



# Standard Specification for Steel Sheet, Zinc and Aramid Fiber Composite Coated for Corrugated Steel Sewer, Culvert, and Underdrain Pipe<sup>1</sup>

This standard is issued under the fixed designation A 885/A 885M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers steel sheet, composite coated, used in the manufacture of corrugated pipe used for sewers, culverts, and underdrains. The composite coating consists of a layer of aramid nonwoven fabric bonded by molten zinc to the steel sheet, to act as a bonding medium for asphalt coatings later applied to fabricated products. Material for this use is furnished in coils, flat in cut lengths, and corrugated in cut lengths.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not equivalents; therefore, each system must be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.

1.3 This specification and some referenced specifications are expressed in both inch-pound and SI units. If the order specifies the applicable “M” specification designation, the product shall be furnished to SI units.

NOTE 1—Steel sheet with other metallic coatings is described in Specification A 929/A 929M.

## 2. Referenced Documents

### 2.1 ASTM Standards:

A 760/A 760M Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains<sup>2</sup>

A 796 Practice for the Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Buried Applications<sup>2</sup>

A 902 Terminology Relating to Metallic Coated Steel Products<sup>2</sup>

A 924/A 924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process<sup>2</sup>

A 929/A929M Specification for Steel Sheet, Metallic-

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.06.

Coated by the Hot-Dip Process, for Corrugated Steel Pipe<sup>2</sup>  
B 6 Specification for Zinc<sup>3</sup>

D 1682 Test Methods for Breaking Load and Elongation of Textile Fabric<sup>4</sup>

D 3850 Test Method for Rapid Thermal Degradation of Solid Electrical Insulating Materials by Thermogravimetric Method TGA<sup>5</sup>

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>6</sup>

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology A 902. The following definitions are as stated in that terminology.

3.1.1 *fabricator, n*—as related to corrugated metal pipe, (1) the organization that produces the finished pipe or (2) for structural plate pipe, the organization that processes flat sheets and other items needed for field assembly of the finished products.

3.1.2 *manufacturer, n*—as related to corrugated metal pipe, the organization that produces the metal sheet from which pipe is made.

3.1.3 *purchaser, n*—as related to corrugated metal pipe, the person or agency that purchases the finished pipe.

3.1.4 *Discussion*—With regard to this specification for sheet for corrugated steel pipe, the fabricator may also be considered as the purchaser of the sheet, where that term is used in this specification. Such interpretation would not restrict the purchaser of the finished pipe from enforcing any provisions of this specification.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *composite coating*—the total coating on top of the steel substrate, including the zinc and the aramid fibers.

3.2.2 *nonwoven fabric*—a fabric that is neither woven, knitted, nor spun, but built up by the interlocking of fibers by chemical bonding agents, or of fusible fibers by mechanical

<sup>3</sup> Annual Book of ASTM Standards, Vol 02.04.

<sup>4</sup> Discontinued—See 1991 Annual Book of ASTM Standards, Vol 07.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 10.02.

<sup>6</sup> Annual Book of ASTM Standards, Vol 14.02.

works, chemical action, moisture, and heat.

#### 4. Ordering Information

4.1 All sheet, both flat and formed, covered by this specification is ordered only to the specified thicknesses listed in Table 1.

4.2 Orders for material to this specification shall include the following information, as necessary, to describe the desired product adequately:

4.2.1 Name of material (composite-coated steel sheet for corrugated pipe);

4.2.2 ASTM designation and year of issue, as A 885 for inch-pound units or A 885M for SI units;

4.2.3 *Quantity and Dimensions*:

4.2.3.1 *Cut Lengths*—Show the number of sheets; thickness; width, either flat or overall corrugated; length; and pitch and depth of corrugations, if corrugated;

4.2.3.2 *Coiled Sheet*—Show the total weight [mass]; thickness; width; and coil requirements (maximum outside diameter, acceptable inside diameter, and maximum weight [mass] of individual coils);

4.2.4 Certification, if required (see 12.1); and

4.2.5 Special requirements.

NOTE 2—A typical ordering description (inch-pound units) is as follows: composite-coated steel sheet for corrugated pipe in accordance with ASTM A 885, 5000 sheets, 0.064 by 25½ by 60 in. with 2⅔ by ½ in. corrugations, certified.

NOTE 3—A typical ordering description (SI units) is as follows: composite-coated steel sheet for corrugated pipe in accordance with ASTM A 885M, 45 000 kg, 2.77 by 700 mm by coil, 1500 mm max outside diameter, 600 mm inside diameter, 7000 kg max, certified.

#### 5. Materials and Manufacture

5.1 Both sides of the steel sheet shall be coated with a layer of aramid nonwoven fabric applied by pressing the fabric into the molten zinc bonding medium.

NOTE 4—Composite coating weight [mass] tests are not made by the manufacturer, and there are no specified values for the weight [mass] of zinc used for bonding the fabric to the base metal. The primary function of the zinc is to bond the fabric to the base metal. However, in the case of accidental damage to the coating, the zinc bonding layer will also provide galvanic protection to the base metal.

5.2 *Aramid Nonwoven Fabric*—The aramid fabric shall consist of an aramid nonwoven sheet. The ordered weight of fabric shall be 0.75 lb/100 ft<sup>2</sup> [36.5 g/m<sup>2</sup>].

**TABLE 1 Sheet Thickness for Composite-Coated Sheets**

NOTE 1—Thickness is measured on the tangents of corrugations on the sheet not less than ⅜ in. [10 mm] from an edge.

Specified Thickness, <sup>A</sup> with Coating, in. [mm]	Minimum Thickness, without Coating, in. [mm]
0.064 [1.63]	0.054 [1.37]
0.079 [2.01]	0.069 [1.75]
0.109 [2.77]	0.098 [2.49]
0.138 [3.51]	0.126 [3.20]
0.168 [4.27]	0.156 [3.96]

<sup>A</sup>The specified thickness corresponds to specified thicknesses used in pipe design (Practice A 796) and referenced in the pipe specification (Specification A 760/A 760M) and is used here for convenient reference. However, as stated in 9.1, the minimum thickness of composite-coated sheet is based on measurements of uncoated sheet. The thickness of coating on composite-coated sheet may not be the same as on sheets with other metallic coatings.

5.2.1 *Breaking Strength*—The breaking strength of the fabric shall be a minimum of 20 lbf [90 N] in the machine direction and 15 lbf [67 N] in the cross direction when measured in accordance with Test Methods D 1682.

5.2.2 *Thermal Stability*—The fabric shall show less than 10 % weight loss at temperatures up to 752°F [425°C] when analyzed using thermal gravimetric analyses in accordance with Test Method D 3850.

5.3 *Zinc Bonding Medium*—The zinc used for bonding the aramid fabric to the steel sheet shall conform to Specification B 6 and shall be at least equal to the grade designated as “Prime Western.”

#### 6. Chemical Composition

6.1 *Base Metal Analysis*—The base metal cast and product analyses shall conform to the chemical requirements of Table 2.

#### 7. Mechanical Properties

7.1 The base metal for composite-coated sheet shall conform to the mechanical requirements of Table 3.

7.2 Two tension tests shall be made on random samples of the material prior to coating from each cast or heat. When the material from said cast or heat is less than 50 tons [45 Mg], one test is sufficient. When material rolled from one cast or heat differs 0.050 in. [1.25 mm] or more in thickness, one tension test shall be made from both the thickest and thinnest material rolled regardless of the weight [mass] represented. The samples shall be prepared and tested in accordance with the method specified in Specification A 924/A 924M.

#### 8. Aramid Nonwoven Fabric Bond Strength

8.1 There shall be no spalling or cracking of the coating when tested in accordance with 8.2. There shall be no disbonding of the coating at the cut to be made as described in 8.2.

8.2 Cut a 2 by 8-in. [50 by 200–mm] coupon from the sample of composite-coated steel sheet. Bend the coupon 180° over a 0.5-in. [13–mm] diameter mandrel. Make a cut through the composite coating along an element on the outside of the bend to check for aramid fabric adhesion. Perform this test at 0, 77, and 122 ± 2°F [–18, 25, and 50 ± 1°C].

#### 9. Dimensions and Tolerances

9.1 *Thickness*—Sheet thickness shall conform to the dimensions in Table 1. The thickness measurements made on finished sheets shall be made after removal of the composite coating. If corrugated, the measurement shall be made on the tangent part of the corrugation.

9.2 *Length*—Permissible variations in the length of cut-length sheets, both flat and corrugated, shall be in accordance with Specification A 924/A 924M.

**TABLE 2 Chemical Composition**

	Cast Analysis	Product Analysis
Sulfur, max, %	0.05	0.06
Sum of carbon, manganese, phosphorus, sulfur, and silicon, max, %	0.70	0.74

**TABLE 3 Mechanical Requirements (Properties of Flat Sheet Prior to Fabrication)<sup>A</sup>**

Tensile strength, min, <sup>B</sup> ksi [MPa]	45.0 [310]
Yield strength, min, <sup>B</sup> ksi [MPa]	33.0 [230]
Elongation in 2 in. [50 mm], <sup>C</sup> min, %	20

<sup>A</sup>To determine conformance with this specification, round each value for tensile strength and yield strength to the nearest 0.1 ksi [1 MPa] and each value for elongation to the nearest 1 %, both in accordance with the rounding method of Practice E 29.

<sup>B</sup>Yield strength and tensile strength are based on the thickness of the base metal. If tests are made after coating, determine the base metal thickness after stripping the coating from the ends of the specimen contacting the grips of the tension testing machine prior to tensile testing.

<sup>C</sup>The elongation requirement does not apply to material tested after corrugating.

9.3 *Flat Sheet*—Permissible variations in the width and camber of flat materials shall be in accordance with Specification A 924/A 924M. Flatness tolerances shall be in accordance with Specification A 929/A 929M.

#### 9.4 *Corrugated Sheet:*

9.4.1 *Corrugations*—Corrugations shall form smooth continuous curves and tangents. The dimensions of the corrugations shall be in accordance with Table 4.

9.4.2 *Covering Width and Lip Dimension*—The covering width of corrugated sheet shall be in accordance with Table 5. The covering width is the distance between the crests of the extreme corrugations. The lip dimension of corrugated sheet shall be in accordance with Table 6 and is measured along the radial curvature from the crest of the corrugation to the edge of the sheet. There is no established tolerance for overall width since the covering width and lip dimensions are the governing factors for the formed product.

### 10. Testing

10.1 The manufacturer shall make such tests and measurements as deemed necessary to ensure that the coated sheet produced complies with this specification.

10.2 The purchaser may make tests and measurements as determined to be necessary to confirm conformance with this specification.

10.3 *Chemical Analysis of Steel*—Heat analysis (by the manufacturer) and product analysis (by the purchaser) shall be in accordance with Specification A 924/A 924M.

10.4 *Mechanical Testing*—Mechanical property tests shall be conducted on the sheet prior to corrugating or other

**TABLE 4 Corrugation Size**

Nominal Size, in. [mm]	Maximum Pitch, <sup>A</sup> in. [mm]	Minimum Depth, <sup>B</sup> in. [mm]	Radius of Curvature, in. [mm]	
			Nominal	Minimum
2 2/3 by 1/2 [68 by 13]	2 7/8 [73]	0.48 [12]	11/16 [17]	0.5 [13]
3 by 1 [75 by 25]	3 1/4 [83]	0.95 [24]	9/16 [14]	0.5 [13]

<sup>A</sup> Pitch is measured from crest to crest of the corrugations at 90° to the direction of the corrugations.

<sup>B</sup> Depth is measured as the vertical distance from a straight edge resting on the corrugation crests to the bottom of the intervening valley.

**TABLE 5 Covering Width Tolerance for Corrugated Sheet**

Covering Width, in. [mm], incl	Tolerance Over and Under, in. [mm]
To 24 [610]	1/4 [6.4]
Over 24 [610] to 36 [910]	3/8 [9.5]

**TABLE 6 Corrugated Sheet Lip Dimensions**

Nominal Corrugation Size, in. [mm]	Lip Dimensions, <sup>A</sup> in. [mm]
2 2/3 by 1/2 [68 by 12.7]	3/4 [19]
3 by 1 [76 by 25]	7/8 [22]

<sup>A</sup> The tolerance for lip dimensions is +3/16 in. [5 mm], -0.

fabrication, when possible, and shall be in accordance with Specification A 924/A 924M. If tests are made after corrugating, specimens shall be taken on the tangents of corrugations and used for the determination of tensile and yield strengths only.

### 11. Rejection and Rehearing

11.1 Material tested by the purchaser and found not conforming to this specification may be rejected, subject to the rejection and rehearing provisions of Specification A 924/A 924M.

### 12. Certification

12.1 When specified in the purchase order or contract, a manufacturer's certification shall be furnished to the purchaser. The certification shall be in accordance with the provisions of Specification A 924/A 924M and shall include reference to this product specification designation (A 885/A 885M).

12.2 Test results, including the chemical composition and mechanical properties for each heat and coating lot, shall be maintained by the manufacturer for seven years without regard to whether a certification was furnished. The test results shall be made available to the fabricator and purchaser upon request.

### 13. Product Marking

13.1 Each 2 to 5 ft [0.5 to 1.5 m] of sheet in coils or cut lengths shall be identified by showing the following:

13.1.1 Name of manufacturer,

13.1.2 Brand name,

13.1.3 Specified thickness,

13.1.4 Identification symbols relating to a specific heat number and coating lot number, and

13.1.5 ASTM designation number.

13.2 The brand shall be removed or obliterated, or the sheet re-branded "non specification," on each 2 to 5 ft [0.5 to 1.5 m] of sheet in a coating lot or heat where control tests, as prescribed herein, show nonconformance to this specification.

### 14. Keywords

14.1 coatings, composite; coatings, metallic; coatings, zinc; corrugated steel pipe; pipe, corrugated steel; steel sheet, composite-coated; steel sheet, metallic coated; steel sheet, zinc-coated; zinc-coated steel sheet

 **A 885/A 885M**

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