

# American National Standard

## *Test Procedure and Acceptance Criteria for — Factory Applied Finish Coatings for Steel Doors and Frames*

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Approved November 14, 2019



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**ANSI/SDI**®  
**A250.3-2019**  
Revision of  
ANSI/SDI A250.3-2007

American National Standard

Test Procedure and Acceptance Criteria for  
Factory Applied Finish Coatings  
for Steel Doors and Frames

Secretariat

**Steel Door Institute**

Approved November 14, 2019

**American National Standards Institute, Inc.**

# American National Standard

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**Foreword** (This Foreword is not part of American National Standard A250.3-2007)

The material contained in this document has been developed under the auspices of the Technical Committee of the Steel Door Institute.

The original standard was issued on July 28, 1980 and was last revised in 2007. The current edition is a revision of the 2007 document with the contents being updated to reflect changes and advances that have taken place in the steel door and frame industry since that time.

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

The organizations that have approved this standard are as follows:

Builders Hardware Manufacturers Association  
Canadian Steel Door Manufacturers Association  
Cedar Valley Associates  
D.H. Pace Company  
Door and Hardware Institute  
ESTM Services  
FM Approvals  
Hollow Metal Manufacturers Association / Division of National Association  
of Architectural Metal Manufacturers Association  
Intertek  
Ray and Associates  
Steel Door Institute  
Therma-Tru  
Underwriters Laboratories Inc.  
Vetrotech / Saint Gobain

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

Craig Ordmandy, Chairman  
 J. Jeffery Wherry, Secretary

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## American National Standard

# Test Procedure and Acceptance Criteria for — Factory Applied Finish Coatings for Steel Doors and Frames

## 1 General

### 1.1 Scope

These methods prescribe the procedures to be followed in the selection of material, chemical preparation, coating application, testing, and evaluation of factory applied finish coatings for steel doors and frames. Coatings covered by this standard include paints, stains, clear coats, and powder coats.

### 1.2 Reference Documents

ASTM B117-18 *Standard Practice for Operating Salt Spray (Fog) Testing Apparatus*

ASTM D1654-08 (2016)e1 *Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments*

ASTM D4585 / D4585M-18 *Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation*

ASTM G154-16 *Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials*

ASTM D4587-11 *Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings*

ASTM D2794-93 (2019) *Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)*

ASTM D3359-17 *Standard Test Method for Measuring Adhesion by the Tape Test*

ASTM D4060-14 *Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser*

ASTM D610-08 (2019) *Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces*

ASTM D714-02 (2017) *Standard Test Method for Evaluating Degree of Blistering of Paints*

ASTM D4214-07 (2015) *Standard Test Method for Evaluating Degree of Chalking of Exterior Paint Films*

ASTM D523-14 (2018) *Standard Test Method for Specular Gloss*

ASTM D2244-16 *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates*

## 2 Material

**2.1** The test specimen shall be the exact type and gauge of steel as used in the manufacture of the product. The specimen shall be a minimum of 4" (102 mm) × 6" (152 mm) with a 1/4" (6.4 mm) diameter hole at the center of the 4" (102 mm) width, 1/2" (12.7 mm) in from the end. Identification marks shall be added to the specimen as required for control purposes. The test specimen shall be handled at all stages of the process with clean gloves to prevent contamination.

**2.2** The specimen(s) shall be hung using a method representative of that used in production.

**2.3** The test specimen(s) shall be cleaned, pretreated and coated in accordance with the manufacturer's normal production method and procedure. All coating weights used on test specimens shall be documented and representative of the individual manufacturer's normal production material.

**2.4** At the end of the coating process, the specimen(s) shall be removed from the system and handled carefully. The coated surface of the specimen shall not be handled or come in contact with other objects in such a way as to disrupt the coated surface.



**2.5** Specimens shall be allowed to age at an ambient room temperature for a minimum 72 hour duration before any testing commences.

### 3 Testing

#### 3.1 Salt spray test

- a) *Apparatus* – The apparatus used for salt spray testing shall be of such design as to conform to ASTM B117.
- b) *Test performance* – Salt spray testing shall be conducted as specified in ASTM B117 for a test period of 120 continuous hours. The test specimen shall be scribed in accordance with ASTM D1654, section 6.1.

#### 3.2 Condensation testing (humidity)

- a) *Apparatus* – The apparatus used for condensation (humidity) testing shall be of such design to conform with ASTM D4585 / D4585M
- b) *Test performance* – Condensation (humidity) testing shall be conducted as specified in ASTM D4585 / D4585M, for a test period of 480 continuous hours. Exposure temperatures shall be maintained at a minimum of 100°F (38°C). To ensure adequate condensation, maintain at least a 20°F differential between the room and the vapor. Actual test temperature shall be noted in the report.

#### 3.3 Accelerated weathering test

- a) *Apparatus* – The apparatus used for accelerated weathering testing shall be of such design to conform with ASTM G154, The bulb type used shall be a UVA340.
- b) *Test performance* – Accelerated weathering testing shall be conducted in accordance with ASTM D4587, for a test period of 300 hours duration. The cycle schedule for operating this type of equipment shall be 18 hours of light exposure at 140°F (60°C) followed by a 6 hour condensation cycle at 120°F (49°C).

#### 3.4 Impact test

The coating shall be tested in accordance with ASTM D2794 with 20 inch pounds of direct impact using a Gardner Impact Tester with a 1/2" (12.7 mm) diameter ball or punch at room temperature of 70°-75°F (21°C-24°C). The test specimen shall be impacted at three locations

on the panel that have a dry film thickness within the tolerance range for the coating process. Apply one-inch (25.4 mm) wide, #600 Scotch cellophane pressure-sensitive tape firmly to the impact area and pull off sharply.

#### 3.5 Film adhesion test

The coating film adhesion shall be tested in accordance with method "B" of ASTM D3359. A total of (11) parallel cuts shall be made with a sharp instrument, 0.039" (1 mm) apart in both a vertical and horizontal direction forming a grid. One-inch (25.4 mm) wide #600 Scotch cellophane pressure sensitive-tape shall be firmly applied to the scribed surface and pulled off sharply.

#### 3.6 Abrasion test

The coating film shall be tested with a Taber Abraser Testing Apparatus using a No. CS-10 Resilient Calibrase Wheel in accordance with ASTM D4060. The specimen shall be run for a maximum of 1000 cycles, or until breakthrough of the finish coating occurs.

### 4 Acceptance criteria

#### 4.1 Salt spray resistance

The coating film on the unscored surface of the test specimen shall have a rust grade of no less than 6 as defined per ASTM D610. See Table 1 and Figure 1 herein for evaluation of the rust grades. The coating film at the scribe line shall not be undercut by rust more than 1/8" (3.2 mm) or a Rating Number 6 on each side of the scribe line when evaluated in accordance with and rated per ASTM D1654. See Table 2 herein, "Rating of failure at scribe (Procedure A)".

#### 4.2 Condensation resistance

The coating film shall be allowed to exhibit the dense pattern of #8 blisters, but shall have no more than the "few" pattern of #6 blisters as illustrated in the photographic reference ASTM D714. See Figures 2 through 5 herein for visual representations of the various degrees of blistering.

#### 4.3 Accelerated weathering resistance

When tested in accordance with Paragraph 3.3 herein, the paint film shall exhibit the following traits:

**Table 1 – Rust grades**

<b>Rust Grade</b>	<b>Maximum % of rusted area</b>
10	00.01
9	00.03
8	00.10
7	00.30
6	01.00
5	03.00
4	10.00
3	16.67
2	33.33
1	50.00
0	100.00

**4.3.1** No rust, checking, cracking, erosion or flaking shall be present.

**4.3.2** No more than the “few” pattern of #6 blisters as illustrated in the photographic reference ASTM D714. Visual representations of the various degrees of blistering are shown in Figures 2 through 5 herein.

**4.3.3** A degree of chalking not to exceed “visible” as described in test method B of ASTM D4214.

**4.3.4** No more than a 50% decrease in gloss when tested in accordance with ASTM D523.

**4.3.5** No more than a 10% change in color (fade) when tested in accordance with ASTM D2244.

#### **4.4 Impact test**

No coating film removal shall occur other than at an area  $\frac{1}{8}$ " (3.2 mm) in diameter at the center of the impact area, when tested in accordance with Paragraph 3.4 herein.

#### **4.5 Film adhesion**

There shall be no adhesion loss less than a grade 3B as defined in ASTM D3359. This grade represents a film removal of between 5 and 15%. Table 3 herein illustrates the various classifications for adhesion loss.

#### **4.6 Abrasion resistance**

The coating film shall have a wear index of 100 (0.10 mg weight loss per cycle) or less when tested in accordance with Paragraph 3.6 herein. The wear index shall be calculated using the actual number of cycles to which the specimen was subjected.

### **5 Report**

**5.1** The report shall state the date the test was performed and the issue date of the report.

**5.2** Identification of the specimen tested, source of supply, manufacturer, model or series number, or both, and any other pertinent information.

**5.3** A detailed description of the specimen or specimens tested shall include the type of prime or barrier coating if used, the method of coating application, the procedure used to cure it and the dry film thickness.

**5.4** Any modifications made on the test specimen to obtain the values of acceptance shall be noted and described in detail in the report.

**5.5** A statement that the test or tests were conducted in accordance with the methods and procedures as specified herein. If deviations from these methods and procedures were made, they shall be described in the report.

**5.6** When the test is made to check the conformance of the unit specimen to test requirements of a particular specification, the identification or description of the specification shall be included in the report.

### **6 General**

#### **6.1 Testing laboratory**

All tests shall be conducted and certified by a nationally recognized, independent testing laboratory.

#### **6.2 Certification**

When reference is made to this specification the following statement shall be used: “Finish coating has been tested in conformance with ANSI/SDI A250.3.”

Table 2 – Rating of failure at scribe (procedure A)

Representative Mean Creepage from Scribe		
Millimeters	Inches (Approximate)	Rating Number
Zero	0	10
Over 0 to 0.5	0 to 1/64	9
Over 0.5 to 1.0	1/64 to 1/32	8
Over 1.0 to 2.0	1/32 to 1/16	7
Over 2.0 to 3.0	1/16 to 1/8	6
Over 3.0 to 5.0	1/8 to 3/16	5
Over 5.0 to 7.0	3/16 to 1/4	4
Over 7.0 to 10.0	1/4 to 3/8	3
Over 10.0 to 13.0	3/8 to 1/2	2
Over 13.0 to 16.0	1/2 to 5/8	1
Over 16 to more	5/8 to more	0

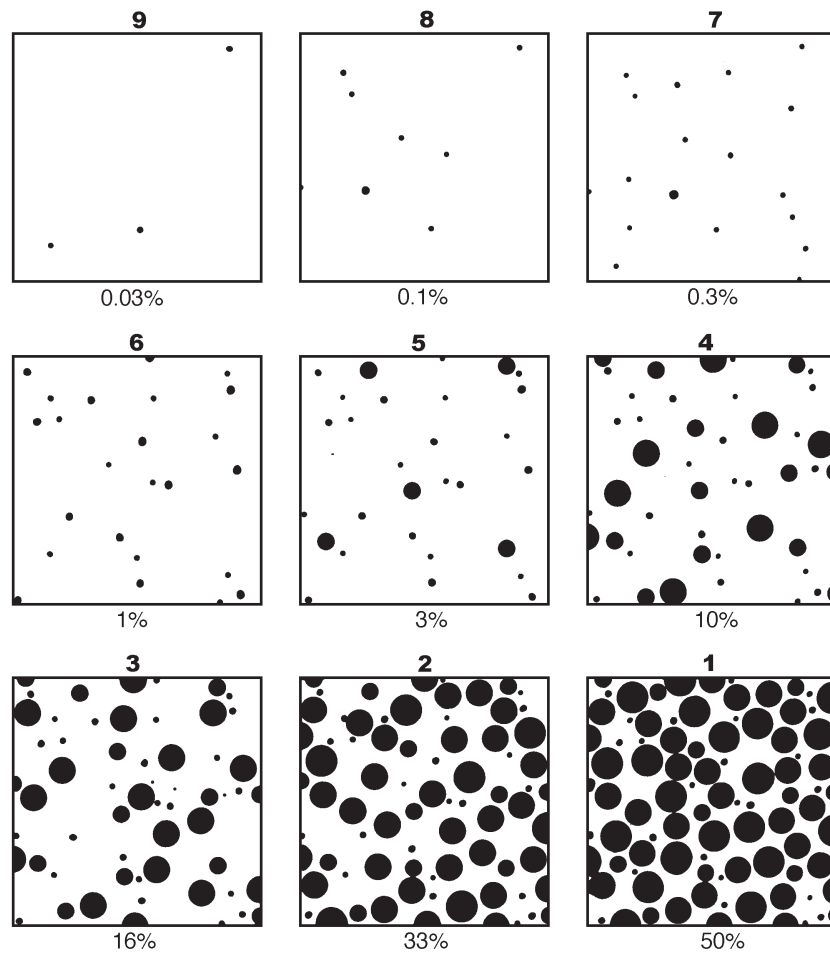
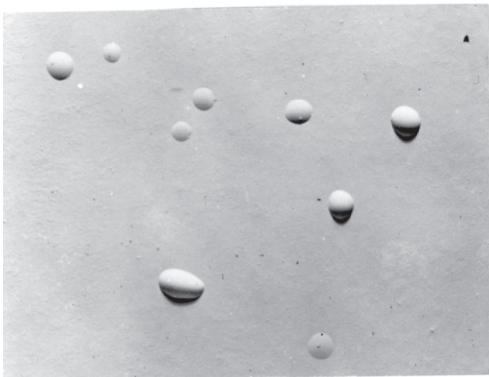
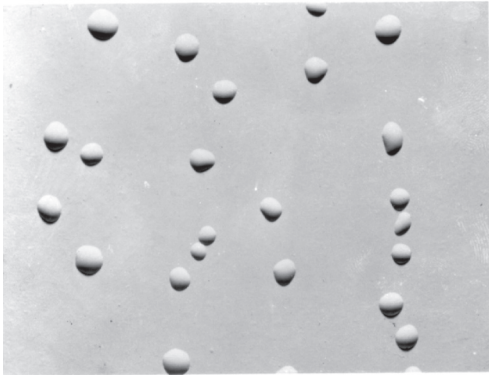


Figure 1 – Visual reference for percentage of rust

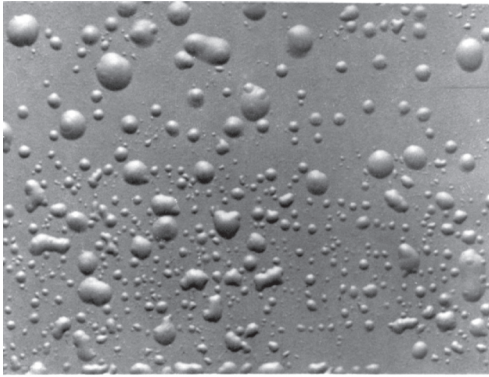
Visual examples illustrating degrees of blistering



FEW



MEDIUM

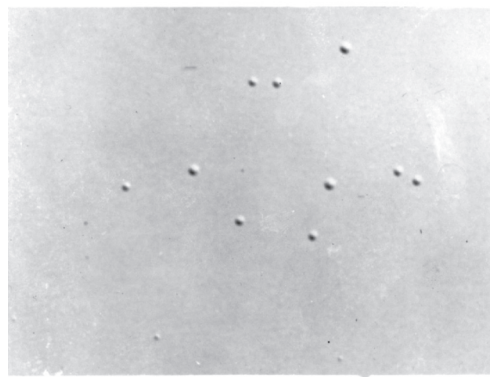


MEDIUM DENSE

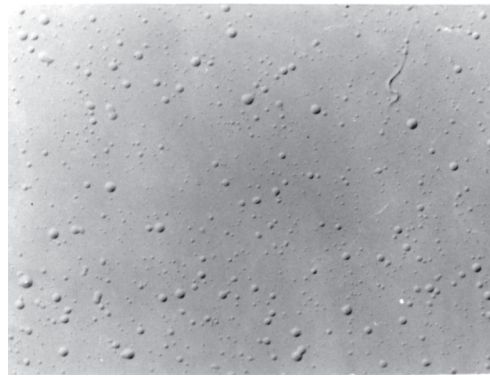


DENSE

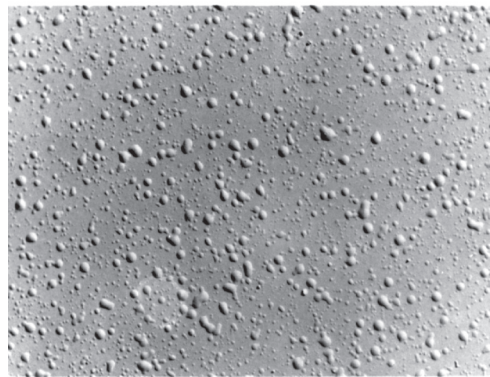
Figure 2 – Blister size #2



FEW



MEDIUM



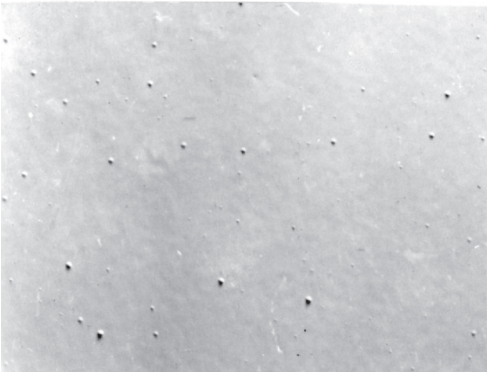
MEDIUM DENSE



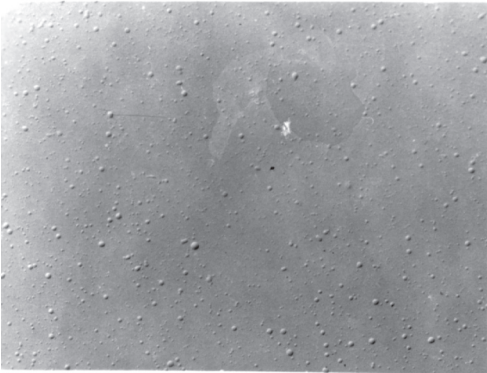
DENSE

Figure 3 – Blister size #4

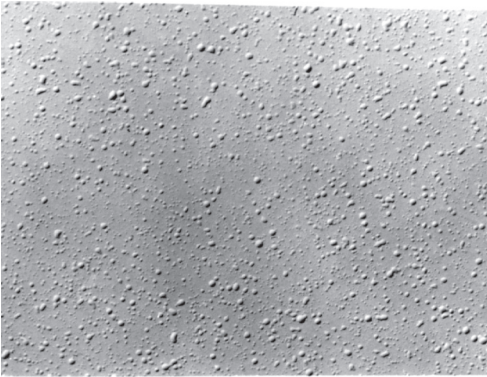
Visual examples illustrating degrees of blistering



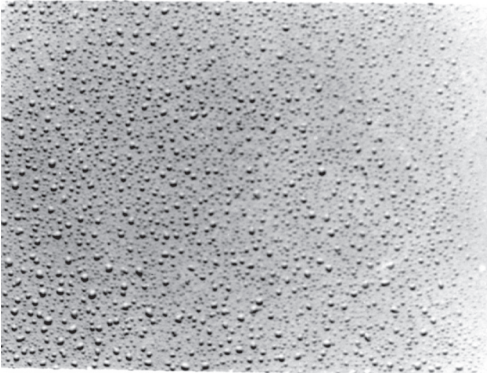
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MEDIUM



MEDIUM DENSE

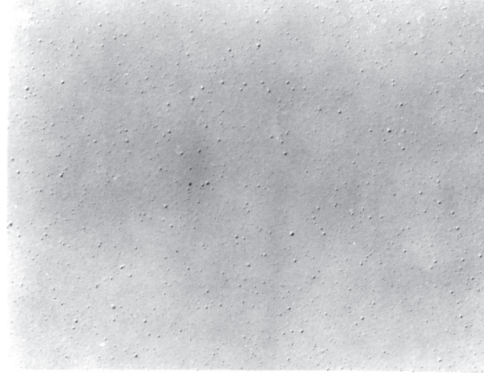


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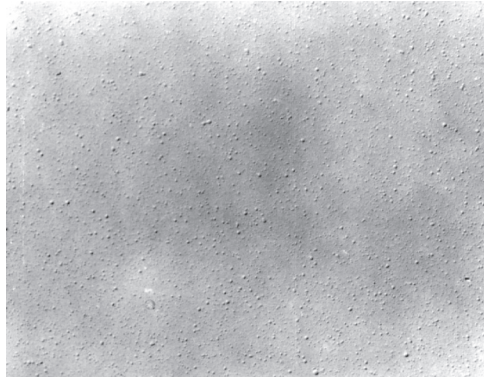
Figure 4 – Blister size #6



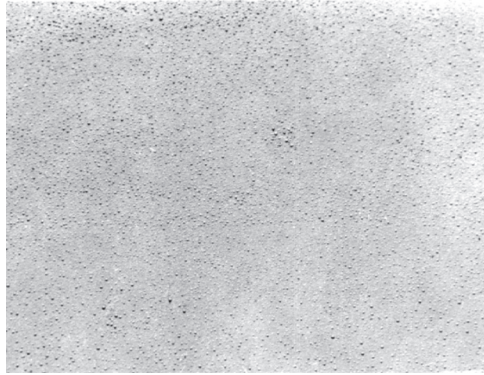
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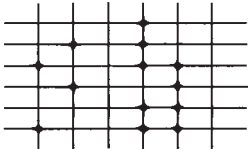
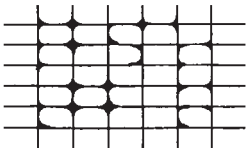
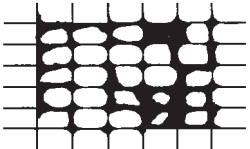

MEDIUM DENSE



DENSE

Figure 5 – Blister size #8

**Table 3 – Classification of adhesive test results**

Classification	Surface of cross-cut areas from which listing has occurred. (Example for six parallel cuts.)	Rate of adhesion
5B	None	The edges of the cuts are completely smooth; none of the squares or the lattice are detached.
4B		Small flakes of coating are detached at intersections; less than 5% of the area is affected.
3B		Small flakes of coating are detached along edges and at intersections of cuts. The area affected is 5 to 15% of the lattice.
2B		The coating has flaked along the edges and at parts of the squares. The affected area is 15 to 35% of the lattice.
1B		The coating has flaked along the edges of cuts in large ribbons and entire squares have detached. The area affected is 35 to 65% of the lattice.
0B	Flaking and detachment in excess of 65%.	



## AVAILABLE PUBLICATIONS

### 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
- SDI-136** Guideline for Specifying Windstorm Products

### 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 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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