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Designation: D 5677 – 00

An American National Standard

Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Pipe Fittings, Adhesive Bonded Joint Type, for Aviation Jet Turbine Fuel Lines[1]

This standard is issued under the fixed designation D 5677; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope *

1.1 This specification covers a reinforced plastic pipe and fittings system made from epoxy resin and glass-fiber reinforcement, together with adhesive for joint assembly, intended for service up to 150°F (65.6°C) and 150-psig (1034-kPa) operating pressure and surges up to 275 psig (1896 kPa) in aviation jet turbine fuel lines installed below ground.

1.2 The dimensionless designator NPS has been substituted in this specification for such traditional terms as "nominal diameter,"" size," and "nominal size."

1.3 The values stated in inch-pound units are to be regarded as standard. The values in parentheses are for information only.

1.4 The following safety hazards caveat pertains only to the test method portion, Section 9, of this specification: *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.*

NOTE 1—There is no similar or equivalent ISO standard.

2. Referenced Documents

2.1 *ASTM Standards:*

D 381 Test Methods for Existent Gum in Fuels by Jet Evaporation[2]

D 883 Terminology Relating to Plastics[3]

D 1599 Test Method for Short-Time Hydraulic Failure of Plastic Pipe, Tubing, and Fittings[4]

D 1600 Terminology Relating to Abbreviations, Acronyms, and Codes for Terms Relating to Plastics[3]

D 2310 Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe[4]

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading[4]

D 3241 Test Method for Thermal Oxidation Stability of Aviation Turbine Fuels (JFTOT Procedure)[5]

D 3567 Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings[4]

D 3951 Practice for Commercial Packaging[6]

F 412 Terminology Relating to Plastic Piping Systems[4]

F 1173 Specification for Epoxy Resin Fiberglass Pipe and Fittings to Be Used for Marine Applications[7]

2.2 *Military Specification:*

MIL-T-5624 Turbine Fuel, Aviation, Grades JP-4, JP-5 and JP-5/JP-8 ST[8]

2.3 *ANSI Standard:*

B16.5 Steel Pipe Flanges and Flanged Fittings[9]

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminologies D 883 and F 412 and abbreviations are in accordance with Terminology D 1600, unless otherwise indicated.

3.1.1 *conductive*—a pipe or fitting that meets the requirements for conductivity listed in Section 6 of Specification F 1173.

3.2 *Abbreviations:Abbreviation:*

3.2.1 *RTRP*, *n*—reinforced thermosetting resin pipe.

4. Classification

4.1 *General*:

4.1.1 Pipe meeting this specification is classified by type, grade, and class similar to Classification D 2310.

4.1.2 Fittings meeting this specification are also classified by type (method of manufacture) and grades (generic type of resin).

[1] This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.23 on Reinforced Plastic Piping System and Chemical Equipment.

Current edition approved March 10, 2000. Published June 2000. Originally published as D 5677 – 95. Last previous edition D 5677 – 95.

[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] *Annual Book of ASTM Standards*, Vol 08.04.

[5] *Annual Book of ASTM Standards*, Vol 05.02.

[6] *Annual Book of ASTM Standards*, Vol 15.09.

[7] *Annual Book of ASTM Standards*, Vol 01.07.

[8] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[9] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

***A Summary of Changes section appears at the end of this standard.**

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4.2 *Pipe*:
4.2.1 Type I Filament-Wound Pipe Nonconductive
4.2.2 Type Ia Filament-Wound Pipe Conductive
4.2.3 Type II Centrifugally Cast Pipe
4.3 *Fittings*:
4.3.1 Type I Filament-Wound Fittings Nonconductive
4.3.2 Type Ia Filament Wound Fittings Conductive
4.3.3 Type Il Molded Fittings Nonconductive
4.4 *Grade*:
4.4.1 Grade 1 Glass-Fiber-Reinforced Epoxy Resin (Pipe and Fittings)
4.5 *Classes (Pipe Only)*:
4.5.1 Class A No Liner
4.5.2 Class C Epoxy Resin Liner Nonreinforced
4.5.3 Class F Epoxy Resin Liner Reinforced

5. Materials and Manufacture

5.1 *General*—The fiberglass pipe shall be round and straight, and the pipe and fittings shall be of uniform density, resin content, and surface finish. All pipe ends shall be cut at right angles to the axis of the pipe and any sharp edges removed. The bore of the pipe and fittings shall have a smooth, uniform surface with no exposed fibers and may contain a liner. The liner, if used, shall be composed of an epoxy resin formulation and may contain a reinforcement.

5.2 *Material*—The pipe and fittings shall be made from epoxy resins and glass-fiber reinforcement of commercial first quality. Fillers, colorants, and other materials may be added, provided the pipe and fittings meet all the requirements of this specification. Epoxy pipe shall be joined only with epoxy fittings.

5.3 *Adhesive*—Adhesive for joint assembly shall be a material suitable for providing a seal between the pipe and fittings in continuous service up to 150°F (65°C) and 150 psig (1034 kPa) with surges to 275 psig (1896 kPa). The adhesive shall be supplied as a kit which includes containers of all components in the amounts needed for each adhesive mixture. Instructions for use shall be marked on each container or listed on an instruction sheet included in each adhesive kit. When specified in the contract or purchase order, adhesive kits shall be furnished in a sufficient quantity for the particular procurement of pipe and fittings.

6. Dimensions

6.1 *Pipe*—The pipe shall be 2, 3, 4, 6, 8, 10, 12, 14, and 16-in. (50, 80, 100, 150, 200, 250, 300, 350 and 400-mm) nominal sizes as specified and shall have the dimensions and tolerances shown in Table 1.

6.1.1 *Length*—Unless other lengths are specified on the purchase order, the length of the pipe shall be 20 ft (6.1 m), 30 ft (9.2 m), or 40 ft (12.2 m) with a plus tolerance of 2 ft (0.6 m) and a minus tolerance of 5 ft (1.5 m).

6.1.2 *Wall Thickness*—The minimum wall thickness of the pipe shall be not less than 87.5 % of the average wall thickness of the pipe as measured in Section 8 and tested in Section 9.

6.1.3 *Fittings*—Fittings shall be 2, 3, 4, 6, 8, 10, 12, 14, and 16-in. (50, 80, 100, 150, 200, 250, 300, 350 and 400-mm) nominal sizes, as specified, and shall have dimensions suitable for joining to the pipe and enabling the pipe and fitting joint to meet the requirements of this specification. For purposes of this specification, fittings shall include couplings and flanges.

6.1.4 *Flanges*—Flanges shall conform to the bolt hole sizes and pattern for 150-lb steel flanges in accordance with ANSI B16.5.

7. Performance Requirements

7.1 *Joint Strength*—Pipe, fittings, adhesive, and joints shall show no porosity or other evidence of failure when tested in accordance with 9.2.2.

7.2 *Hydrostatic Strength*—Pipe, fittings, adhesive, and joints shall withstand a hydrostatic pressure of 300 psi (2068 kPa) without any indication of porosity, delamination, splitting, or other evidence of failure when tested in accordance with 9.2.3.

7.3 *Impact Resistance*—Pipe and fittings shall show no porosity or visual evidence of damage that would affect serviceability when tested in accordance with 9.2.4.

7.4 *Boil Resistance*—Pipe and fittings shall show no evidence of delamination or other impairment and shall have a weight gain no greater than 1.0 % when tested in accordance with 9.2.5.

7.5 *External Load Resistance*—When tested as specified in 9.2.6, the pipe shall show no visual evidence of cracking, crazing, or other damage that could allow leakage of fuel

TABLE 1 Dimensions of Pipe

NOTE 1—Nominal pipe diameters of 14 (350 mm) and 16 in. (450 mm) are available and approved with 14.000 (355.6 mm) and 16.000 (406.4 mm) outside diameters or inside diameters.

Nominal Pipe Diameter		Outside Diameter		Tolerance, Type I and Type Ia		Tolerance, Type II	
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
2 ± 0.30	(50)	2.375	(60.32)	±0.060 –0.018	(±1.52 –0.46)	±0.012	(±0.30)
3	(75)	3.500	(88.90)	±0.060 –0.018	(±1.52 –0.46)	±0.012	(±0.30)
4	(100)	4.500	(114.30)	±0.060 –0.018	(±1.52 –0.46)	±0.015	(±0.38)
6	(150)	6.625	(168.28)	±0.066 –0.028	(±1.68 –0.71)	±0.025	(±0.64)
8	(200)	8.625	(219.08)	±0.086 –0.040	(±2.28 –1.02)	±0.025	(±0.64)
10	(250)	10.750	(273.05)	±0.108 –0.048	(±2.74 –1.22)	±0.025	(±0.64)
12	(300)	12.750	(323.05)	±0.128 –0.056	(±3.25 –1.42)	±0.025	(±0.64)
14	(350)	14.000	(355.60)	±0.145 –0.064	(±3.68 –1.63)	±0.035	(±0.89)
16	(400)	16.000	(406.40)	±0.165 –0.074	(±4.19 –1.88)	±0.035	(±0.89)