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Standard Specification for Polytetrafluoroethylene (PTFE) Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges[1]

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1. Scope

1.1 This specification covers factory-made polytetrafluoroethylene (PTFE) plastic-lined ferrous metal pipe, fittings, and flanges primarily intended for conveying corrosive fluids. Included are requirements for material, workmanship, dimensions, working pressure and temperature, design, fabrication, test methods, marking, as well as qualification requirements.

NOTE 1—This specification does not include products coated with PTFE.

1.2 This specification covers ANSI Class 150 and 300 PTFE-lined pipe, flanges, and fittings in nominal diameters of ½ to 24 in. Pressure limitations shall be those established by the manufacturer considering both pressure and temperature limitations of the ferrous metal housings and sealing ability of the linear at flanged joints.

1.3 The PTFE-lined flanged pipe and fitting assemblies are limited for use from −20 to 500°F (−29 to 260°C). For use below −20°F (−29°C) consult the manufacturer.

NOTE 2—The temperature limitations are based on noncorrosive test conditions. Use in specific aggressive environments may alter temperature limitations. In such instances, specific temperature limits shall be established by mutual agreement between the purchaser and manufacturer.

1.4 The values given in parentheses are provided for information purposes only.

2. Referenced Documents

2.1 *ASTM Standards:*
A 536 Specification for Ductile Iron Castings[2]
D 792 Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement[3]
D 1457 Specification for Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials[3]
D 1505 Test Method for Density of Plastics by the Density-Gradient Technique[3]
D 1600 Terminology for Abbreviated Terms Relating to Plastics[3]
F 412 Terminology Relating to Plastic Piping Systems[4]
2.2 *ANSI/ASME Standards:*
B 16.5 Steel Pipe Flanges and Flanged Fittings[5]
B 16.9 Factory-Made Wrought Steel Butt Welding Fittings[5]
B 16.42 Ductile Iron Pipe Flanges and Flanged Fittings[5]
Section IX of the ASME Boiler and Pressure Vessel Code[6]
2.3 *MSS Standards:*
MSS SP-43 Wrought Stainless Steel Butt-Welding Fittings[7]
2.4 *Federal Standard:*
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[8]
2.5 *Military Standard:*
MIL-STD-129 Marking for Shipment and Storage[8]

3. Terminology

3.1 Terminology—Definitions are in accordance with Terminology F 412, and abbreviations are in accordance with Terminology D 1600, unless otherwise specified. The abbreviation for polytetrafluoroethylene is PTFE.

4. Materials

4.1 *Lining*:
4.1.1 *Material*—The lining shall be made from polytetrafluoroethylene resins conforming to the requirements of Specification D 1457, except that a maximum of 1 % by weight of additives or colorants, or both, is permissible for identification or other purposes. Organic additives or colorants, or both, if used, shall be identified in the manufac-turer's specification.
4.1.2 The lining shall be made from virgin resin meeting Specification D 1457 or clean unsintered reworked resin capable of meeting the performance requirements of this specification.
4.1.3 *Mechanical Properties*—When tested in accordance with Specification D 1457 the minimum longitudinal tensile strength and elongation shall be 3000 psi (21 MPa) and 250 % respectively and the transverse minimum values 2500 psi (17 MPa) and 200 %.

[1] This specification is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems and the direct responsibility of Subcommittee F17.11 on Composite Pipe.
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[2] *Annual Book of ASTM Standards*, Vol 01.02.
[3] *Annual Book of ASTM Standards*, Vol 08.01.
[4] *Annual Book of ASTM Standards*, Vol 08.04.
[5] Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.
[6] Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.
[7] Available from Manufacturer's Standardization Society of the Valve and Fittings Industry, 5203 Leesburg Pike, Suite 502, Falls Church, VA 22041.
[8] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

4.1.4 *Specific Gravity*—The linings manufactured from PTFE resins meeting Specification D 1457, Types I and IV, shall have a specific gravity from 2.14 to 2.19, and those manufactured from Type III shall have a specific gravity from 2.13 to 2.21, when tested in accordance with Test Methods D 792 or D 1505.

4.2 *Pipe and Fittings*:

4.2.1 Mechanical properties of pipe and fitting shall conform to the requirements of the appropriate specification of Table 1 except as they are influenced by accepted methods of processing in the industry, that is, Van Stone flaring, bending, swaging, and welding. The carbon steel pipe and fittings shall be welded or seamless steel, Schedule 40 or Schedule 80, except that Schedule 30 may be used for pipe with 8 and 10-in. nominal size. Schedule 20 may be used for 12-in. nominal size and above with the agreement of the purchaser. Lighter schedules may be used by mutual agreement between the purchaser and the manufacturer.

4.2.2 *Welding*—All fusion welding shall be done by welders or welding operators using welding procedures qualified under the provisions of Section IX of the ASME Boiler and Pressure Vessel Code.

4.2.3 *Finish*—The interior surfaces of all housings shall be clean and free of mold burrs, rust, scale, or other protrusions that may adversely affect the integrity or performance of the lining.

4.3 *Back-Up Gaskets*—Back-up gaskets shall be used to cover the pipe end and gasket face of threaded or slip-on flanges unless a full radius is provided at the end of the pipe and a smooth transition is provided at the junction of the pipe and flange. Gaskets may also be required on fittings to provide accommodation or elimination, or both, of sharp corners that could damage the lining.

5. Requirements

5.1 *Dimensions*:

5.1.1 *Housings*—Housing installation dimensions are as required in the applicable material specification listed in Table 1.

5.1.2 *Wall Thickness*—Pipe and fitting linings shall have a minimum wall thickness and gasket face thickness as follows:

Minimum Linear and Gasket Face Thickness

Nominal Pipe Size, in.	Liner Wall, in. (mm)	Gasket Face Thickness, in. (mm)
1 to 4	0.050 (1.3)	0.040 (1.0)
6 to 14	0.100 (2.5)	0.080 (2.0)
16, 18	0.125 (3.2)	0.100 (2.5)
20, 24	0.150 (3.8)	0.120 (3.0)

5.1.3 *Lining Flare Diameter*—The outside diameter of the PTFE flare covering the gasket face portion of the flange or the full face of the lap-joint stub end shall not be less than the diameter specified in Table 2. The flared portion of the lining shall be concentric with the flared portion of the pipe within 1/16 in. (1.6 mm).

5.1.4 *Tolerances*—Tolerances for pipe, flanges, and fittings shall be as specified in Table 3. Bolt holes in both flanges on a fixed flange spool shall straddle the same center line to facilitate alignment. Finished lined (plastic flare to plastic flare) fabricated fittings shall conform to the nominal face-to-face dimensions as specified in ANSI B16.42 or B16.5 with the applicable tolerances.

5.2 *Flange Construction*:

5.2.1 Screw-type flanges shall be secured in position to prevent inadvertent turning of the flange.

5.2.2 Socket-type flanges shall be fully backwelded to the pipe housing and the inside surfaces of the socket flanges shall be ground smooth.

TABLE 1 Specifications for Steel Pipe and Fittings

Pipe Section	Material	Specifications	
Piping	carbon steel	ASTM A 53	Welded and Seamless Steel Pipe[A] (Types E and S)
		ASTM A 106	Seamless Carbon Steel Pipe for High-Temperature Service[A]
		ASTM A 135	Electric-Resistance-Welded Steel Pipe[A]
		ASTM A 513	Electric-Resistance Welded Carbon and Alloy Steel Mechanical Tubing[A]
		ASTM A 587	Electric-Welded Low-Carbon Steel Pipe for the Chemical Industry[A]
Flanges	ductile iron	ASTM A 395	Ferritic Ductile Iron Pressure Retaining Castings for Use at Elevated Temperatures[B] (60-40-18)
		ASTM A 536	Ductile Iron Castings
		ANSI B 16.42	Ductile Iron Pipe Flanges and Flanged Fittings
	forged steel	ASTM A 105	Forgings, Carbon Steel, for Piping Components[A]
		ASTM A 181	Forgings, Carbon Steel for General Purpose Piping[A]
	cast steel	ASTM A 216	Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service[A,B] (Grade WCB)
	steel	ANSI B 16.5	Steel Pipe Flanges and Flanged Fittings
Fittings	ductile iron	ASTM A 395	Ferritic Ductile Iron (for Pressure-Retaining Castings for Use at Elevated Temperatures[B] (60-40-18)
		ASTM A 536	Ductile Iron Castings
		ANSI B 16.42	Ductile Iron Pipe Flanges and Flanged Fitting
	forged steel	ASTM A 105	Forgings, Carbon Steel, for Piping Components[A]
		ASTM A 181	Forgings, Carbon Steel for General Purpose Piping[A]
	cast steel	ASTM A 216	Carbon-Steel Castings Suitable for Fusion Welding for High-Temperature Service[A,B] (Grade WCB)
		ASTM A 352	Ferritic and Martensitic Steel Castings for Pressure—Containing Parts Suitable for Low-Temperature Service[A,B]
		ASTM A 389	Alloy-Steel Castings Specially Heat Treated for Pressure Containing Parts Suitable for High-Temperature Service[A,B]
	carbon steel	ASTM A 234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures[A]
	steel	ANSI B 16.5	Steel Pipe Flanges and Flanged Fittings

[A] *Annual Book of ASTM Standards*, Vol 01.01.
[B] *Annual Book of ASTM Standards*, Vol 01.02.