

# **Zinc-Coated (Galvanized/Galvannealed) Steel Doors and Frames**



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**STEEL DOOR INSTITUTE**

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## **Zinc-Coated (Galvanized/Galvannealed) Steel Doors and Frames**

### **Purpose**

It is the intent of this document to provide information regarding the zinc-coated sheet used in steel door and frame construction when a requirement for zinc-coated doors and frames is specified. It should be noted that doors and frames of cold rolled or hot rolled steel are normally protected with a satisfactorily applied coat of rust inhibiting paint, and that zinc-coated doors and frames need only be specified when they are to be exposed to corrosive atmospheric conditions.

### **Applicable standards**

ASTM A 924/A 924M – Standard Specification for General Requirements For Steel Sheet, Metallic-Coated by the Hot-Dip Process.

ASTM A 653/A 653M – Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

### **Types of zinc coatings**

Galvanized steel doors and frames are fabricated from carbon steel sheet that has been coated with zinc on two sides by the continuous hot-dip process. The process results in a layer of zinc on each side of the steel sheet that is tightly adhered to the steel sheet through the formation of an iron-zinc alloy bonding layer that is formed by a diffusion process while the heated steel strip is in contact with the molten zinc. The relatively pure zinc coating exhibits a bright metallic color with a pronounced “spangled” appearance. These coatings have a free zinc spangled surface and may be processed in a manner that reduces spangle and results in a smooth dull-gray appearance. This type of coating is referenced with a “G” designation (or “Z” in SI Units).

Galvannealed steel doors and frames are fabricated from carbon steel sheet that has been coated by the continuous hot-dip process and further treated to convert the zinc coating into a zinc-iron alloy. The zinc coated sheet receives an in-line heat treatment immediately as the strip exits the molten zinc bath to convert the entire coating layer to a zinc-iron alloy by diffusion of iron from the sheet into the zinc coating. The galvannealed surface has a non-spangled matte finish with a nominal composition of 90% zinc and 10% iron. This type of coating is referred to with an “A” designation (or “ZF” in SI Units).

The galvannealed coating has several advantages compared to the galvanized coating: 1) improved paint adhesion; 2) the coated surface accepts paint very readily without a pretreatment (a pretreatment will enhance the performance); 3) the zinc-iron alloy coating can be welded more easily; and 4) the coating is harder and more resistant to manufacturing processes.

### **Coating designations**

Coating designations are written to represent the coating type, either G or A (Z or ZF in SI Units), and the coating weight. The coating weight is the amount of zinc on the steel surface and is expressed to represent the ounces per square foot of zinc as the total weight on both surfaces of the steel sheet.

### **Minimum coating weights**

There are two coating weights used to specify zinc-coated steel doors and frames. In a coating weight of 40 there are 0.4 ounces of zinc per square foot of steel, and in 60 there are 0.6 ounces of zinc per square foot of steel.

### Average coating thickness

The average coating thickness specified in table 1 is based on the conversion factor of one ounce of zinc coating per square foot of surface corresponding to an average coating thickness of 0.0017" (0.043 mm).

This coating thickness is not significant enough to make an appreciable difference in the measurable thickness of coated or uncoated steel of the same gage.

Refer to table 1 showing the coating designations, minimum coating weights, and average coating thickness.

Corrosion resistance is directly proportionate to coating weight. The heavier the coating weight the more zinc is present and the more corrosion protection it will provide. Therefore, under normal atmospheric conditions a 60 designation will provide 50% more corrosion protection than a 40 designation coating.

### Painting

Painting zinc-coated steel is recommended. In the factory, steel is first chemically treated to ensure proper paint adhesion; then a factory applied coating of rust inhibiting primer is applied to the fabricated doors and frames. When additional priming is required, care must be taken to ensure compatibility with the factory-applied zinc surface.

### NOTES:

- **Zinc-coating after fabrication is not available due to thermal distortion of the product.**
- **Although sometimes specified, the G Type zinc-coating designation is not recommended for door and frame construction.**

**Table 1 – Coating designations, minimum coating weights, and average coating thickness**

Type	Coating Designation		Coating Weight				Average Coating Thickness / Side	
			Minimum Check Limit Triple Spot Test		Minimum Check Limit Single Spot Test			
	in-lb	SI	oz/ft² *	g/m² *	oz/ft² *	g/m² *	inches	mm
Galvanized	G60	Z180	0.60	180	0.50	150	.0005	.013
	G40	Z120	0.40	120	0.30	90	.0003	.009
Galvannealed	A60	ZF180	0.60	180	0.50	150	.0005	.013
	A40	ZF120	0.40	120	0.30	90	.0003	.009

\* NOTE: The weight of coating refers to the total coating on both surfaces.

## 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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