



Designation: A 978/A 978M – 97

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
Reprinted from the Annual Book of ASTM Standards. Copyright ASTM

Standard Specification for Composite Ribbed Steel Pipe, Precoated and Polyethylene Lined for Gravity Flow Sanitary Sewers, Storm Sewers, and Other Special Applications¹

This standard is issued under the fixed designation A 978/A 978M; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification covers composite ribbed steel pipe, precoated and polyethylene lined intended for use for gravity flow sanitary sewers, storm sewers, and other special applications such as water transmission pipe, rehabilitation pipe, slip line pipe, and irrigation pipe where extra corrosion and abrasion resistance are required. The steel sheet used in the fabrication of the pipe has a polymer coating over a metallic coating of zinc on both sides. In addition, as the pipe is being fabricated, the ribs are filled with polyethylene and then a polyethylene liner is extruded onto the interior surface.

1.2 The exterior polymer precoating provides extra protection of the steel against soilside corrosion, in addition to that provided by the metallic coating, and also provides a dielectric barrier for cathodic protection. The interior polymer precoating provides an adhesive layer between the galvanized steel and the polyethylene lining. The applied lining provides internal protection against corrosion, erosion, and abrasion. By filling the rib which has a deltoid shape (smaller at the opening in the pipe wall than at the bottom of the rib), the polyethylene is mechanically connected to the pipe wall and the polyethylene liner is then thermally bonded to the filled rib.

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 has shown that the successful performance of this product depends upon the proper selection of sheet thickness, type of bedding and backfill, controlled manufacture in the plant, and care in the installation. The installation procedure is described in Practice A 798.

1.4 This specification is applicable to orders in either inch-pound units as A 978, or in SI units as A 978M. 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 A 978M.

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 limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

- A 90/A 90M Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coating²
- A 153/A 153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware²
- A 307 Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength³
- A 563 Specification for Carbon and Alloy Steel Nuts³
- A 563M Specification for Carbon and Alloy Steel Nuts [Metric]³
- A 742/A 742M Specification for Steel Sheet Metallic Coated and Polymer Precoated for Corrugated Steel Pipe²
- A 780 Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings²
- A 796 Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Applications²
- A 798 Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications²
- A 902 Terminology Relating to Metallic Coated Steel Products²
- A 926 Test Method for Comparing the Abrasion Resistance of Coating Materials for Corrugated Metal Pipe²
- A 929/A 929M Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe²
- B 633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel⁴
- B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel⁴
- C 443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets⁵
- C 443M Specification for Joints for Circular Concrete

¹ This specification is under the jurisdiction of ASTM Committee A-5 on Metallic Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.17 on Corrugated Steel Pipe Specification.

Current edition approved Oct. 10, 1997. Published November 1998.

² Annual Book of ASTM Standards, Vol 01.06.

³ Annual Book of ASTM Standards, Vol 15.08.

⁴ Annual Book of ASTM Standards, Vol 02.05.

⁵ Annual Book of ASTM Standards, Vol 04.05.

TABLE 1 Rib Requirements for Steel Pipe

Nominal Size	Deltoid Shaped Rib				Bottom Outside Radius, Min	Bottom Outside Radius, ^E Max Avg	Top Outside Radius, Min	Top Outside Radius, ^E Max Avg
	Narrowest Width, ^A Min	Widest Width, ^B Min	Depth, ^C Min	Spacing, ^D Max				
A 978, in.								
¾ by ¾ by 7 ½	0.45	0.68	0.73	7 ½	0.10	0.25	0.10+t	0.25+t
¾by 1 by 11 ½	0.45	0.68	0.90	11 ¾	0.10	0.25	0.10+t	0.25+t
A 978M, mm								
19 by 19 by 190	12	17	19	190	2.5	6.0	2.5+t	6.0+t
19 by 25 by 292	12	17	23	298	2.5	6.0	2.5+t	6.0+t

^ANarrowest width is a dimension of the inside of the rib measured on the inside of the pipe.

^BWidest width is a dimension of the inside of the rib but is measured on the outside of the pipe (outside of the rib) and shall meet or exceed the stated minimum width plus two times the wall thickness (that is, $2t + 0.68$ in. ($2t + 17$ mm)).

^CDepth is an average of the ribs within a sheet width measured from the inside by placing a straight edge across the open rib and measuring to the bottom of the rib.

^DSpacing is an average of three adjacent ribs (one sheet width) spacings for ¾ by ¾ × 7 ½ in. pipe and two adjacent rib (one sheet width) spacings for the ¾ × 1 × 11 ½ in. pipe measured center-to-center of the ribs, at 90° to the direction of the ribs.

^EThe average of the two top rib radii and of the two bottom radii shall be within the minimum and maximum tolerances. The term "outside" refers to the outside surface of the pipe.

Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]⁵
D 638/D 638M Test Method for Tensile Properties of Plastics⁶

D 792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement⁶

D 1005 Test Methods for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers⁷

D 1056 Specification for Flexible Cellular Materials, Sponge or Expanded Rubber⁸

D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plasometer⁶

D 2240 Test Method for Rubber Property—Durometer Hardness⁹

D 1435 Practice for Outdoor Weathering of Plastics⁶

D 3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals¹⁰

D 5576 Practice for Determination of Structural Entities in Polyolefins by Fourier Transform Infrared Spectroscopy (FT-IR)¹¹

D 5630 Test Method for Ash Content in Thermoplastics¹¹

F 568 Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners³

F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs³

F 594 Specification for Stainless Steel Nuts³

F 738M Specification for Stainless Steel Metric Bolts, Screws, and Studs³

F 836M Specification for Stainless Steel Metric Nuts³

2.2 AASHTO Standard:

T 249 Test for Helical Lock Seam Corrugated Pipe¹²
Specifications for Highway Bridges, Division 2, Section 26¹²

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology A 902.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *composite, n*—the joining of steel and plastic to achieve a synergy of desirable characteristics not attainable by either material alone.

3.2.2 *deltoid shape, n*—the open triangular shape of the rib profile, which has a greater dimension at the base (away from the pipe wall) than at the peak (opening at the interior wall of the pipe).

3.2.3 *extruded liner, n*—a liner produced by a process that applies melted polyethylene into the ribs and sequentially extrudes a liner over the top of the rib openings and across the adjacent flats while the pipe is being fabricated.

3.2.3 *extruded liner, n*—a liner produced by a process that applies melted polyethylene into the ribs and sequentially extrudes a liner over the top of the rib openings and across the adjacent flats while the pipe is being fabricated.

4. Ordering Information

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

4.1.1 Name of material (composite ribbed steel pipe, pre-coated and polyethylene lined),

4.1.2 Type of metallic coating (zinc) (see 5.1),

4.1.3 ASTM designation and year of issue, as A 978 for inch-pound units or as A 978M for SI units,

4.1.4 Rib size and spacing (see Table 1). If not stated, either size and spacing combination may be furnished,

4.1.5 Diameter of pipe (see 7.1),

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

4.1.7 Sheet thickness (see 7.2),

4.1.8 Joint connectors, number, and type (soil tight, water-resistant, or watertight),

4.1.9 Certification, if required (see 13.1), and

4.1.10 Special requirements.

NOTE 1—Typical ordering information may be described as: (1) Composite ribbed steel pipe, pre-coated and polyethylene lined, zinc-coated, in accordance with Specification A 978, ¾ by ¾ by 7 ½ in., 72 in. diameter, 600 ft. in length, 0.109 in. sheet thickness, 30-soil tight joint connectors; (2) Composite ribbed steel pipe, pre-coated and polyethylene lined, zinc-coated, in accordance with Specification A 978M, 19 by 19 by 190 mm, 1800 mm diameter, 182.9 m in length, 2.77 mm sheet thickness, 30-soil tight joint connectors.

⁶ Annual Book of ASTM Standards, Vol 08.01.

⁷ Annual Book of ASTM Standards, Vol 06.01.

⁸ Annual Book of ASTM Standards, Vol 09.02.

⁹ Annual Book of ASTM Standards, Vol 09.01.

¹⁰ Annual Book of ASTM Standards, Vol 08.04.

¹¹ Annual Book of ASTM Standards, Vol 08.03.

¹² Available from American Association of State Highway and Transportation Officials, 444 N. Capital, Washington, DC 20001.