

# American National Standard

## *Specifications for Standard Steel Doors and Frames (SDI-100)*

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Approved August 22, 2017



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**ANSI/SDI®**  
**A250.8-2017**  
Revision of ANSI/SDI A250.8-2014

American National Standard

Specifications for  
Standard Steel Doors and Frames  
(SDI-100)

Secretariat  
**Steel Door Institute**

Approved August 22, 2017  
**American National Standards Institute, Inc.**

# American National Standard

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**Foreword** (This Foreword is not part of American National Standard A250.8-2017)

The material contained in this document has been developed under the auspices of the ANSI A250 Committee. This committee has a diverse membership of users, producers, and general interest in addition to members of the Steel Door Institute. The committee has been charged with the development of standards, test methods, and other matters relating to steel doors and frames.

The current edition is a revision, and replaces the ANSI A250.8-2014 document. The contents have been updated to reflect changes that have taken place in the steel door and frame industry since the time of the previous publication, specifically the addition of a tolerance disclaimer to section 2.1.6.

Suggestions for improvement gained in the use of this standard will be welcome, and should be sent to the Steel Door Institute, 30200 Detroit Road, Cleveland, Ohio 44145-1967.

The organizations of the Accredited Standards Committee A250 that have approved this standard are as follows:

American Institute of Architects/ARCOM  
Builders Hardware Manufacturers Association  
Cedar Valley Associates  
Door and Hardware Institute  
Door Control Services  
FM Approvals  
HMMA/Division of NAAMM  
Intertek Testing Services  
National Wind Institute / Texas Tech  
Steel Door Institute  
Underwriters Laboratories LLC  
Vetrotech / Saint Gobain  
Therma-Tru

The Accredited Standards Committee A250 TC-1 developed this standard had the following personnel at the time of approval:

James Urban, Chairman  
 J. Jeffery Wherry, Secretary

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## American National Standard

# Specifications for Standard Steel Doors and Frames (SDI-100)

## 1 General

### 1.1 Scope

This specification for standard swinging steel doors and frames offers a variety of choices suitable for any commercial application. Specific performance levels of doors and frames are defined herein. SDI-108, *Recommended Selection and Usage Guide for Standard Steel Doors* shall be used as a guide. This Standard shall not act as an obstruction to the development of new, modified or improved products that meet the intent of this specification.

This specification covers sizes, design, materials, general construction requirements and finishing of standard steel doors and frames. SDI-100 is intended to define standard items not subject to variations. The products defined in this standard have demonstrated successful performance to established test procedures and physical usage (see Section 1.2).

It is the user's responsibility to coordinate the information contained herein with applicable building and/or fire code requirements.

### 1.2 Reference Documents

#### 1.2.1 SDI Standards

- SDI-108-2010 (R2014) *Recommended Selection and Usage Guide for Standard Steel Doors*
- SDI-111-2009 *Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components*
- SDI-112-2008 (R2014) *Zinc Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames*
- SDI-117-2013 *Manufacturing Tolerances for Standard Steel Doors and Frames*

- SDI-118-2012 *Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and Window Frame Requirements*
- SDI-124-2016 *Maintenance of Standard Steel Doors and Frames*
- SDI-134-14 *Glossary of Terms for Hollow Metal Doors and Frames*

#### 1.2.2 ANSI Standards

- ANSI/UL 10B *Standard for Fire Tests of Door Assemblies*, 10th Edition, February 7, 2008, revisions up to and including February 16, 2015
- ANSI/UL 10C *Standard for Positive Pressure Fire Tests of Door Assemblies*, 3rd Edition, June 9, 2016
- ANSI/UL 1784, *Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives*, 4th Edition, February 17, 2015
- ANSI/NFPA 80-2016 *Standard for Fire Doors and Other Opening Protectives*
- ANSI/NFPA 252-2017 *Standard Methods of Fire Tests of Door Assemblies*
- ANSI/SDI A250.3-2007 (R2011) *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*
- ANSI/SDI A250.4-2011 *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings*
- ANSI/SDI A250.6-2003 (R2009) *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*
- ANSI/SDI A250.10-2011 *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*

- ANSI/SDI A250.11-2012 *Recommended Erection Instructions for Steel Frames* (Formerly SDI-105)
- ANSI/BHMA A156.115-2014 *Hardware Preparation in Steel Doors or Steel Frames*

### 1.2.3 ASTM Standards

- ASTM A1008-2016 *Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable*
- ASTM A568-2015 *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*
- ASTM A1011-2017 *Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength*
- ASTM A653-2015e1 *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*
- ASTM A879-2012 (R2017) *Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface*
- ASTM A924-2017 *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process*

### 1.3 Approval Drawings and Hardware Schedules

It is intended that approval drawings will not be required for these items and that the manufacturer's published details, together with this standard, will provide all the needed information. When specified, shop drawings shall be submitted for approval prior to manufacturing and/or delivery of product to the site. They shall show elevations of each door design, door construction details, hardware locations, dimensions, and shapes of materials, anchorage and fastening methods, door frame types and details, and finish requirements. SDI-111, *Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components* and SDI-134 *Glossary of Terms for*

*Hollow Metal Doors and Frames* shall be used as guides in the development of the necessary product schedule.

### 1.4 Classification — Level, Performance, Model

For each of the following levels and models, doors, frames, frame anchors, and hardware reinforcements shall be provided to meet the requirements of the performance levels indicated below. The material used in manufacturing these products and components shall comply with Tables 2, 3, and 4 of this document. The physical performance levels are determined by testing assemblies in accordance with ANSI/SDI A250.4, *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcements*. See Section 2.3.1.1 and 2.3.1.2 for a description of Full Flush and Seamless.

#### Level 1 and Physical Performance Level C

Standard-duty 1- $\frac{3}{8}$ " (34.9 mm) and 1- $\frac{3}{4}$ " (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

#### Level 2 and Physical Performance Level B

Heavy-duty 1- $\frac{3}{4}$ " (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

#### Level 3 and Physical Performance Level A

Extra Heavy-duty 1- $\frac{3}{4}$ " (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

**Model 3** – Stile and Rail

#### Level 4 and Physical Performance Level A

Maximum-duty 1- $\frac{3}{4}$ " (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

### 1.5 Sizes

Standard doors and frames are sized to fit openings noted in Table 1.

**Table 1 – Standard opening sizes**

<b>Widths*</b>	Ft-in	2'0"	2'4"	2'6"	2'8"	2'10"	3'0"	3'4"	3'6"	3'8"	3'10"	4'0"
	mm	610	711	762	813	864	914	1016	1067	1118	1168	1219

\* Sizes shown are for single doors only; equal pairs of doors use twice the width indicated. Pairs of doors can consist of two unequal widths.

<b>Heights</b>	<b>1-¾" Doors</b>	Ft-in	6'8"	7'0"	7'2"	7'10"	8'0"
		mm	2032	2134	2184	2388	2438

<b>1-¾" Doors</b>	Ft-in	6'8"	7'0"	7'2"
	mm	2032	2134	2184

## 2 Products

### 2.1 General

#### 2.1.1 Steel Specifications

All steel used to manufacture doors, frames, anchors, and accessories shall meet at least one or more of the following requirements.

**2.1.1.1** Cold rolled steel shall conform to ASTM A1008, *Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable* and A568, *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*.

**2.1.1.2** Hot rolled, pickled and oiled steel shall comply with ASTM A1011, *tandard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength* and A568, *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*.

**2.1.1.3** When specified, hot dipped zinc coated steel shall be of the alloyed type and comply with ASTM A924, *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process* and A653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*. The

coating weight shall meet or exceed the minimum requirements for coatings having 0.4 oz/ft<sup>2</sup> (122 g/m<sup>2</sup>), total both sides, i.e., A40 (ZF120). See SDI-112 *Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames* for further information.

**2.1.1.4** When zinc coated steel is specified for anchors and accessories, and electrolytically deposited zinc coated steel is provided, it shall comply with ASTM A653 *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*. The minimum coating designation shall be A40 i.e., 0.4 oz/ft<sup>2</sup> (122 g/m<sup>2</sup>).

#### 2.1.2 Fire Doors and Related Frames

##### 2.1.2.1 Fire Doors and Frames

When specified for either insurance rating purposes or for compliance to building codes, manufacturers shall provide the type of fire door and frame assembly that has been investigated and/or successfully fire tested in accordance with the latest revision of ANSI/UL10B, *Standard for Fire Tests of Door Assemblies*, ANSI/UL10C, *Standard for Positive Pressure Fire Tests of Door Assemblies*, or ANSI/NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*. The assembly shall be identified by labels and/or an approved identification marking of an agency accepted by the authority having jurisdiction. The door label shall indicate the applicable fire test rating for the door construction furnished. See Appendix "A," and SDI-118, *Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and*

*Window Frame Requirements* for additional information.

### 2.1.2.2 Smoke Control Doors

When specified, manufacturers shall provide the type of fire door and frame assembly that has been investigated and/or successfully tested in accordance with the latest revision of ANSI/UL1784 *Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives*. See SDI-118, *Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and Window Frame Requirements* for additional information.

### 2.1.2.3 Steel Astragals on Fire Doors

Where required by a manufacturer's listing or ANSI/NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, a steel overlapping astragal shall be provided.

### 2.1.2.4 Louvers for Fire Doors

When specified, fire doors shall be provided with fire labeled louvers. See SDI-118, *Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and Window Frame Requirements* for acceptable labeling methods.

### 2.1.3 Prime Finish

Doors and frames shall be thoroughly cleaned and chemically treated to ensure paint adhesion. All surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air-dried or baked-on. The finish shall meet the requirements for acceptance stated in ANSI/SDI A250.10, *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*. Proper job site storage as outlined in Section 4.1, shall be followed.

### 2.1.4 Factory Applied Finish Paint

When specified, doors and frames shall be finish painted on all surfaces of the door and frame exposed to view. The factory applied finish paint shall meet the performance requirements and acceptance criteria as stated in ANSI/SDI A250.3, *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*. Consult individual manufacturers for product availability and color selection. Proper job site storage, as outlined in Section 4.1, shall be followed.

### 2.1.5 Field Applied Finish Paint

Unless doors and frames are factory finish painted, a compatible coat of finish paint shall be applied in the field. The finish paint shall be of a type recommended for use on prime-painted steel. Consult the door and frame manufacturer's literature for description of primer used. The manufacturer of the finish paint should verify compatibility with the primer.

### 2.1.6 Tolerances

SDI-117, *Manufacturing Tolerances for Standard Steel Doors and Frames* shall apply to the standard steel doors and frames specified.

**Note:** All values which do not carry specific tolerances or are not marked maximum or minimum shall have the following tolerances: Linear dimensions shall be  $\pm 1/16$  in. (1.6 mm). Weight or force shall be  $\pm 2\%$ . Angles shall be  $\pm 2$  degrees. Where only minus tolerances are given, the dimensions are permitted to be exceeded at the option of the manufacturers.

### 2.1.7 Test Procedures

The products furnished under this standard shall have demonstrated successful performance to the following established standard test methods:

**ANSI/SDI A250.3** – *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*.

**ANSI/SDI A250.4** – *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings*.

**ANSI/SDI A250.10** – *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*.

### 2.1.8 Design Clearances

**2.1.8.1** The clearance between the door and frame shall be a maximum of  $1/8$ " (3.2 mm) in the case of both single swing and pairs of doors.

**2.1.8.2** The clearance between the meeting edges of pairs of doors shall be  $3/16$ " (4.8 mm)  $\pm 1/16$ " (1.6 mm). For fire rated applications, the clearances between the meeting edges of pairs of doors shall be  $1/8$ " (3.2 mm)  $\pm 1/16$ " (1.6 mm).

**2.1.8.3** The clearance measured from the bottom of the door to the bottom of the frame (Undercut) shall be a maximum of  $3/4$ " (19.1 mm)

**Table 2 – Steel thickness / door faces**

Level	Model	Minimum Thickness		MSG No. <sup>(1)</sup>
		Inches	mm	
1	1	0.032	0.8	20
	2	0.032	0.8	20
2	1	0.042	1.0	18
	2	0.042	1.0	18
3	1	0.053	1.3	16
	2	0.053	1.3	16
	3	See Sec. 2.3.3 Construction Features		16
4	1	0.067	1.7	14
	2	0.067	1.7	14

<sup>(1)</sup> MSG No. to be used for reference purposes only.

unless otherwise specified. Fire door undercuts shall comply with ANSI/NFPA 80, *Standard for Fire Doors and Other Opening Protectives*.

**2.1.8.4** The clearance between the face of the door and the stop shall be  $\frac{1}{16}$ " (1.6 mm) to  $\frac{3}{32}$ " (2.4 mm).

**2.1.8.5** All clearances shall be, unless otherwise specified in this document, subject to a tolerance of  $\pm\frac{1}{32}$ " (0.8 mm).

**2.1.9 Steel Thickness** (see Table 2)

## **2.2 Manufacturers Standard Gage (MSG) vs. Minimum Steel Thickness**

The minimum steel thickness for each specific gage is derived from the published figures of Underwriters Laboratories LLC, and shall be used for reference purposes only.

## **2.3 Construction Features**

### **2.3.1 Door Faces and Edge**

#### **2.3.1.1 Full Flush**

Each door face shall be formed from a single sheet of steel of a thickness as defined by Table 2. There shall be no visible seams on the surface of the faces. A full height vertical seam is permitted on door edges.

#### **2.3.1.2 Seamless**

In addition to the requirements for full flush doors, no visible seams are permitted along the vertical edges. One of the following methods, at the discretion of the manufacturer, shall be used when a seamless door is specified:

- vertical seam edge filled, dressed smooth
- intermittently welded seams, edge filled, dressed smooth
- continuously welded seam dressed smooth

#### **2.3.1.3 Door Edges**

Door edges shall be fabricated utilizing the following different profiles:

- Square Edge – edge of door which is 90° to the face
- Beveled Edge – edge of a door which is not at a 90° angle to the face of the door (standard bevel is  $\frac{1}{8}$ " (3.2 mm) in 2" (50.8 mm) – narrow side of door is in contact with stop of frame when door is closed

Unless specified, door edges will be manufactured in accordance with manufacturer's standard for that model.

#### **2.3.1.4 End Channels or Closures**

The top and bottom of the door shall be closed with either flush or inverted channels or closures. The channels or closures shall have a minimum material thickness of 0.042" (1.0 mm).

#### **2.3.1.5 Decorative Faces**

When specified, door faces shall be fabricated of textured and/or embossed steel. These materials shall meet the requirements of Table 2.

#### **2.3.2 Core Construction**

The core design shall be at the discretion of the manufacturer.

Doors of the following core designs have met the performance requirements of the documents listed under Section 2.1.7:

- ***KraftPaper Honeycomb***
- ***Polystyrene***
- ***Polyurethane***
- ***Mineral Board***
- ***Vertical Steel Stiffeners***

This shall not restrict the development of alternate core materials that meet the performance requirements specified above.

#### **2.3.3 Construction Features – Stile and Rail – Flush Panel**

Stiles and rails shall be a minimum of 0.053" (1.3 mm) in thickness and shall be cold rolled or galvanized steel. Door corners shall be mitered or butted. Mitered joints shall be internally reinforced, welded and ground smooth such that no miter joints appear on door faces. Where specified, intermediate rails shall be butted and either permanently mechanically fastened or internally welded to door stiles. Butted joint seams shall remain visible. Center panels shall be made using cold rolled or galvanized steel with a minimum thickness of 0.042" (1.0 mm), and shall be reinforced with manufacturer's standard core material. Panel faces shall be flush with perimeter surfaces and shall be joined to abutting perimeter members by welding or permanent mechanical fastening. Where specified, panels shall be recessed in lieu of flush. Recessed panels shall be reinforced and fastened as specified for flush panels. Hardware reinforcements shall be as specified in Table 4 and located as specified in Table 5.

#### **2.3.4 Vision Lights**

When doors are specified to contain glazed openings, the manufacturer's standard light kit shall be supplied unless otherwise specified.

#### **2.3.5 Louvered Doors**

When specified, doors shall be provided with louvers. SDI-111C, *Recommended Louver Details for Standard Steel Doors* shall be used as a guide in detailing/specifying louvers.

#### **2.4 Frames**

##### **2.4.1 General**

Provide steel frames for doors, transoms, sidelights, mullions, interior glazed panels and other openings, where indicated. Provide either knockdown field assembled type, or welded unit type frames as specified.

Performance tests shall be conducted on 3-sided door frames and corresponding door designs. The variety and complexity of openings containing transom, sidelights, or other such configurations preclude the use of these test methods on such designs.

SDI-134 *Glossary of Terms for Hollow Metal Doors and Frames* and SDI-111, *Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components* shall be used as guides in the development of frame details.

##### **2.4.1.1 Knockdown Frames**

Unless otherwise specified, frames shall be supplied as knockdown, and shall have rigidly interlocked frame joints so as to maintain alignment and assure performance of completed frames when field assembled. These frames can consist of either single rabbet or double rabbet profiles.

##### **2.4.1.2 Frames for Existing Drywall Openings**

When frames are specified for installation in existing drywall construction they shall be of the slip-on drywall type. These frames are not available with welded corners. A butted wall frame with existing wall anchors may also be installed in existing drywall wall construction. This frame type is available with welded corners.

**Table 3 – Minimum steel thickness / frames**

Level	Thickness		MSG No. <sup>(1)</sup>
	inches	mm	
1	0.042	1.0	18
2	0.053	1.3	16
3	0.053	1.3	16
4	0.067	1.7	14

<sup>(1)</sup> MSG No. to be used for reference purposes only.

#### 2.4.1.3 Welded Frames

Welded frames required to comply with this standard shall be supplied as face welded unless otherwise specified as either full profile welded, fully welded or continuously welded.

**Face Welded:** The joint between the head and jamb faces shall be completely arc welded along their length either internally or externally. **The remaining elements of the frame profile, i.e., soffit, stops, rabbets, are not welded.** Face joints shall be ground and finished smooth with no visible seam. Face joints at meeting mullions or between mullions and other frame members shall be completely arc welded externally, ground, and finished smooth.

**Full Profile Welded:** (Also specified as fully welded or continuously welded.) The joints between all elements of the head and jamb profiles, i.e., soffit, stops, rabbets, faces and returns, shall be completely arc welded. Faces and returns may be arc welded either internally or externally, all other frame elements shall be welded internally. Faces and returns shall be ground and finished smooth with no visible seam. The joint at other frame elements shall appear as a hairline seam on the external side. Face joints at meeting mullions or between mullions and other frame members shall be completely externally welded on the faces only, welds shall be ground and finished smooth. The meeting joints of other mullion profile elements are not welded.

Welded frames shall be provided with a temporary spreader bar for shipping and handling purposes only. This temporary spreader bar shall be removed and a setting spreader, supplied by the installer, shall be used for installation of the frame. See ANSI/SDI A250.11,

*Recommended Erection Instructions for Steel Frames* for details.

#### 2.4.2 Manufacturers Standard Gages for Frames

Table 3 shall be used to determine the proper gage thickness for the corresponding door levels.

#### 2.4.3 Frames with Mullions and Transom Bars

Mullions and transom bars shall be joined to adjacent members by welding (see 2.4.1.3) or by rigid mechanical connection, so as to maintain alignment of parts and assure performance of completed frames when field assembled. When specified, vertical mullions shall be provided with floor anchors.

#### 2.4.4 Frame Anchors for Wall Conditions

Provide frames, other than slip-on drywall type, with a minimum of three anchors per jamb suitable for the adjoining wall construction. Provide anchors of not less than 0.042" (1.0 mm) in thickness or 0.167" (4.2 mm) diameter wire. Frames OVER 7'6" (2286 mm) in height shall be provided with additional anchors.

##### 2.4.4.1 Slip-On Drywall Frame Anchors

Slip-on drywall frames shall have an anchoring system that is an integral part of the frame, and allows installation of the frame after the wall has been constructed and finished.

##### 2.4.4.2 Base Anchors

Provide frames, other than slip-on drywall type, with base anchors that are not less than 0.042" (1.0 mm) in thickness for attachment to the floor. For wall conditions that do not allow for

**Table 4 – Minimum hardware reinforcing thickness**

Hardware Item	Door			Frame		
	inches	mm	MSG No. <sup>(6)</sup>	inches	mm	MSG No. <sup>(6)</sup>
Mortise Hinge 1-3/8" [34.9 mm] Door <sup>(1)</sup>	0.093	2.3	12	0.093	2.3	12
Mortise Hinge 1-3/4" [44.5 mm] Door <sup>(1)(2)</sup>	0.123	3.1	10	0.123	3.1	10
Mortise Lock or Deadbolt <sup>(1)</sup>	0.067	1.7	14	0.067	1.7	14
Bored Lock or Deadbolt <sup>(1)</sup>	0.067	1.7	14	0.067	1.7	14
Flush Bolt Front <sup>(1)</sup>	0.067	1.7	14	0.067	1.7	14
Surface Bolt <sup>(3)</sup>	0.067	1.7	14	0.067	1.7	14
Surface Applied Closer <sup>(4)</sup>	0.067	1.7	14	0.067	1.7	14
Hold Open Arm <sup>(3)</sup>	0.067	1.7	14	0.067	1.7	14
Pull Plates and Bar <sup>(3)</sup>	0.053	1.3	16	0.053	1.3	16
Surface Exit Device <sup>(3)</sup>	0.067	1.7	14	0.067	1.7	14
Floor Checking Hinge	0.167	4.2	7	0.167	4.2	7
Pivot Hinge	0.167	4.2	7	0.167	4.2	7
Continuous Hinges <sup>(5)</sup>	Not Required			Not Required		
Kick / Push Plate	Not Required			Not Required		

**Note:** The minimum steel thickness for each specific gage is derived from the published figures of Underwriters Laboratories LLC.

<sup>(1)</sup> Thinner steel may be employed as long as tapped holes used for mounting the hardware are extruded to produce an equivalent number of threads.

<sup>(2)</sup> If reinforcing is angular or channel shaped, 0.093" (2.3 mm) is permitted.

<sup>(3)</sup> When reinforcing is omitted, thru-bolting via the use of spacers or sex-bolts is required.

<sup>(4)</sup> Reinforcement shall occur on both sides.

<sup>(5)</sup> Refer to ANSI/SDI A250.6, *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*.

<sup>(6)</sup> MSG No. to be used for reference purposes only.

the use of a floor anchor, an additional jamb anchor shall be specified.

#### 2.4.5 Glazing Beads

On frame assemblies that incorporate glazed openings, the frame shall be provided with glazing beads designed to receive the glazing materials specified. The glazing beads shall be butted at the corners. Glazing beads shall be of snap-on or screw-applied design.

#### 2.4.6 Terminated Stops

When specified, stops for interior door frames shall be terminated above the floor 6" (152.4 mm) standard, measured from frame bottom

to bottom of terminated stop. The stop is cut at a 45° or 90° angle and closed with a steel filler plate welded in place. Terminated stops on frames for lightproof doors, sound-rated doors, double egress, or lead-lined doors are not available.

### 3 Hardware Preparation

#### 3.1 Reinforcings

Provide minimum hardware reinforcing gages as noted in Table 4 and ANSI/SDI A250.6, *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*.



### 3.1.1 Mortise Hardware Preparations

Doors and frames shall be reinforced, drilled and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Preparation shall be in accordance with ANSI/BHMA A156.115 *Hardware Preparation in Steel Doors or Steel Frames* and ANSI/SDI A250.6, *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames* where applicable.

### 3.1.2 Surface Applied Hardware

When specified, doors and frames shall be reinforced for surface applied hardware. Drilling and/or tapping shall be completed by others.

### 3.1.3 Function Holes

The preparation for locks and/or exit devices shall include reinforcements (as shown in Table 4) and function holes. Trim and/or mounting holes are not included.

### 3.1.4 Anchor or Pivot Reinforced Hinges

Where specified, the appropriate recessing and reinforcing shall be provided. Mounting holes shall be field drilled and tapped by others.

### 3.1.5 Hinge Preparations

See Table 5. Doors up to and including 7'6" (2184 mm) high require a minimum three (3) hinge preparations. Doors over 7'6" (2286 mm) high require a minimum four (4) hinge preparations. Exception: 1-3/8" (34.9 mm) thick, 6'8" (2032 mm) high non-fire rated doors shall be prepared for a minimum of two hinges.

### 3.1.6 Hardware Locations

Hardware shall be located in accordance with Table 5.

Other items of hardware shall be located according to the door and/or hardware manufacturer's directions. This includes the door closers, floor hinges, overhead door holders, pocket pivot, and most specialized-purpose hardware.

## 4 Storage, Handling, and Installation

### 4.1 Jobsite Storage

All doors and frames shall be stored vertically under cover. The units shall be placed on at least 4" (102 mm) high wood sills or in a manner that will prevent rust or damage. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided. A 1/4" (6.3 mm) space between the doors shall be provided to promote air circula-

**Table 5 – Hardware locations**

Locks, Latches, Roller Latches and Double Handle Sets		38" – 42" (965 mm – 1067 mm) Centerline of Lock Strike from Bottom of Frame
Rim and Mortise Panic Devices		
Cylindrical and Mortise Deadlocks <sup>(1)</sup>		48" (1219 mm) to Centerline of Strike from Bottom of Frame
Push Plates		Centerline 45" (1143 mm) from Bottom of Frame
Pull Plates		Centerline of Grip @ 42" (1067) from Bottom of Frame
Combination Push Bar		Centerline of 42" (1067 mm) from Bottom of Frame
Hospital Arm Pull		Centerline of Lower Base is 45" (1143 mm) from Bottom of Frame with Grip Open at Bottom
Hinges	Top	Up to 11-3/4" (298.5 mm) from Rabbet Section of Frame to Centerline of Hinge
	Bottom	Up to 13" (330.2 mm) from Bottom of Frame to Centerline of Hinge
	Intermediate	Equally Spaced Between Top and Bottom Hinges

<sup>(1)</sup> Cylindrical and Mortise Deadlock strikes shall be located at 48" (1219 mm) from the bottom of the frame unless otherwise specified.

tion. If the wrapper on the door becomes wet, it must be removed immediately. Proper jobsite storage is extremely important in maintaining the quality and integrity of the factory applied paint. Improper Storage of material will have an adverse effect on the factory applied paint's ability to meet the requirements of ANSI/ SDI A250.10, *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames* or ANSI/SDI A250.3, *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*.

#### **4.2 Frame Installation**

**4.2.1** Frames shall be installed plumb, level, rigid and in true alignment as recommended in ANSI/SDI A250.11 *Recommended Erection Instructions for Steel Frames*.

All frames, other than drywall slip-on types, shall be fastened to the adjacent structure so as to retain their position and stability. Slip-on drywall frames shall be installed in prepared wall openings in accordance with manufacturer's instructions.

**4.2.2** Where grouting is required in masonry installations, frames shall be braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Grout shall be mixed to provide a 4" (102 mm) maximum slump consistency and hand troweled into place. Grout mixed to a thinner, "pumpable" consistency shall not be used. Excess water from thin consistency grout will cause premature rusting of steel frames and probable deformation or discoloration of certain wall constructions. Standard mortar protection in frames **is not** intended for thin consistency grout or drywall compound.

Steel Frames, including fire rated frames do not require grouting. GROUTING SHALL NOT

BE USED FOR FRAMES INSTALLED IN DRY-WALL WALLS.

#### **4.3 Door Installation**

Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. Doors shall be adjusted to maintain perimeter clearances as specified in Section 2.1.8. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved.

#### **4.4 Hardware Installation**

Installation of hardware items shall be in accordance with the hardware manufacturer's recommendations and templates. ANSI/SDI A250.6, *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames* shall be consulted for other pertinent information.

#### **4.5 Installation of Factory Applied Finish Painted Materials**

In addition to storage and handling precautions noted in Section 4.1, it is IMPERATIVE that the work of all other rough trades MUST be completed prior to the installation of factory applied finished painted product.

#### **4.6 Door and Frame Maintenance**

It is the responsibility of the installer or end user to properly maintain the doors and frames in accordance with SDI-124, *Maintenance of Standard Steel Doors and Frames*.

#### **4.7 Door and Frame Repair**

Any repair required to either the door or frame in a fire rated opening shall be conducted in accordance with ANSI/NFPA 80, *Standard for Fire Doors and Other Opening Protectives*.

## Appendix A (informative)

### Fire Door Considerations

#### Fire door testing

There are two primary fire test methods that are used to establish the fire ratings of doors. The first is ANSI/UL 10B, *Fire Tests of Door Assemblies*, and is referred to as neutral pressure; the second is ANSI/UL 10C, *Positive Pressure Fire Tests of Door Assemblies*, and is referred to as positive pressure.

The difference between the two test methods concerns the location of a neutral pressure plane in the test furnace. In the late 1990's the test method required in building codes changed to a positive pressure test method. This change was adopted in the Uniform Building Code (UBC) and the International Building Code (IBC) for swinging-type fire doors.

Fire doors required to be tested by either method may be specified by calling out the test method or by indicating that the product must meet a specific section of a model building code.

These tests incorporate two phases: A fire test phase utilizing an established time-temperature curve and a structural integrity phase utilizing a hose stream test conducted under established time-pressure criteria determined by exposure time and area of the assembly. To be a valid fire door assembly, the unit must pass both phases of the test.

In certain instances as permitted by building codes, the integrity portion (hose stream) is deleted. The deletion of this requirement negates the assembly's use as a true fire door.

The fire test procedures also include a measurement of unexposed surface temperatures at regular intervals up to 30 minutes.

The fire test does not address or measure the amount of smoke leakage through the assembly. For this criteria, ANSI/NFPA-105 *Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives* and ANSI/UL 1784 *Air Leakage Tests of Door Assemblies* should be consulted.

#### Fire door ratings

Swinging steel doors and frames are commonly tested as flush (non-glazed) units for a 3-hour time period. This allows their usage for all lower fire protection ratings. Lights in doors may be permitted based on the performance of flush doors when evaluated with the testing database and experience of the test lab or certifying agency.

Typical hourly ratings for swinging steel fire doors are 3-hours, 1-½-hours, ¾-hours, and ⅓-hour. Usage of these ratings is as follows:

**3-Hour** — Openings in fire walls that divide a single building into fire areas, normally 4-hour rated walls.

**1-½-Hour** — Openings in enclosures of vertical communications through buildings and in 2-hour partitions providing horizontal fire separations. These may also be used as non-glazed doors for openings in exterior walls subject to severe fire exposure from outside of the building.

**¾-Hour** — Openings in 1-hour rated (or less) partitions between rooms and corridors, or other separation of occupancy. With certain light restrictions these may also be used in exterior walls subject to moderate or light fire exposure from outside of the building. The ¾-hour fire door may also be used as a smoke and draft control door.

**½-Hour (20 minute)** — Doors of this rating are used for the protection of openings between living quarters and corridors and where smoke control is a primary concern. They may also be used as a smoke partition across corridors.

### **Fire door temperature rise**

In addition, a temperature rise rating may be required by building codes in areas such as enclosures of vertical communications or in areas of storage for hazardous materials. Temperature rise ratings indicate the maximum temperature, above ambient, of the unexposed surface at 30 minutes into the fire test. Three ratings, 250°F (121°C), 450°F (232°C), or 650°F (343°C) are recognized, with the 250°F (121°C) rating being the most thermally efficient. Ratings over 650°F (343°C) are not recognized as temperature rise doors.

### **Fire door labeling**

Doors and frames may bear labels or marks of a recognized third party certification agency, acceptable to the authority having jurisdiction. Fire door labels must indicate the hourly rating and either the latch throw for single point locks or must bear a notation “Fire door to be equipped with fire exit hardware”. Fire door labels may also indicate the temperature rise rating.

Door labels may be of metal (installed by welding, riveting, adhesive or drive screw) or of mylar. The existence of a label is the only method of verification that the door is rated.

Frame labels, except in specific instances, do not indicate hourly ratings. Fire door frames assume the rating of the fire door installed or a rating that corresponds to the rating of the wall in which it is installed, whichever is lesser.

Frame labels may be of metal (installed by welding, riveting, or drive screw), mylar, or may be embossed into the frame.

Door and/or frame labels may be of the same or different certifying agencies. A door assembly may consist of labeled components of different manufacturers.

### **Other fire door considerations**

The effectiveness of a fire door assembly is dependent on the use of listed or labeled items for all components. These may include glazing material, locks, hinges, closers, latches, light frames, other hardware items, etc. The substitution of a non-rated component or one that is rated less than the intended fire protection rating of the assembly results in a corresponding decrease in rating or the loss of the rating in its entirety.

For further information, see SDI-118 *Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and Window Frame Requirements* or ANSI/NFPA 80 *Standard for Fire Doors and Other Opening Protectives*.

For information on fire doors used in a means of egress consult NFPA-101 *Life Safety Code*®.

## Appendix B (informative)

### General Considerations

#### Steel coating types

ASTM A924, *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process* and A653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process* provide specifications for both galvannealed (A Type) and Galvanized (G Type) coatings. For purposes of this standard, G type coatings are not recommended due to problems related to paint adhesion and welding. In addition, heavier coating weights, i.e., G60 and G90 are known to experience cracking and peeling of the coating resulting in potential performance failures under ANSI/SDI A250.10, *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames* and ANSI/SDI A250.3, *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*.

#### Steel thickness

When ordering steel directly from the mill, manufacturers order sheet and coil to a minimum decimal thickness and not a nominal gage. This thickness is generally at the low end of the range for a specific gage. For example, the nominal thickness of 16 gage is 0.059" (1.5 mm). The thickness tolerance permitted by ASTM A568, *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*, is  $\pm .006$ " (0.15 mm). Therefore the minimum ordering dimension would then become 0.053" (1.3 mm) as shown in Table 2. These minimum values meet the requirements of Underwriters Laboratories LLC. Steel gages, or MSG numbers may be used for reference purposes only.

#### Thermal bow

Thermal bow is a condition which may occur in metal doors due to an inside / outside temperature differential. It is warping of the top and bottom of the lock edge of the door either toward or away from the frame stop. This condition may result in force on the latch that increases the difficulty of opening the door and may increase the air leakage of the opening.

This condition, and the degree of bowing, depends on the door color, construction, length of exposure, temperature, etc. Thermal bow can often be alleviated by painting the exposed surface a light color. In some cases of extreme cold, this condition may also occur in reverse.

#### Aesthetics

The production of steel doors and frames relies on a variety of manufacturing processes including spot welding, projection welding, arc welding ground smooth, grinding, filling, etc. These processes may result in a show-through after application of finished paint. These characteristics are inherent in production and are not to be considered as manufacturing defects.

The show-through characteristics increase as the paint gloss increases. This standard recommends a maximum paint gloss rating of 20% reflectance, measured using a 60° gloss meter, which should be suitable for most applications. Translucent paints may emphasize show-through characteristics and their use is not recommended. The 20% reflectance is equivalent to a Master Painters Institute (MPI) gloss rating description of a traditional "eggshell-like" finish.

## **Water penetration**

Borrowed light, transom, sidelight, and combination transom sidelight frames are not factory sealed to prevent water penetration. In situations where this is a concern, the contractor must seal all joints that are exposed to the elements after the frame assembly is installed.

Whenever possible, it is strongly recommended that glass and glazing be installed on the exterior rabbet of the frame assembly, which will help act as a deterrent to water penetration. It should be noted that a fully welded corner does not ensure a water tight condition.

The member companies of the hollow metal industry cannot control the workmanship associated with the frame installation and therefore, this work must be specified in the installation/glazing/caulking section of the specifications. It is the responsibility of the contractor to assure all steps are taken by the installer, glazer, or others to prevent water penetration.

## Appendix C (informative)

### Section 08100 Standard Hollow Metal Doors and Frames (intended as a sample specification)

#### Part 1: General

##### 1.01 Work included

- A. Furnish only standard hollow metal doors, frames, sidelights and borrowed lights as specified and shown on plans and schedules.
- B. Related sections
  - 1. Section 08700 — Finish hardware
  - 2. Section 09900 — Painting
  - 3. Section 08800 — Glass & glazing

##### 1.02 References

- A. SDI standards
  - 1. SDI-106-1999 *Recommended Standard Door Type Nomenclature*
  - 2. SDI-108-2010 *Recommended Selection and Usage Guide for Standard Steel Doors*
  - 3. SDI-111-2009 *Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components*
  - 4. SDI-112-2008 *Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames*
  - 5. SDI-117-2009 *Manufacturing Tolerances for Standard Steel Doors and Frames*
  - 6. SDI-118-2012 *Basic Fire Door Requirements*
  - 7. SDI-124-2011 *Maintenance of Standard Steel Doors and Frames*
- B. ANSI standards
  - 1. ANSI/UL 10B-2009 *Fire Tests of Door Assemblies*
  - 2. ANSI/UL 10C-2009 *Positive Pressure Fire Tests of Door Assemblies*
  - 3. ANSI/UL 1784-2009 *Air Leakage Tests of Door Assemblies*
  - 4. ANSI/NFPA 80-2010 *Standard for Fire Doors and Other Opening Protectives*
  - 5. ANSI/NFPA 252-2012 *Fire Tests of Door Assemblies*
  - 6. ANSI/SDI A250.3-2007 (R2011) *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*
  - 7. ANSI/SDI A250.4-2011 *Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings*
  - 8. ANSI/SDI A250.6-2003 (R2009) *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*
  - 9. ANSI/SDI A250.7-1997 (R2002) *Nomenclature for Standard Steel Doors and Steel Frames*
  - 10. ANSI/SDI A250.10-1998 (R2011) *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*

11. ANSI/SDI A250.11-2012 *Recommended Erection Instructions for Steel Frames* (Formerly SDI-105)
12. ANSI/BHMA A156.115-2006 *American National Standard for Hardware Preparations in Steel Doors and Steel Frames*

C. ASTM standards

1. ASTM A1008-2012 *Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability*
2. ASTM A568-2011 *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*
3. ASTM A1011-2012 *Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability*
4. ASTM A653-2011 *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*
5. ASTM A879-06 *Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface*
6. ASTM A924-2010 *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process*

### 1.03 Quality assurance

- A. Manufacturer shall meet or exceed all standards as noted in Section 2.01 references.
- B. Fire rated assemblies shall be manufactured in accordance with [Underwriters Laboratories] [Intertek Testing Services] [Factory Mutual] established procedures and shall bear the appropriate labels for each application.
- C. No product shall be manufactured prior to receipt of approved hardware schedule and templates.

### 1.04 Submittals

- A. Shop drawings, if required, shall show all openings in the door schedule and/or the drawings.
- B. When required, provide details of door design, door construction details and methods of assembling sections, hardware locations, anchorage and fastening methods, door frame types and details, and finish requirements.

### 1.05 Delivery, marking and storage

- A. Where specified, all products shall be marked with architects opening number on all doors, frames, misc. parts and car tons.
- B. All materials upon receipt shall be inspected for damage, and the shipper and supplier notified if damage is found.
- C. All doors and frames shall be stored vertically under cover. The units shall be placed on at least 4" (102 mm) high wood sills or in a manner that will prevent rust or damage. The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided.
- D. A ¼" (6.3 mm) space between the doors shall be provided to promote air circulation. If the wrapper on the door becomes wet, it must be removed immediately.



**1.06 Warranty****1.07 [See manufacturer's warranty]****Part 2: Product****2.01 Materials**

**2.02** All steels used to manufacture doors, frames, anchors, and accessories shall meet at least one or more of the following requirements:

- A. Cold rolled steel shall conform to ASTM designations A1008, *Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability* and A568, *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*.
- B. Hot rolled, pickled and oiled steel shall comply with ASTM designations A1011, *Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability* and A568, *Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for*.
- C. Hot dipped zinc coated steel shall be of the alloyed type and comply with ASTM designations A924, *Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process* and A653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*.

**2.03 Frames**

- A. Interior frames
  - 1. Level 1 for door model [1] [2] [0.042" (1.0mm)] [0.053" (1.3mm)] minimum steel thickness for frames
  - 2. Level 2 for door model [1] [2] [0.042" (1.0mm)] minimum steel thickness for frames
  - 3. Level 3 for door model [1] [2] [3] [0.053" (1.3mm)] [0.067" (1.7mm)] minimum steel thickness for frames
- B. Exterior frames
  - 1. Level 1 for door model [1] [2] [0.042" (1.0mm)] [0.053" (1.3mm)] minimum steel thickness for frames
  - 2. Level 2 for door model [1] [2] [0.053" (1.3mm)] minimum steel thickness for frames
  - 3. Level 3 for door model [1] [2] [3] [0.053" (1.3mm)] [0.067" (1.7mm)] minimum steel thickness for frames
  - 4. Level 4 for door model [1] [2] [0.067" (1.7mm)] [0.093" (2.3mm)] minimum steel thickness for frames
- C. Frames shall be [knockdown type] [slip-on drywall type] [face welded type] [full profile weld type]
- D. Provide frames, other than slip-on drywall type with a minimum of three anchors per jamb suitable for the adjoining wall construction. Provide anchors of not less than 0.042" (1.0 mm) in thickness or 0.167" (4.2 mm) diameter wire. Frames OVER 7'6" (2286 mm) shall be provided with an additional anchor per jamb.
- E. Slip-on drywall frame anchors shall be as provided by the manufacturer to assure performance.

- F. Base anchors shall be provided, other than slip-on drywall type, with minimum thickness of 0.042" (1.0mm). For existing masonry wall conditions that do not allow for the use of a floor anchor, an additional jamb anchor shall be provided.
- G. All frames shall be fully prepared for all mortise template hardware and reinforced only for surface mounted hardware. Drilling and/or tapping shall be completed by others.
- H. Minimum hardware reinforcing gages shall comply with Table 4 of ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)*.

## 2.04 Doors

- A. Doors shall meet at least one or more of the following requirements:
  - 1. Level 1 – Standard duty 1-<sup>3</sup>/<sub>8</sub>" (34.9 mm) and 1-<sup>3</sup>/<sub>4</sub>" (44.5 mm)
    - Model 1 – Full flush
    - Model 2 – Seamless
  - 2. Level 2 – Heavy duty 1-<sup>3</sup>/<sub>4</sub>" (44.5 mm)
    - Model 1 – Full flush
    - Model 2 – Seamless
  - 3. Level 3 – Extra heavy-duty 1-<sup>3</sup>/<sub>4</sub>" (44.5 mm)
    - Model 1 – Full flush
    - Model 2 – Seamless
    - Model 3 – Stile and rail
  - 4. Level 4 – Maximum-duty 1-<sup>3</sup>/<sub>4</sub>" (44.5 mm)
    - Model 1 – Full flush
    - Model 2 – Seamless
- B. Interior doors
  - Level [I]      [II]      [III]      [IV]
  - Model          [1]      [2]      [3]
- C. Exterior doors
  - Level [I]      [II]      [III]      [IV]
  - Model          [1]      [2]      [3]
- D. Door [and panel] construction
- E. Face steel sheet shall meet at least one or more of the following requirements:
  - 1. Level 1
    - Model 1 – 0.032" (0.8mm) minimum thickness
    - Model 2 – 0.032" (0.8mm) minimum thickness
  - 2. Level 2
    - Model 1 – 0.042" (1.0mm) minimum thickness
    - Model 2 – 0.042" (1.0mm) minimum thickness
  - 3. Level 3
    - Model 1 – 0.053" (1.3mm) minimum thickness
    - Model 2 – 0.053" (1.3mm) minimum thickness
    - Model 3 – 0.053" (1.3mm) minimum thickness

- 4. Level 4
  - Model 1 – 0.067" (1.7mm) minimum thickness
  - Model 2 – 0.067" (1.7mm) minimum thickness
- F. End closure: The top and bottom of the doors shall be closed with [flush] [inverted] channels or closures. The channels or closures shall have a minimum material thickness of 0.042" (1.0mm).
- G. Core: See ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)*, Section 2.3.2.
- H. Door edge design: See ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)*, Section 2.3.1.3.
- I. Minimum hardware reinforcing gages shall comply with Table 4 of ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)*.
- J. Label requirements, steel astragals, louvers, vision lights – see ANSI/SDI A250.8, *Specifications for Standard Steel Doors and Frames (SDI-100)* Section 2, Products.

## 2.05 Finishing

Prime finish: Doors and frames shall be thoroughly cleaned, and chemically treated to insure maximum paint adhesion. All surfaces of the door and frame exposed to view shall receive a factory applied coat of rust inhibiting primer, either air-dried or baked-on. The finish shall meet the requirements for acceptance stated in ANSI/SDI A250.10 *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*.

## 2.06 Design clearances

- A. The clearance between the door and frame head and jambs shall be 1/8" (3.2 mm) in the case of both single swing and pairs of doors.
- B. The clearance between the meeting edges of pairs of doors shall be 1/8" (3.2 mm) to 1/4" (6.3 mm), for fire rated doors 1/8" (3.2 mm) ± 1/16" (1.6 mm).
- C. The clearance at the bottom shall be [3/4" (19.1 mm)] [5/8" (15.8 mm)].
- D. The clearance between the face of the door and door stop shall be 1/16" (1.6 mm) to 1/8" (3.2 mm).
- E. All clearances shall be, unless otherwise specified, subject to a tolerance of ± 1/32" (0.8 mm).

## Part 3: Execution

### 3.01 Installation

- A. Frames shall be installed plumb, level, rigid and in true alignment as recommended in ANSI/SDI A250.11, *Recommended Erection Instructions for Steel Frames*. All frames other than slip-on types shall be fastened to the adjacent structure so as to retain their position and stability. Drywall slip-on frames shall be installed in prepared wall openings in accordance with manufacturer's instructions.
- B. Where grouting is required in masonry installations, frames shall be braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Grout shall be mixed to provide a 4" (102mm) maximum slump consistency, hand troweled into place. Grout mixed to a thin "pumpable" consistency shall not be used.

- C. Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. Doors shall be adjusted to maintain perimeter clearances as specified in Section 2.1.8. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved.
- D. Installation of hardware items shall be in accordance with the hardware manufacturer's recommendations and templates. ANSI/SDI A250.6, *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames* shall be consulted for other pertinent information.

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## AVAILABLE PUBLICATIONS

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### Specifications

- ANSI/SDI A250.6** Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
- ANSI/SDI A250.8** Specifications for Standard Steel Doors and Frames (SDI-100)
- SDI-108** Recommended Selection & Usage Guide for Standard Steel Doors
- SDI-118** Basic Fire Door, Fire Door Frame, Transom/Sidelight Frame, and Window Frame Requirements
- SDI-128** Guidelines for Acoustical Performance of Standard Steel Doors and Frames
- SDI-129** Hinge and Strike Spacing
- SDI-133** Guideline for Specifying Steel Doors & Frames for Blast Resistance

### Test Procedures

- ANSI/SDI A250.3** Test Procedure & Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames
- ANSI/SDI A250.4** Test Procedure & Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors
- ANSI/SDI A250.10** Test Procedure & Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
- ANSI/SDI A250.13** Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies for Protection of Building Envelopes (Not applicable for FEMA 320/361 or ICC-500 Shelters)
- SDI-113** Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
- SDI-131** Accelerated Physical Endurance Test Procedure for Steel Doors

### Construction Details

- ANSI/SDI A250.11** Recommended Erection Instructions for Steel Frames
- SDI-110** Standard Steel Doors & Frames for Modular Masonry Construction
- SDI-111** Recommended Details for Standard Details Steel Doors, Frames, Accessories and Related Components
- SDI-122** Installation Troubleshooting Guide for Standard Steel Doors & Frames

### Miscellaneous Documents

- SDI-112** Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames
- SDI-117** Manufacturing Tolerances for Standard Steel Doors and Frames
- SDI-124** Maintenance of Standard Steel Doors & Frames
- SDI-127** Industry Alert Series (A-L)
- SDI-130** Electronic Hinge Preparations
- SDI-134** Glossary of Terms for Hollow Metal Doors and Frames
- SDI-135** Guidelines to Measure for Replacement Doors in Existing Frame Openings

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