



Standard Specification for Composite Corrugated Steel Pipe for Sewers and Drains¹

This standard is issued under the fixed designation A1042/A1042M; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers composite corrugated steel pipe, intended for uses such as storm water drainage, sanitary sewers, underdrains, construction of culverts, and similar uses. The composite material used in fabrication of the pipe consists of a three-layer polymer protective coating on both sides of a steel sheet core. The three layers consist of an inner layer of fusion-bonded epoxy on the steel surface, an intermediate layer of polyethylene adhesive, and an outer layer of high-density polyethylene.

1.2 The three-layer polymer coating protects the base metal against corrosion or abrasion, or both. Severe environments are likely to cause corrosion problems to accessory items such as coupling band hardware unless supplemental protection is provided. Additional protection for composite steel pipe is available by use of coatings applied after fabrication of the pipe as described in Specification A849.

1.3 This specification does not include requirements for bedding, backfill, or the relationship between earth cover load and sheet thickness of the pipe. Experience with drainage products has shown that successful performance depends upon the proper selection of corrugation profile, sheet thickness, type of bedding and backfill, controlled manufacture in the plant, and care in installation. The installation procedure is described in Practice A798/A798M.

1.4 This specification is applicable to orders in either inch-pound units as A1042, or in SI units as A1042M. Inch-pound units and SI units are not necessarily equivalent. SI units are shown in brackets in the text for clarity, but they are the applicable values when the material is ordered to A1042M.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

¹ This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.17 on Corrugated Steel Pipe Specifications.

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2. Referenced Documents

2.1 ASTM Standards:²

- A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A307 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- A563 Specification for Carbon and Alloy Steel Nuts
- A563M Specification for Carbon and Alloy Steel Nuts (Metric)
- A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
- A742/A742M Specification for Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe
- A796/A796M Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Buried Applications
- A798/A798M Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
- A849 Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
- A902 Terminology Relating to Metallic Coated Steel Products
- B633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- C443 Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
- D1056 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- F568M Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners (Metric)

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Pipe Sizes

Nominal Inside Diameter		Corrugation Sizes			
in.	mm	2- ² / ₃ by 1/2 in. [68 by 13 mm]	3 by 1 in. [75 by 25 mm] 5 by 1 in. [125 by 25 mm]	1/2 by 1/4 in. [13 by 6.5mm]	9/16 by 3/8 in. [15 by 10 mm]
6	150			x	
8	200			x	
10	250			x	
12	300	x		x	x
15	375	x		x	x
18	450	x		x	x
21	500	x		x	x
24	600	x			x
27	675	x			x
30	750	x			x
33	825	x			x
36	900	x	x		x
42	1050	x	x		
48	1200	x	x		
54	1350	x	x		
60	1500	x	x		
66	—	x	x		
72	1800	x	x		
78	1950	x	x		
84	2100	x	x		
90	2250		x		
96	2400		x		
102	2550		x		
108	2700		x		
114	2850		x		
120	3000		x		
126	3150		x		
132	3300		x		
138	3450		x		
144	3600		x		

NOTE—An “x” indicates standard composite corrugated profiles for each nominal diameter of pipe.

2.2 AASHTO Standard:

T249M Test for Helical Lock Seam Corrugated Pipe³

2.3 ANSI/AWWA Standard:

C213 Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines⁴

3. Terminology

3.1 *General Definitions*—For definitions of general terms used in this standard, refer to Terminology **A902**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *fabricator*—the producer of the pipe.

3.2.2 *manufacturer*—the producer of the sheet.

3.2.3 *purchaser*—the person or agency that purchases the finished product.

4. Classification

4.1 The composite corrugated steel pipe covered by this specification is classified as follows:

³ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001.

⁴ Available from American Water Works Association, 6666 West Quincy Ave., Denver, CO 80235.

4.1.1 *Type IC*—This pipe shall have a full circular cross section, with a single thickness of corrugated sheet, fabricated with helical corrugations.

4.1.2 *Type ICS*—This pipe shall have a full circular cross section, with an outer shell of corrugated sheet, fabricated with helical corrugations and lock seams, and an inner liner of high-density polyethylene.

5. Ordering Information

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

5.1.1 Name of material (composite corrugated steel pipe),

5.1.2 ASTM designation and year of issue, as A 1042-XX for inch-pound units or as A 1042M-XX for SI units,

5.1.3 Type of pipe (4.1),

5.1.4 Diameter of circular pipe (Table 1),

5.1.5 Length, either total length or length of each piece and number of pieces,

5.1.6 Description of corrugations (7.2),

5.1.7 Sheet thickness (8.1.2),

5.1.8 Coupling bands, number, and type (9.1) if special type is required,

TABLE 2 Corrugation Requirements

Nominal Size	Maximum Pitch ^A	Minimum Depth ^B	Nominal Inside Radius ^C	Minimum Inside Radius
inches				
2- ² / ₈ by 1/2	2- ⁷ / ₈	0.48	¹ / ₁₆	0.50
3 by 1	3- ¹ / ₄	0.95	⁹ / ₁₆	0.50
5 by 1	5- ⁵ / ₁₆	0.95	1.57	1.4
1/2 by 1/4	⁹ / ₁₆	0.24	¹ / ₈ ^D	0.09
⁹ / ₁₆ by ³ / ₈	5/8	0.40	¹ / ₈	0.09
millimetres				
68 by 13	73	12	17	12
75 by 25	83	24	14	12
125 by 25	135	24	40	36
13 by 6.5	14	6.1	3.2 ^D	2.3
15 by 10	16	10.2	3.2	2.3

^A Pitch is measured from crest to crest of corrugations, at 90° to the direction of the corrugations.

^B Depth is measured as the vertical distance from a straightedge resting on the corrugation crests parallel to the axis of the pipe to the bottom of the intervening valley. If the depth measurement of one or more corrugations is less than the value indicated herein, the depth of all corrugations between the seams shall be measured, and the requirements of [Table 3](#) shall be applied (see [7.2.1](#)).

^C Minimum inside radius requirement does not apply to a corrugation containing a lock seam. The term “outside” refers to the outside surface of the pipe.

^D Average of nominal inside radius (0.162 in.) [4.1 mm] of outer corrugations and nominal inside radius (0.094 in.) [2.4 mm] of inner corrugations.

5.1.9 Gaskets for coupling bands, if required ([9.5](#)),

5.1.10 Certification, if required ([14.1](#)), and

5.1.11 Special requirements.

6. Materials and Manufacture

6.1 *Steel Sheet for Pipe*—All pipe fabricated under this specification shall be formed from polymer coated sheet conforming to [Annex A1](#) of this specification.

6.2 *Steel Sheet for Coupling Bands*—The sheet used in fabricating coupling bands shall be one of the following: the same material as that specified for fabrication of the pipe furnished under the order, with the same three-layer polymer coating; polymer precoated sheet conforming to Specification [A742/A742M](#); stainless steel sheet of a grade selected by the fabricator.

6.3 *Steel Sheet for Connecting Straps*—The sheet used in fabricating connecting straps for flange type couplings shall be one of the following: carbon steel sheet meeting the steel substrate requirements of [Annex A1.3](#) or stainless steel sheet of a grade selected by the fabricator.

6.3.1 Except for stainless steel straps, connecting straps shall be zinc coated after fabrication by one of the processes of [6.4.1](#).

6.4 *Hardware for Couplings*—Bolts and nuts for couplings shall conform to the following requirements:

	Bolts	Nuts
For A XXX pipe	A307	A563, Grade A
[For A XXXM pipe]	[F568M , Class 4.6]	[A563M , Class 5]

6.4.1 Bolts, nuts, and other threaded items used with couplings shall be zinc coated by one of the following processes: hot-dip process as provided in Specification [A153/A153M](#); electroplating process as provided in Specification [B633](#), Class Fe/Zn 8; or mechanical process as provided in Specification [B695](#), Class 8. Other hardware items used with coupling bands shall be zinc coated by one of the following processes: hot-dip process as provided in Specification [A153/A153M](#); electroplating process as provided in Specification [B633](#), Class Fe/Zn 25; or mechanical process as provided in Specification [B695](#), Class 25.

6.4.2 As an alternative to the materials in [6.4](#) and coating processes in [6.4.1](#), stainless steel bolts and nuts of a grade selected by the fabricator are permitted to be used.

6.5 *Gaskets*—If gaskets are used in couplings, they shall be a band of expanded rubber that meets the requirements of Specification [D1056](#) for the “RE” closed cell grades, O-rings meeting the requirements of Specification [C443](#), or other material approved by the purchaser.

7. Fabrication

7.1 *General Requirements*—Pipe shall be fabricated in full circular cross section.

7.1.1 Type IC pipe shall be fabricated with helical corrugations and a continuous lock seam extending helically from end to end of each length of pipe.

7.1.2 Type ICS pipe shall be fabricated with helical corrugations and a continuous helical lock seam extending from end to end of each length of pipe, and with a smooth high-density polyethylene liner thermally bonded to the pipe polymer coating at each interior corrugation crest over the length of the pipe. The minimum thickness of the liner shall be 0.020 in. [0.50 mm].

7.2 *Corrugations*—The corrugations shall be helical as provided in [7.1.1](#). The direction of the crests and valleys of the helical corrugations shall not be less than 60° from the axis of the pipe for pipe diameters larger than 21 in. [525 mm], and not less than 45° from the axis for pipe diameters of 21 in. [525 mm] and smaller.

7.2.1 The corrugations shall form smooth continuous curves, or curves and tangents. The dimensions of the corrugations shall be in accordance with [Table 2](#) for the nominal size indicated on the order. If the depth measurement of one or more corrugations is less than the specified minimum depth in [Table 2](#), the depth of all the corrugations between adjacent seams shall be measured and the values in [Table 3](#) for minimum average depth and minimum corrugation depth shall apply.

NOTE 1—Inspection frequently consists of measurement of the depth of one or a few corrugations. If such measurement indicates insufficient