

# American National Standard

*SDI-100*  
*Recommended Specifications for*  
*Standard Steel Doors and Frames*

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SPONSOR  
Steel Door Institute  
Approved November 14, 2003





**ANSI/SDI®**  
**A250.8-2003**  
Revision of ANSI/SDI A250.8-1998

American National Standard

**SDI-100**  
**Recommended Specifications for**  
**Standard Steel Doors and Frames**

Secretariat

**Steel Door Institute**

Approved November 14, 2003

**American National Standards Institute, Inc.**



# American National Standard

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ANSI/SDI A250.8-2003

# Contents

	Page
<b>1</b> General .....	1
<b>1.1</b> Scope .....	1
<b>1.2</b> Reference Documents .....	1
<b>1.3</b> Approval Drawings and Hardware Schedules .....	2
<b>1.4</b> Classification – Level, Performance, Model.....	2
<b>1.5</b> Sizes.....	2
<b>2</b> Products .....	3
<b>2.1</b> General .....	3
<b>2.2</b> Manufacturers Standard Gage (MSG) vs. Minimum Steel Thickness .....	5
<b>2.3</b> Construction Features .....	5
<b>2.4</b> Frames.....	6
<b>3</b> Hardware Preparation.....	9
<b>3.1</b> Reinforcings .....	9
<b>4</b> Storage, Handling, and Installation.....	10
<b>4.1</b> Jobsite Storage.....	10
<b>4.2</b> Frame Installation.....	10
<b>4.3</b> Door Installation.....	10
<b>4.4</b> Hardware Installation.....	10
<b>4.5</b> Installation of Factory Applied Finish Painted Materials .....	10
<b>4.6</b> Door and Frame Maintenance .....	10
<b>Tables</b>	
<b>1</b> Standard opening sizes.....	3
<b>2</b> Steel thickness / door faces.....	5
<b>3</b> Minimum steel thickness / frames .....	7
<b>4</b> Minimum hardware reinforcing thickness.....	8
<b>5</b> Hardware locations .....	9
<b>Appendices</b>	
<b>A</b> Fire Door Considerations.....	11
<b>B</b> General Considerations .....	13
<b>C</b> Section 08100 Standard Hollow Metal Doors and Frames .....	15

**Foreword** (This Foreword is not part of American National Standard A250.8-2003)

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 A250.8-1998 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. Some of the significant changes from the previous version are as follows:

- Titles of the reference documents (1.2) have been updated, and are included throughout the document to assist the reader.
- References to the UL 10C Positive Pressure Fire Test Standard have been added.
- Requirements for Smoke Control Doors have been added (2.1.2.2).
- Requirements for Welded Frames (2.4.1.3) have been revised to correspond with the industry standards.
- References to material gages in decimal form have been emphasized to correspond with the industry standards.
- Table 3 was updated to show one material thickness for frames for each of the corresponding door levels.
- Appendices A and B in the 1998 edition have been updated and divided into three separate appendices: Appendix A, Fire Door Considerations; Appendix B, General Considerations; and Appendix C, Section 08100 Standard Hollow Metal Doors and Frames (intended as a sample specification). Each appendix is informative and not to be considered part of the standard.
- An informative statement relating to water penetration for welded frame assemblies is included in Appendix B.

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  
 American Iron and Steel Institute  
 Builders Hardware Manufacturers' Association  
 Canadian Steel Door Manufacturers' Association  
 Door and Hardware Institute  
 Factory Mutual Research Corporation  
 General Services Administration  
 Hollow Metal Manufacturers' Association / Division of National Association  
 of Architectural Metal Manufacturers' Association  
 Insulated Steel Door Institute  
 International Conference of Building Officials  
 Intertek Testing Services  
 Manufactured Housing Institute  
 National Association of Home Builders  
 Steel Door Institute  
 Underwriters Laboratories Inc.  
 Window and Door Manufacturers' Association

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

Robert M. Berhinig, Chairman  
 J. Jeffery Wherry, Managing Director

<i>Organization Represented</i>	<i>Name of Representative</i>
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Security Metal Products Corporation.....	Daniel Buffenbarger
Steel Door Institute.....	J. Jeffery Wherry
Underwriters Laboratories Inc. ....	Daniel Kaiser
Window & Door Manufacturers' Association .....	Rick Perry

## American National Standard

# SDI-100 Recommended Specifications for Standard Steel Doors and Frames

## 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, "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-106-1999 Recommended Standard Door Type Nomenclature
- SDI-108-1999 Recommended Selection and Usage Guide for Standard Steel Doors
- SDI-111-2000 Recommended Details and Guidelines for Standard Steel Doors, Frames, and Accessories
- SDI-112-1997 Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames
- SDI-117-2000 Manufacturing Tolerances for Standard Steel Doors and Frames

- SDI-118-2002 Basic Fire Door Requirements
- SDI-124-1998 Maintenance of Standard Steel Doors and Frames

#### 1.2.2 ANSI Standards

- ANSI/UL 10B-1997 Fire Tests of Door Assemblies
- ANSI/UL 10C-1998 Positive Pressure Fire Tests of Door Assemblies
- ANSI/UL 1784-2001 Air Leakage Test of Door Assemblies
- ANSI/NFPA 80-1999 Fire Doors and Fire Windows
- ANSI/NFPA 252-1999 Fire Tests of Door Assemblies
- ANSI/SDI A250.3-1999 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
- ANSI/SDI A250.4-2001 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
- ANSI/SDI A250.6-1997 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
- ANSI/SDI A250.7-1997 Nomenclature for Standard Steel Doors and Steel Frames
- ANSI/SDI A250.10-1998 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
- ANSI/SDI A250.11-2001 Recommended Erection Instructions for Steel Frames (Formerly SDI-105)

- A115 Hardware Preparation in Steel Doors and Steel Frames
- A115.IG Installation Guide for Doors and Hardware

### 1.2.3 ASTM Standards

- ASTM A1008-2003 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- ASTM A568-2003 Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
- ASTM A1011-2001 Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- ASTM A591-1998 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications
- ASTM A653-2002 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM A924-1999 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 and methods of assembling sections, hardware locations, dimensions, and shapes of materials, anchorage and fastening methods, door frame types and details, and finish requirements. SDI-111, "Recommended Details and Guidelines for Steel Doors, Frames, and Accessories" and SDI-106, "Recommended Standard Door

Type Nomenclature" 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 1-3/8" (34.9 mm) and 1-3/4" (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

#### Level 2 and Physical Performance Level B

Heavy-duty 1-3/4" (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

#### Level 3 and Physical Performance Level A

Extra Heavy-duty 1-3/4" (44.5 mm)

**Model 1** – Full Flush

**Model 2** – Seamless

**Model 3** – Stile and Rail

#### Level 4 and Physical Performance Level A

Maximum-duty 1-3/4" (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**

Widths*	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.

Heights	1-3/4" Doors	Ft-in	6'8"	7'0"	7'2"	7'10"	8'0"
		mm	2032	2134	2184	2388	2438

1-3/8" Doors	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 and High-Strength Low-Alloy with Improved Formability" and A568, "Standard Specification for Steel Sheet, Carbon, 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, "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, 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 A591, "Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications." The minimum coating weight shall be a class "B", i.e., 0.075 oz/ft<sup>2</sup> (22.9 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, "Fire Tests of Door Assemblies", ANSI/UL10C, "Positive Pressure Fire Tests of Door Assemblies", or ANSI/NFPA 252, "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 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 "Air Leakage Test of Door Assemblies." See SDI-118, "Basic Fire Door Requirements" for additional information.

### 2.1.2.3 Steel Astragals on Fire Doors

Where required by a manufacturer's listing or ANSI/NFPA 80, "Fire Doors and Fire Windows", 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 Requirements" for acceptable labeling methods. **CAUTION: LOUVERS SHALL NOT BE USED IN SMOKE CONTROL DOORS, DOORS HAVING LITES OR FIRE EXIT HARDWARE.**

### 2.1.3 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." 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 Painted Steel Surfaces 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 primed steel. Consult the door and frame manufacturer's literature for description of primer used.

### 2.1.6 Tolerances

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

### 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 Finished Painted Steel Surfaces 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) ± 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) ± 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) unless otherwise specified. Fire door undercuts shall comply with ANSI/NFPA 80, "Fire Doors and Fire Windows."

**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.

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

**2.1.8.5** All clearances shall be, unless otherwise specified in this document, subject to a tolerance of  $\pm 1/32$ " (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 Inc., 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 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 Lites**

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

### **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, sidelites, 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, sidelites, or other such configurations preclude the use of these test methods on such designs.

ANSI/SDI A250.7, "Nomenclature for Standard Steel Doors and Steel Frames" and SDI-111, "Recommended Details and Guidelines for Standard Steel Doors, Frames, and Accessories" 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 Slip-On Drywall Frames**

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.

#### **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 Pro-

**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.

file 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) shall be provided with an additional anchor.

##### **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.

##### **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

**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 Inc.

<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.

floor. For wall conditions that do not allow for 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." For additional information refer to A115.IG, "Installation Guide for Doors and Hardware."

##### 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 A115 standards 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 anchor hinges are 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 6'8" (2032 mm), 7'0" (2134 mm), and 7'2" (2184 mm) high require three (3) hinge preparations. Doors over 7'6" (2286 mm) to 8'0" (2438 mm) high require 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 two hinge preparations.

##### 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.

**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.

## **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 circulation. 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 Painted Steel Surfaces 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" and A115.IG, "Installation Guide for Doors and Hardware." 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.

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. A115.IG, "Installation Guide for Doors and Hardware" and 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."

## 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 "Installation of Smoke Control Door Assemblies" 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. Lites 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, 1-1/2-hours, 3/4-hours, and 1/3-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.

**1-1/2-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.

**3/4-Hour** — Openings in 1-hour rated (or less) partitions between rooms and corridors, or other separation of occupancy. With certain lite restrictions these may also be used in exterior walls subject to moderate or light fire exposure from outside of the building. The 3/4-hour fire door may also be used as a smoke and draft control door.

**1/3-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, 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 labeled items for all components. These may include glazing material, locks, hinges, closers, latches, lite 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 Requirements" or ANSI/NFPA 80 "Fire Doors and Fire Windows."

For information on fire doors used as 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 Painted Steel Surfaces 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, 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 Inc. Steel gages, or MSG numbers may be used for reference purposes only.

#### **Thermal bow**

Installers should be aware of a condition known as thermal bow. Thermal bow is a temporary condition which may occur in metal doors due to an inside / outside temperature differential. This can occur when the direct rays of the sun strike a door surface. This condition, and the degree of bowing, depends on the door color, construction, length of exposure, temperature, etc. This condition 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.

#### **Water penetration**

Borrowed lite, transom, sidelite, and combination transom sidelite 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 watertight 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-108-1999 Recommended Selection and Usage Guide for Standard Steel Doors
  - 3. SDI-111-2000 Recommended Details and Guidelines for Standard Steel Doors, Frames, and Accessories
  - 4. SDI-112-1997 Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames
  - 5. SDI-117-2000 Manufacturing Tolerances for Standard Steel Doors and Frames
  - 6. SDI-118-2002 Basic Fire Door Requirements
  - 7. SDI-124-1998 Maintenance of Standard Steel Doors and Frames
- B. ANSI standards
  - 1. ANSI/UL 10B-1997 Fire Tests of Door Assemblies
  - 2. ANSI/UL 10C-1998 Positive Pressure Fire Tests of Door Assemblies
  - 3. ANSI/UL 1784-2001 Air Leakage Test of Door Assemblies
  - 4. ANSI/NFPA 80-1999 Fire Doors and Fire Windows
  - 5. ANSI/NFPA 252-1999 Fire Tests of Door Assemblies
  - 6. ANSI/SDI A250.3-1999 Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
  - 7. ANSI/SDI A250.4-2001 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
  - 8. ANSI/SDI A250.6-1997 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
  - 9. ANSI/SDI A250.7-1997 Nomenclature for Standard Steel Doors and Steel Frames

10. ANSI/SDI A250.10-1998 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
11. ANSI/SDI A250.11-2001 Recommended Erection Instructions for Steel Frames (Formerly SDI-105)
12. A115 Hardware Preparation in Steel Doors and Steel Frames
13. A115.IG Installation Guide for Doors and Hardware

C. ASTM standards

1. ASTM A1008-2003 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A568-2003 Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
3. ASTM A1011-2001 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 A591-1998 Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications
5. ASTM A653-2002 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
6. ASTM A924-1999 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 cartons.
- 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 1/4" (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, 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, 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, "SDI-100, Recommended Specifications for Standard Steel Doors and Frames".

**2.04 Doors**

- A. Doors shall meet at least one or more of the following requirements:

- 1. Level 1 – Standard duty 1-3/8" (34.9 mm) and 1-3/4" (44.5 mm)
  - Model 1 – Full flush
  - Model 2 – Seamless
- 2. Level 2 – Heavy duty 1-3/4" (44.5 mm)
  - Model 1 – Full flush
  - Model 2 – Seamless
- 3. Level 3 – Extra heavy-duty 1-3/4" (44.5 mm)
  - Model 1 – Full flush
  - Model 2 – Seamless
  - Model 3 – Stile and rail
- 4. Level 4 – Maximum-duty 1-3/4" (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	[1]	[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, "SDI-100, Recommended Specifications for Standard Steel Doors and Frames", Section 2.3.2.
- H. Door edge design: See ANSI/SDI A250.8, "SDI-100, Recommended Specifications for Standard Steel Doors and Frames", Section 2.3.1.3.
- I. Minimum hardware reinforcing gages shall comply with Table 4 of ANSI/SDI A250.8, "SDI-100, Recommended Specifications for Standard Steel Doors and Frames".
- J. Label requirements, steel astragals, louvers, vision lites – see ANSI/SDI A250.8, "SDI-100, Recommended Specifications for Standard Steel Doors and Frames" 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)  $\pm$  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  $\pm$  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" and A115.IG, "Installation Guide for Doors and Hardware". All frames other than slip-on types shall be fastened to the adjacent structure so as to retain their position and stability. Dry-wall 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. A115.IG, "Installation Guide for Doors and Hardware" and ANSI/SDI A250.6, "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames" shall be consulted for other pertinent information.