

## SECTION 08110

### STEEL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Steel doors.
  - 2. Steel frames.
- B. Related Sections include the following:
  - 1. Division 4 Section "Unit Masonry Assemblies" for building anchors into and grouting steel frames in masonry construction.
  - 2. Division 8 Section "Glazing" for glazed lites in steel doors and frames.
  - 3. Division 8 Section "Finish Hardware" for door hardware and weatherstripping for steel doors.
  - 4. Division 9 painting Sections for field painting steel doors and frames.

##### 1.03 DEFINITIONS

- A. Minimum Steel Sheet Thickness: Minimum thickness of base metal without coatings.

##### 1.04 SUBMITTALS

- A. General: Submit in accordance with Section 01300.
  - 1. Submittals for Sections 08110, 08211, and 08710 shall be made concurrently.
- B. Product Data: Include door designation, type, level and model, construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- C. Shop Drawings: In addition to requirements below, provide a schedule of steel doors and frames using same reference numbers for details and openings as those on Drawings:
  - 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details.
  - 3. Frame details for each frame type, including dimensioned profiles.
  - 4. Details and locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, accessories, joints, and connections.
  - 7. Details of glazing frames and stops showing glazing.
  - 8. Details of conduit and preparations for electrified door hardware and controls.
- D. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of steel door and frame.

##### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain steel doors and frames through one source from a single manufacturer.

- B. Fire-Rated Door Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
  - 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- D. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
  - 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

#### 1.07 COORDINATION

- A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in masonry. Deliver such items to Project site in time for installation.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ceco Door Products; a United Dominion Company.
  - 2. CURRIES Company; an ASSA ABLOY Group Company.
  - 3. Steelcraft; an Ingersoll-Rand Company.

#### 2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.
- G. Grout: Comply with Division 4 Section "Unit Masonry Assemblies."
- H. Glazing: Comply with requirements in Division 8 Section "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.03 STEEL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8, unless more stringent requirements are specified.
  - 1. Design: Flush panel .
  - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board with internal sound deadener of inside of face sheets, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
    - a. Fire Door Core: As required to provide fire-protection ratings indicated.
    - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 11.1 deg F x h x sq. ft./Btu when tested
      - 1) Locations: Exterior doors and doors into parking areas.
  - 3. Vertical Edges for Doors: Beveled edge .
    - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).
  - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick end closures or channels of same material as face sheets.
  - 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate reinforcement plates of sufficient strength from same material as door face sheets to support hardware without through bolting and to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.123 inch (3.0 mm) thick (10 gage) by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
  - 2. Pivots: Minimum 0.167 inch (4.2 mm) thick (8 gage) by 1-1/2 inches (38 mm) wide by 6 inches (152 mm) longer than hinge, secured by not less than 6 spot welds.
  - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch (1.7 mm) thick (8 gage).
  - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch (1.7 mm) thick (8 gage).
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.04 STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
    - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
    - 2. Frames for Level 3 Steel Doors: **0.067-inch- (1.7-mm-)** thick (14 gage) steel sheet, unless otherwise indicated.
  
  - C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
    - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints, unless otherwise indicated.
    - 2. Frames for Level 2 Steel: **0.053-inch- (1.3-mm-)** thick (16 gage) steel sheet, unless otherwise indicated.
    - 3. Frames for Wood Doors: **0.053-inch- (1.3-mm-)** thick (16 gage) thick steel sheet, unless otherwise indicated.
    - 4. Frames for Borrowed Lights: **0.053-inch- (1.3-mm-)** thick (16 gage) steel sheet, unless otherwise indicated.
  
  - D. Hardware Reinforcement: Fabricate reinforcement plates of sufficient strength from same material as frames to support hardware without through bolting and to comply with the following minimum sizes:
    - 1. Hinges: Minimum **0.123 inch (3.0 mm)** thick (10 gage) by **1-1/2 inches (38 mm)** wide by **6 inches (152 mm)** longer than hinge, secured by not less than 6 spot welds.
    - 2. Pivots: Minimum **0.167 inch (4.2 mm)** thick (8 gage) by **1-1/2 inches (38 mm)** wide by **6 inches (152 mm)** longer than hinge, secured by not less than 6 spot welds.
    - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum **0.067 inch (1.7 mm)** thick (14 gage).
    - 4. All Other Surface-Mounted Hardware: Minimum **0.067 inch (1.7 mm)** thick (14 gage).
    - 5. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
  
  - E. Supports and Anchors: Fabricated from not less than 0.042-inch thick (18 gage) electrolytic zinc-coated or metallic-coated steel sheet.
  
  - F. Jamb Anchors:
    - 1. Masonry Type: T-shaped anchors to suit frame size, not less than **0.042 inch (1.0 mm)** thick (18 gage).
    - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than **0.042 inch (1.0 mm)** thick (18 gage).
  
  - G. Floor Anchors: Formed from same material as frames, not less than **0.042 inch (1.0 mm)** thick (18 gage), and as follows:
    - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  
  - H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
  
  - I. Plaster Guards: Formed from same material as frames, not less than **0.016-inch (0.4-mm)** thick (28 gage) steel sheet to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- 2.05 STOPS AND MOLDINGS
- A. Moldings for Glazed Lites in Doors: Minimum **0.032 inch (0.8 mm)** thick (20 gage), fabricated from same material as door face sheet in which they are installed.
    - 1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
    - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
  
  - B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch (16 mm) high, unless otherwise indicated.
  
  - C. Loose Stops for Glazed Lites in Frames: Minimum **0.032 inch (0.8 mm)** thick, fabricated from same material as frames in which they are installed.

## 2.06 FABRICATION

- A. General: Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Steel Doors:
1. Exterior Doors: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of **0.053-inch** thick (16 gage), metallic-coated steel channels with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
  2. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from cold-rolled steel sheet, unless otherwise indicated.
  3. Glazed Lites: Factory cut openings in doors.
- C. Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding; grind smooth and invisible.
  3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
  4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
  5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
  6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  7. Jamb Anchors: Locate anchors not more than **18 inches (457 mm)** from top and bottom of frame. Space anchors not more than **32 inches (813 mm)** o.c. and as follows:
    - a. Masonry Type:
      - 1) Two anchors per jamb up to **60 inches (1524 mm)** in height.
      - 2) Three anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** in height.
      - 3) Four anchors per jamb from **90 to 120 inches (2286 to 3048 mm)** in height.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof more than **120 inches (3048 mm)** in height.
    - b. Stud-Wall Type:
      - 1) Three anchors per jamb up to **60 inches (1524 mm)** in height.
      - 2) Four anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** in height.
      - 3) Five anchors per jamb from **90 to 96 inches (2286 to 2438 mm)** in height.
      - 4) Five anchors per jamb plus 1 additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof more than **96 inches (2438 mm)** in height.
      - 5) Two anchors per head for frames more than **42 inches (1066 mm)** wide and mounted in metal-stud partitions.
  8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  9. Provide welded frames with temporary spreader bars.
- D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware. Through bolting will not be acceptable.
  2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of doors and frames.
  - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.07 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Apply primers to steel door and frames after assembly.
- B. Comply with SSPC-PA1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- D. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than **0.7 mils (0.018 mm)**.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of steel doors and frames.
  - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
  - 2. If unacceptable conditions are encountered, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Paint backside of frames to be set in masonry with bituminous coating.

- C. Prior to installation, adjust and securely brace steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
  1. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  2. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
  3. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  4. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a perpendicular line from head to floor.
- D. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

### 3.03 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Steel Frames: Install steel frames for doors, sidelights, transoms, borrowed lights, and other openings, of size and profile indicated. Comply with SDI 105.
  1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable glazing stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove shipping straps at bottom of frames. Properly space frame using wood template that is full depth of frame and of proper spacing width during setting and anchoring of frames to maintain proper width, with frame plumb and square without twists. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors. Floor anchors are in addition to wall anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  3. Metal-Stud Partitions: Attach wall anchors to studs with screws. Provide floor anchor at each jamb, in addition to the wall anchors.
  4. Masonry Walls: Anchors shall be masonry T-shaped anchors. Provide floor anchor at each jamb, in addition to the wall anchors. Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
  5. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- C. Steel Doors: Fit doors accurately in frames, within clearances specified below. Shim as necessary.
  1. Non-Fire-Rated Steel Doors:
    - a. Jambs and Head: **1/8 inch (3 mm)** plus or minus **1/16 inch (1.6 mm)**.



- b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
  - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
  - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with steel door and frame manufacturer's written instructions.
- 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

#### 3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION