. With push-to-operate function enabled, the control provides a means of initiating a self-start activation circuit by slightly pushing the door open at any point in the door swing.
 2. Latch Assist to provide a two second impulse in the close direction to overcome restrictions with locking devices of pressure differentials, allowing the unit to operate in standard time delay mode and permitting the door to close from the full open position, after the hold time is satisfied. All activation modes must provide fully adjustable opening speed.
- B. Hold door open by low voltage applied to the continuous duty motor. Include an adjustable safety circuit that monitors door operation and shuts the motor off if an open obstruction is sensed. Include a recycle feature the reopens the door if an obstruction is sensed at any point during its closing cycle. Include a standard three position toggle switch with functions for ON, OFF, and HOLD OPEN.

2.3 ENCLOSURE

- A. Provide operator completely self-contained within an extruded aluminum housing (alloy 6063-T6) to conceal operator mechanism and mounting brackets and with removable access cover; overall maximum size of 140 mm (5-1/2 inches) wide by 150 mm (6 inches) deep. Header color must match adjacent storefront/frame finish.

2.4 ACTIVATION DEVICES

- A. Automatic: Opening cycle activated by pressing switches with international symbol of accessibility and "PRESS TO OPERATE DOOR" engraved on the faceplate. Install

switches in a standard 2-gang electrical wall box and place in a location complying with ANSI A117.1; switches may be wall mounted or mounted on a free standing post or guard rail.

- B. Opening and closing force, measured 25 mm (1 inch) out from the lock stile of the door, must not exceed 67 N (15 lbf) to stop the door when operating in either direction or cycle.
- C. Opening Time: Field adjust so that opening time to back check or 80 degrees, whichever occurs first, is 3 seconds or longer as required in Table 1. Backcheck cannot occur before 60 degrees opening.
 Total opening time to fully open, as provided in Table II.
- D. Closing Time: Field adjust to close from 90 degrees to 10 degrees in 3 seconds or longer as required in Table 1.
 - 1. Field adjust to close from 10 degrees to fully close position in not less than 1.5 seconds.
 - 2. Field adjusted to remain fully open for not less than 5 seconds.
 - 3. Table 1 provides speed settings for various widths and weights of doors for obtaining results complying with this paragraph.
- E. Cycle Tests:
 - 1. Cycle test Low Energy Power Operated, Low Energy Power Open and Power Assist Operators for 300,000 cycles.
 - 2. Use the widest and heaviest door specified as a test specimen; narrower or lighter doors of the same configurations will be considered to meet the cycle test requirements.

Table 1

Minimum Opening Time to Backcheck or 80 degrees, whichever occurs first and the Minimum Closing Time from 90 degrees to Latch Check or 10 degrees.

"D" Door Leaf Width- mm (inches)	"W" Door Weight in kg (pounds) Matrix Values are in seconds				
	(100) 45.4	(56.7) 125	(68.0) 150	(79.4) 175	(90.7) 200
(762) 30	3.0	3.0	3.0	3.0	3.5
(914) 36	3.0	3.5	3.5	4.0	4.0
(1067) 42	3.5	4.0	4.0	4.5	4.5

Doors of other weights and widths can be calculated using the formula;

$$T = DvW/133 \text{ in US units } T = DvW/2260 \text{ in SI (metric) units}$$

Where: T= Time, seconds

D= Door width, mm (inches)

W= Door weight, kg (lbs)

The values for "T" time have been rounded up to the nearest half second.

These values are based on a kinetic energy of (1.25 lbf-ft).

Table II

Total Opening Time to Full Open Position

Backcheck at 60 degrees	Backcheck at 70 degrees	Backcheck at 80 degrees
Table 1 plus 2 seconds	Table 1 plus 1.5 seconds	Table 1 plus 1 second

Note: To determine maximum times from close to full open, adjust the operator as shown in the chart. Backcheck occurring at a point between positions in Table II must use the lowest setting. For example - if the backcheck occurs at 75 degrees, the full open is determined to be the time shown in Table 1 plus 1.5 seconds.

2.5 POWER UNITS

- A. Provide separate self-contained electric circuits for automatic operators. Capacity and size of power circuits must be in accordance with automatic operator manufacturer's specifications.

2.6 SAFETY DEVICES

- A. Time delay switches to be adjustable between 5 to 60 seconds and control closing cycle of doors.
- B. Install decals with sign "In" or "Do Not Enter" on both faces of each door where shown and conform to the requirements of ANSI/BHMA A156.19.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate installation of equipment with other related work. Provide recessed or semi-flush mounted manual controls and power-disconnect switches in partitions. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment in finish work.

- B. Install power units in locations shown. Where units are to be mounted on walls, provide metal supports or shelves for the units. All equipment, including time delay switches, must be accessible for maintenance and adjustment.
- C. Adjust operators to function properly for the type of traffic (pedestrians) expected to pass through doors. Each door leaf of pairs of doors must open and close in synchronization. On pairs of doors, operators allow either door to be opened manually without the other door opening.
- D. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors to be 40 inches unless otherwise approved by the COTR Project Manager.

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SECTION 08 80 00 GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 RELATED WORK

- A. Factory glazed by manufacturer in following units:
 - 1. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, INTERIOR WOOD DOORS.
 - 2. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
 - 3. Section 08 51 13, ALUMINUM WINDOWS.

1.3 LABELS

- A. Temporary Labels:
 - 1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness. Identify coated side of glass units.
 - 2. Label in accordance with NFRC (National Fenestration Rating Council) label requirements.
 - 3. Temporary labels must remain intact until glass is approved by COTR.
- B. Permanent Labels:
 - 1. Locate in corner for each pane.
 - 2. Label in accordance with SGCC (Safety Glass Certification Council) label requirements.
 - a. Tempered glass.
 - b. Laminated glass.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing must withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.

- B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
 - 1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.
 - 2. Design Wind Pressures: In accordance with ASCE 7 and applicable code.
 - 3. Wind Design Data: In accordance with ASCE 7 and applicable code.
 - 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 0.75 inch (19 mm), whichever is less.
- C. Windborne-Debris-Impact Resistance: Comply with enhanced-protection testing requirements in ASTM E1996 for project wind zone when tested according to ASTM E1886, based upon testing of specimens not less than the size required for project and utilizing installation method identical to that specified for project.
 - 1. Project Wind Zone: Wind Zone 1.
 - 2. Large-Missile Test: For glazing located within 9.1 m (30 feet) of grade.
- D. Building Enclosure Vapor Retarder and Air Barrier:
 - 1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 - 2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.5 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project local/regional materials, low-emitting materials, recycled content requirements.

1.6 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Certificates:
 - 1. Provide certificate stating that fire-protective and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.
 - 2. Certify solar heat gain coefficient when value is specified.

3. Certify "R" value when value is specified.
- C. Warranty: Submit sample warranty, conforming to "Warranty" Article in this Section.
- D. Manufacturer's Literature and Data:
 1. Glass, each kind required.
 2. Insulating glass units.
 3. Glazing accessories, each type.
- E. Samples:
 1. Size: 300 mm by 300 mm (12 by 12 inches).
 2. All glazing types specified for the project.
- F. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

1.9 WARRANTY

- A. Warranty: Conform to terms of "Warranty" Article, FAR clause 52.246-21, except extend warranty period for the following:
 1. Insulating glass units to remain sealed and free of obstruction of vision by dust, moisture, or film on interior surfaces of glass for 10 years.
 2. Laminated glass units to remain visibly clear without edge separation, delamination affecting vision, and blemishes for 5 years.
 3. Coated glass units to remain visibly clear without peeling, cracking, or discoloration for 10 years.

1.10 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced.
Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society of Civil Engineers/Structural Engineering Institute (ASCE):
ASCE/SEI 7-2010 Minimum Design Loads for Buildings and Other Structures
- C. American Society for Testing and Materials (ASTM):
- | | |
|---------------|--|
| C542-05(2011) | Lock-Strip Gaskets |
| C716-06(2011) | Installing Lock-Strip Gaskets and Infill Glazing Materials |
| C864-05(2011) | Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers |
| C920-11 | Elastomeric Joint Sealants |
| C1036-06-11e1 | Flat Glass |
| C1048-12e1 | Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass |
| C1172-09e1 | Laminated Architectural Flat Glass |
| E1300-12ae1 | Determining Load Resistance of Glass in Buildings |
| E1886-05 | Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials |
| E1996-12a | Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes |
| E2190-10 | Insulating Glass Unit |
- D. Glass Association of North America (GANA):
Glazing Manual (2009)
Laminated Glazing Manual (2009)
Sealant Manual (2009)
Protective Glazing Manual (2011)
- E. International Code Council (ICC):
International Building Code (IBC), adopted edition applicable to project
- F. National Fenestration Rating Council (NFRC)

G. Safety Glazing Certification Council (SGCC):

Certified Products Directory (Issued Semi-Annually)

H. Sealant, Waterproofing, and Restoration Institute (SWRI):

Product Validation Program

PART 2 - PRODUCT

2.1 GLASS PRODUCTS

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

2.2 HEAT-TREATED GLASS

- A. Clear Heat-Strengthened Float Glass: ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
- B. Clear Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Two or more lites of glass bonded with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent-resin interlayer complying with interlayer manufacturer's written instructions.
- B. Interlayer: Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing unless otherwise indicated in Drawings.
- C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
 - 1. Horizontal or sloped glazing.
 - 2. Acoustical glazing.
 - 3. Assemblies requiring heat strengthened or fully tempered glass.
- D. Interlayer: Use 2.28 mm (0.090 inch) thick interlayer where required to meet performance requirements.
- E. Interlayer Color: Clear, unless otherwise indicated in Drawings.

2.5 INSULATING GLASS UNITS

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190.
- B. Assemble units using glass types specified.

2.6 GLAZING ACCESSORIES

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Provide accessories approved by manufacturer for application and compatible with related materials. Provide ferrous metal accessories exposed in the finished work, with a finish that will not corrode or stain while in service.
- B. Setting Blocks: ASTM C864:
 - 1. Channel shape; having 6 mm (1/4 inch) internal depth.
 - 2. Shore A hardness of 80 to 90 Durometer.
 - 3. Block lengths: 50 mm (two inches) except 100 to 150 mm (four to six inches) for insulating glass.
 - 4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
 - 5. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.
- C. Spacers: ASTM C864:
 - 1. Channel shape having a 6 mm (1/4 inch) internal depth.
 - 2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
 - 3. Lengths: One to 25 to 76 mm (one to three inches).
 - 4. Shore a hardness of 40 to 50 Durometer.
- D. Sealing Tapes:
 - 1. Semi-solid polymeric based material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
 - 2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
- E. Glazing Gaskets: ASTM C864:
 - 1. Firm dense wedge shape for locking in sash.
 - 2. Soft, closed cell with locking key for sash key.
 - 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- F. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- G. Glazing Sealants: ASTM C920, silicone neutral cure:
 - 1. Type S.
 - 2. Class 25 or 50 as recommended by manufacturer for application.
 - 3. Grade NS.
 - 4. Shore A hardness of 25 to 30 Durometer.
 - 5. SWRI validated.

H. Color - Glazing Compounds, Gaskets, and Sealants:

1. Match color of the finished aluminum and be non-staining, when in contact with aluminum.
2. Provide black, gray, or neutral color, when in contact with other exposed and prefinished materials (unpainted).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
 2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer's approved shop drawings.
- B. Do not proceed with installation until above conditions have been verified or corrected, at no additional cost to NCA.
- C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.
- B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.
- C. Shop-fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.
- D. Verify that components used are compatible.
- E. Clean and dry glazing surfaces.
- F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION - GENERAL

- A. Install in accordance with GANA Glazing Manual and GANA Sealant Manual unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet performance requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.

- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Laminated glass and insulating glass units containing laminated glass must be glazed with minimum 12 mm (1/2 inch) bite and continuous bead of structural silicone sealant attaching the inner lite of glass to the frame or mullions.
- G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- H. Laminated Glass:
 - 1. Tape edges to seal interlayer and protect from glazing sealants.
 - 2. Do not use putty or glazing compounds.
- I. Insulating Glass Units:
 - 1. Glaze in compliance with glass manufacturer's written instructions.
 - 2. When glazing gaskets are used, provide in sufficient size and depth to cover glass seal or metal channel frame completely.
 - 3. Do not use putty or glazing compounds.
 - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
 - 5. Install with tape or gunnable sealant in wood sash.

3.4 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line.

- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

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

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- F. Trim protruding tape edge.
- G. Locate and secure glazing pane using glazers' clips.
- H. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.6 REPLACEMENT AND CLEANING

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Resident Engineer.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.7 PROTECTION

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

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SECTION 08 90 00 LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK

- A. Louvers in steel doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.

1.3 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements. See Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS, for project local/regional materials, recycled content requirements.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For each type of product.
1. Show material, finish, size of members, method of assembly, and installation and anchorage details.
 2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
- C. Manufacturer's Literature and Data: For each type of louver and vent.
1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Air Movement and Control Association, Inc. (AMCA):
- | | |
|----------|-----------------|
| 500-L-12 | Testing Louvers |
|----------|-----------------|
- C. American Architectural Manufacturers Association (AAMA):
- | | |
|---------|--|
| 2605-05 | Performing Organic Coatings on Architectural Extrusions and Panels |
|---------|--|
- D. American Society for Testing and Materials (ASTM):

A167-99	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
A1008/A1008M-12a	Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
B209/B209M-10	Aluminum and Aluminum Alloy, Sheet and Plate
B221-13	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

E. The Master Painters Institute (MPI):

Approved Product List – Current Year

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-505 Metal Finishes Manual

G. National Fire Protection Association (NFPA):

90A-12 Installation of Air Conditioning and Ventilating Systems

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, Extruded: ASTM B221.
- B. Aluminum, Plate and Sheet: ASTM B209.
- C. Fasteners: Provide toggle or expansion bolt fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or shown, of size and type as required for each specific type of installation and service condition.
 - 1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
 - 2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum.

2.2 EXTERIOR WALL LOUVERS

- A. General:
 - 1. Provide fixed type louvers of size and design shown.
 - 2. Heads, sills and jamb sections formed with caulking slots or designed to retain caulking. Head sections to have exterior drip lip, and sill sections an integral water stop.
 - 3. Furnish louvers with sill extension or separate sill as shown.
 - 4. Frame to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics:

1. Provide weather louvers with a minimum of 35 percent free area for size and configurations indicated.
2. Louvers must bear AMCA certified rating seals for Air Performance and Water Penetration ratings.

C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions (sliding interlocking type); 2 mm (0.081-inch) thick extruded aluminum.
2. Blades to be standard type and have reinforcing bosses.
3. Louvers, Fixed:
 - a. Make frame sizes 13 mm (1/2-inch) smaller than openings.
 - b. Single louvers frames not to exceed 1700 mm (66 inches) wide.
 - c. When openings exceed 1700 mm (66 inches), provide twin louvers separated by mullion members.

2.3 CLOSURE ANGLES AND CLOSURE PLATES

- A. Fabricate from 2 mm (0.074-inch) thick stainless steel or aluminum.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as specified.

2.4 WIRE GUARDS

- A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.
- B. Fabricate frames from 2 mm (0.081-inch) thick extruded or sheet aluminum or 1.5 mm (0.059-inch) thick stainless steel designed to retain wire mesh.
- C. Provide wire mesh woven from minimum 1.3 mm (0.05-inch) diameter stainless steel wire in 13 mm (1/2-inch) square mesh.
- D. Miter corners and join by concealed corner clips or locks extending about 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over four feet in height with a mid-rail constructed as specified for frame components.
- E. Fasten frames to outside of louvers with aluminum or stainless steel devices designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 EXTERIOR DOOR LOUVERS

- A. Fabricate of minimum 1.6 mm (0.063-inch) thick extruded aluminum. Miter frames at corners and join by concealed corner brackets.

- B. Equip louvers on outside with wire guards, except omit wire guards for louvers in doors located completely below enclosed areaways.

2.6 INTERIOR DOOR LOUVERS

- A. Fabricate louvers for interior doors and partitions of 1.6 mm (0.063-inch) thick extruded aluminum.
- B. Make louvers sight-proof type with stationary blades,

2.7 WALL VENTS

- A. Fabricate exterior wall vents from 4.7 mm (0.187-inch) thick aluminum plate or 6 mm (1/4-inch) thick cast iron, perforated in diamond lattice pattern, with not over 19 mm (3/4-inch) openings.
- B. Vents to have aluminum screen frame with aluminum alloy corrosion resistant insect screening mounted on back of vent.
- C. Vent Frames in Masonry: Fabricate of 45 mm x 30 mm x 5 mm (1-3/4 inch by 1-1/4 inch by 3/16-inch) steel angles bolted with minimum 6 mm (1/4-inch) diameter expansion bolts at jambs.

2.8 AIR INTAKE VENTS

- A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221.
- B. Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.
- C. Provide aluminum closures where shown for inside face of dummy vents.
- D. Provide 0.8 m (0.032-inch) thick aluminum sleeves in cavity walls where shown.
- E. Provide vents complete with aluminum screen frame with corrosion resistant insect screening mounted on back of vent.

2.9 BRICK VENTS

- A. Vents to be of size shown formed of approximately 3 mm (0.125 inch) thick cast aluminum, or 3 mm (0.125) inch extruded aluminum.
- B. Provide vents complete with aluminum screen frame with corrosion resistant insect screening mounted on back of vent.
- C. Provide vents with required anchors.

2.10 FINISH

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505.
- B. Aluminum Louvers:
 - 1. Anodized Finish:

- a. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick.
- b. AA-C22A44 Chemically etched medium matte, with electronically deposited metallic compound, Class I Architectural, 0.7 mils thick may be provided as an option for AA-C22A42 color anodic coating. Dyes will not be accepted.

2.11 PROTECTION

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous paint (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.
- B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.
- C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set work accurately, in alignment and where shown; plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction; provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.
- D. Generally set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation.
- E. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING

- A. After installation, clean exposed prefinished and plated items and items fabricated from stainless steel and aluminum as recommended by the manufacturer and protected from damage until completion of the project.

- B. Clean and adjust movable parts, including hardware, to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components

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