

## SECTION 08110

### STEEL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

**A. Section Includes:**

1. Doors: Hollow metal construction interior and exterior, factory primed, field finished steel doors fire-rated and non-rated as scheduled on drawings.
2. Frames: Welded unit, factory primed, pressed steel frames for steel doors, sidelights, mullions, glazed openings, and other openings; interior and exterior, fire-rated and non-rated as scheduled on drawings.
3. Grouting of hollow metal frames with masonry mortar where not covered under other Sections.

**B. Related Sections:**

1. Section 04200 - Unit Masonry: Building in of anchors and grouting of frames in masonry construction.
2. Section 07210 - Building Insulation: Foamed-in-place insulation for filling voids in steel door frames.
3. Section 07920 - Joint Sealants: Caulking of joints between steel frames and other building components.
4. Section 08710 - Finish Hardware: Door hardware for steel doors.
5. Section 08800 - Glazing: Glass for steel door lights.
6. Section 09910 - Painting: Paint finish for interior steel doors and frames.
7. Section 09800 - High Performance Coatings: Paint finish for exterior steel doors and frames.

##### 1.2 REFERENCES

**A. Industry Standards:** The Industry Standards listed below refer to the latest date of issue or edition, unless otherwise indicated.

1. American National Standards Institute:
  - a. ANSI A115 Series: A Collection of A115.1-A115.17, Specifications for Steel Door and Frame Preparation for Hardware
  - b. ANSI A224.1: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
2. American National Standards Institute/Steel Door Institute:
  - a. ANSI/SDI A250.8: Recommended Specifications for Standard Steel Doors and Frames
3. American Society for Testing and Materials:
  - a. ASTM A 153-82 (R87): Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - b. ASTM A 366/A 366M-91: Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
  - c. ASTM A 525-93: Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process

- d. ASTM A 525M-91a: Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process [Metric]
- e. ASTM A 526/A 526M-90: Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
- f. ASTM A 569/A 569M-91a: Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
- g. ASTM A 620/A 620M-91: Specification for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold-Rolled
- h. ASTM A 642/A 642M-90: Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Drawing Quality, Special Killed
- i. ASTM A 780-92: Practice for Repair of Damaged Hot-Dip Galvanized Coatings
- j. ASTM E 152-81a: Methods for Fire Tests of Door Assemblies
- 4. Door and Hardware Institute (DHI):
  - a. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames. 1990.
- 5. National Fire Protection Association:
  - a. NFPA 80-92: Fire Doors and Windows
  - b. NFPA 105-93: Installation of Smoke-Control Door Assemblies
- 6. Steel Door Institute:
  - a. SDI 105-91: Recommended Erection Instructions for Steel Frames
  - b. SDI 107-84: Hardware on Steel Doors (Reinforcement-Application)
  - c. SDI 108-90: Recommended Selection and Usage Guide for Standard Steel Doors
  - d. SDI 111 Series: 111A-111F: Recommended Details, Steel Doors and Frames
  - e. SDI 117-88: Manufacturing Tolerances Standard Steel Doors and Frames
- 7. Underwriters Laboratories Inc (UL).
  - a. UL Building Materials Directory.
- 8. Warnock Hersey Inc. (WHI):
  - a. WHI Directory of Listed Products.

### 1.3 SUBMITTALS

- A. **Product Data:** Submit manufacturer's specifications and catalog sheets for each type of product specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- B. **Shop Drawings:** Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame, hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- C. **Door Schedule:** Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
  - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

- D. **Label Construction Certification:** For assemblies required to be fire-rated and exceeding label limitations, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

#### 1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Provide doors and frames from a single manufacturer who is a member of the Steel Door Institute.
- B. **Installer Qualification:** Minimum 5 years experience with installation of hollow metal doors and frames or of similar materials.
- C. **Fire-Rated Door Assemblies:** Where fire-rated door and frame assemblies are indicated or required, provide units that comply with NFPA 80, are identical to door and frame assemblies whose fire resistance characteristics have been determined per ASTM E 152, and are labeled and listed by UL, Factory Mutual, Warnock Hersey, or other testing and inspecting organization acceptable to authorities having jurisdiction.
  - 1. **Oversize Fire-Rated Door Assemblies:** For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.
  - 2. **Temperature Rise Rating:** Where indicated, provide doors that have a temperature rise rating of 450 deg F/250 deg C maximum in 30 minutes of fire exposure.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. **Deliver doors and frames** cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. **Inspect doors and frames** on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. **Door Storage:** Store doors in upright position, under cover. Place doors on at least 4 inch (101.6) high wood sills in manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create humidity chamber and promote rusting. If corrugated wrapper on door becomes wet, or moisture appears, remove wrapping immediately. Provide 1/4 inch (6.3) space between doors to promote air circulation.
- D. **Frame Storage:** Store frames under cover on 4 inch wood sills on floors in manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create humidity chamber and promote rusting. Store assembled frames in vertical position, 5 units maximum in stack. Provide 1/4 inch space between frames to promote air circulation.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Approved Manufacturer:** Subject to compliance with requirements, provide products of one of the following:
  - 1. Amweld Building Products, Inc.
  - 2. Ceco Corp.
  - 3. Curries Company.
  - 4. Mesker Door, Inc.
  - 5. Republic Builders Products.
  - 6. Approved equal.

### **2.2 MATERIALS**

- A. Hot-Rolled Steel Sheets and Strip:** Commercial quality carbon-steel, pickled and oiled, complying with ASTM A 569.
- B. Cold-Rolled Steel Sheets:** Commercial quality, stretcher leveled flatness, cold-rolled steel, free from scale, pitting or other surface defects, complying with ASTM A366 and A568 general requirements.
- C. Galvanized Steel Sheets:** Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, or drawing quality, ASTM A 642, hot dipped galvanized in accordance with ASTM A 525, with G60 coating designation, mill phosphatized.
- D. Supports and Anchors:** Fabricate of not less than 18 gage sheet steel; galvanized where used with galvanized frames.
- E. Inserts, Bolts, and Fasteners:** Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.
- F. Shop Applied Primer:** Apply after fabrication.
  - 1. Primer for galvanized doors: Factory-formulated galvanized metal primer for exterior application. Verify compatibility with finish paints.
  - 2. Primer for non-galvanized doors and frames: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints. Comply with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames." Verify compatibility with finish paints.
  - 3. Finish paint for interior galvanized and non-galvanized doors and frames: Refer to "Section 09910 - Painting".
  - 4. Finish paint for exterior galvanized doors and frames: Refer to "Section 09800 - High Performance Coatings".

### **2.3 DOORS**

- A. Steel Doors, General:** Provide 1  $\frac{3}{4}$  inch (44 mm) thick doors of materials and ANSI/SDI A250.8 grades and models specified below, or as indicated on Drawings or schedules:

1. Non-handed, field-reversible doors with “universal” hinge preparations will not be acceptable.
- B. **Exterior Doors:** Grade III, extra heavy duty, Model 2, seamless design, composite construction, minimum 0.0598 inch (16 gauge) galvanized steel faces. Close top and bottom edges flush as integral part of door construction or by addition of minimum 16-gage steel channels.
- C. **Interior Doors:** Grade II, heavy duty, Model 2, seamless design, minimum 0.0478 inch (18 gauge) thick cold-rolled steel sheet faces.
- D. **Labeled Doors:** Insulate as required by Underwriters Laboratories. Build in special hardware and provide astragals as indicated. At one hour and at 1-1/2 hour doors at enclosures, maximum transmitted temperature end point shall not exceed 450 degrees F above ambient at end of 30 minutes of fire exposure specified in U.B.C. Standard No. 43-2.
- E. **Seamless Vertical Edges:** Both lock and hinge rail edge of the door shall be welded, filled and ground smooth the full height of the door.
- F. **Special Reinforcing:** At exterior doors, reinforce inside of door on hinge side with high frequency hinge preparation. Weld to door.
- G. **Internal Construction:** Reinforce tops and bottoms of internal core with 16-gage, horizontal steel channels, welded continuously to core faces.
  1. Core of labeled doors shall be manufacturer's standard construction for required fire resistance rating
  2. Exterior Doors: Polyurethane or polystyrene core complying with ANSI/SDI-A250.8. Close top and bottom edges flush to provide weather seal.
- H. **Hardware:** Mortise, reinforce, drill and tap for hardware furnished under Section 08710 - Hardware, except drilling and tapping for surface door closers, door closer brackets and adjusters shall be done in field. Obtain templates from hardware supplier.
- I. **Finish:** Provide prime coat finish on doors. Thoroughly clean off rust, grease and other impurities. Grind welds smooth, no marks shall show. Apply metallic filler as required to fill cracks and joints and to level any weld areas or similar imperfections. Sand filler coat smooth.

## 2.4 FRAMES

- A. **Provide metal frames** for doors, as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated.
- B. **Fabricate frames** with mitered or coped corners, welded construction for exterior and interior applications.
  1. Welded frame joints shall be continuously welded at face, soffit, stop and back bend, and ground smooth at face and back bend.
  2. Drywall Returns: Frames installed in drywall partitions shall be furnished with drywall returns.

- C. **Exterior Frames:** Form from 14 gauge stainless steel or galvanized steel, including anchors, reinforcement and stiffeners, stops and moldings.
  - 1. Stainless steel frames are at stainless steel doors.
- D. **Door Silencers:** Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of double door frames.
- E. **Plaster Guards:** Provide minimum 26 gage steel plaster guards or mortar boxes behind hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- F. **Anchors:** Space anchors maximum 36 inches on centers, but not less than three (3) anchors at each jamb.
  - 1. For stud partitions: 16 gauge clips welded in side and head jambs. Clips shall be manufacturer's standard design for stud type involved. Provide two anchors at head of frames exceeding 42 inches wide.
  - 2. For masonry: "T" anchors, same gauge as the frame. Anchor stems not less than 1-1/2" wide, corrugated or perforated for mortar bond, extending at least 8 inches into the masonry. Wire masonry anchors not permitted.
  - 3. Provide 18 gauge removable spreaders and adjustable 16 gauge floor clips for all door and cased opening frames extending to the floor frames.
- G. **Strut Supports:** Provide 3/8" x 2" vertical steel struts extending from top of frame at each jamb to supporting overhead construction. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- H. **Labeled Frames:** Construct in accordance with requirements for labeled work. Attach proper U.L. label, Warnock Hersey. "B" labeled frames shall be 1-1/2 hour construction.
- I. **Joinings:** At frames with equal width jambs and head, neatly miter on face (except locations as at transom bars and at frames with large head members). Cope and butt stops. Weld length of entire joint, including face and flat intersections. Grind smooth, at other frames, provide same mitered joint wherever possible (at intersection of jamb-head or jamb-sill) and at other locations butt metal neatly and full weld. If tight butt joints are utilized, joints shall be neatly caulked smooth.
- J. **Workmanship:** Fabricate so no grind marks, hollow or other out-of-plane areas are visible. At joints of intermediate members, provide tight joining, neatly accomplished without holes, burned out spots, weld build up or other defacing work. Fill to close cracks and to preserve shapes. Tightly fit loose stops, to hairline joints.

## 2.5 FABRICATION

- A. **General:** Fabricate units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-A250.8 requirements.
- B. **Clearances:** Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

- C. **Tolerances:** Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. **Exposed Fasteners:** Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- E. **Louver Openings:** Form integral fixed stops and provide pre-fit, pre-attached removable stops. Minimum stop depth shall be 5/8". Removable stops may be mitered or butted at corners, and shall be secured with countersunk screws not more than 8 inches o.c.
  - 1. Removable stops: Minimum 18 gauge steel.
  - 2. Locate fixed stops on outside of openings.
  - 3. Coordinate with work specified in Section 08800 and provide rabbet depth and width to suit methods and materials to be used in glazing.
- F. **Hardware Preparation:** Prepare and reinforce doors and frames to receive finish hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware and as follows.
  - 1. Hinge reinforcement shall be 7 gauge.
  - 2. Surface applied closer reinforcement and hold open arm reinforcement shall be 12 gauge.
  - 3. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.
  - 4. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute (DHI).
- G. **Shop Priming:** Clean, treat, and prime paint exposed surfaces, including galvanized surfaces.
  - 1. Remove mill scale, rust, oil, grease, dirt, and other foreign materials before application of primer.
  - 2. Treat surface by phosphatizing or similar treatment to improve paint bond.
  - 3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- A. **Remove** welded-in shipping spreaders installed at factory.

- B. **Prior to installation** and with installation spreaders in place, adjust and securely brace standard 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.
- C. **Drill and tap doors** and frames to receive nontemplated mortised and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. **General:** Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. **Placing Frames:** Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated. Except for frames located at masonry, drywall and existing concrete installations, place frames prior to construction of enclosing walls and ceilings.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
  - 2. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - 3. In masonry construction, locate wall anchors adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb.
  - 4. Masonry Walls: 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. In stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with screws.
  - 6. Installation Tolerances: Adjust standard 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. **Door Installation:** Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-A250.8.
  - 1. Install hardware in accordance with hardware manufacturer's templates and instructions.



### 3.4 ADJUST AND CLEAN

- A. **Prime Coat Touch-up:** Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer. Repair damaged galvanizing with high zinc dust content paint in accordance with ASTM A 780.
- B. **Clean grout** and other bonding material off standard steel doors and frames immediately after installation.
- C. **Protection Removal:** Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
- D. **Final Adjustments:** Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.
  - 1. Re-hang or replace doors, which do not swing or operate freely. Replace items, which are racked and warped.
  - 2. Repair acceptably or replace items, which are defective, non-complying, and damaged.
  - 3. Protect installed items to assure they are without damage and deterioration at Substantial Completion.

END OF SECTION