



Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe^{1,2}

This standard is issued under the fixed designation D 3262; 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 machine-made fiberglass pipe, 8 in. (200 mm) through 144 in. (3700 mm), intended for use in gravity-flow systems for conveying sanitary sewage, storm water, and some industrial wastes. Both glass-fiber-reinforced thermosetting-resin pipe (RTRP) and glass-fiber-reinforced plastic mortar pipe (RPMP) are fiberglass pipes.

1.2 Although this specification is suited primarily for pipes to be installed in buried applications, it may be used to the extent applicable for other installations such as, but not limited to, sliplining and rehabilitation of existing pipelines.

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

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

1.4 The following safety hazards caveat pertains only to the test method portion, Section 8, of this specification. *This standard does not purport to address all of the safety problems, 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:

- C 33 Specification for Concrete Aggregates³
- D 638 Test Method for Tensile Properties of Plastics⁴
- D 695 Test Method for Compressive Properties of Rigid Plastics⁴
- D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials⁴
- D 883 Terminology Relating to Plastics⁴

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 Systems and Chemical Equipment.

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² This revision includes changes to 8.4.1, Table 3, and Note 8 and X1.1. Paragraphs 6.4.1 and 6.4.2 were added.

³ *Annual Book of ASTM Standards*, Vol 04.02.

⁴ *Annual Book of ASTM Standards*, Vol 08.01.

D 1600 Terminology for Abbreviated Terms Relating to Plastics⁴

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading⁵

D 2584 Test Method for Ignition Loss of Cured Reinforced Resins⁶

D 2992 Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings⁵

D 3567 Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings⁵

D 3681 Test Method for Chemical Resistance of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition⁵

D 3892 Practice for Packaging/Packing of Plastics⁷

D 4161 Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals⁵

F 412 Terminology Relating to Plastic Piping Systems⁴

F 477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe⁵

2.2 AWWA Standard:

Standard C-950, Glass-Fiber Reinforced Thermosetting Resin Pipe⁸

3. Terminology

3.1 Definitions:

3.1.1 *General*—Unless otherwise indicated, definitions are in accordance with Terminology D 883 or Terminology F 412, and abbreviations are in accordance with Terminology D 1600.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *fiberglass pipe*—tubular product containing glass fiber reinforcements embedded in or surrounded by cured thermosetting resin. The composite structure may contain aggregate, granular or platelet fillers, thixotropic agents, pigments, or dyes. Thermoplastic or thermosetting liners or coatings may be included.

⁵ *Annual Book of ASTM Standards*, Vol 08.04.

⁶ *Annual Book of ASTM Standards*, Vol 08.02.

⁷ *Annual Book of ASTM Standards*, Vol 08.03.

⁸ Available from the American Water Works Association, 6666 West Quincey Ave., Denver, CO 80235.

3.2.2 *liner*—a resin layer, with or without filler or reinforcement, or both, forming the interior surface of the pipe.

3.2.3 *qualification test*—one or more tests used to prove the design of a product. Not a routine quality control test.

3.2.4 *reinforced plastic mortar pipe (RPMP)*—fiberglass pipe with aggregate.

3.2.5 *reinforced thermosetting resin pipe (RTRP)*—fiberglass pipe without aggregate.

3.2.6 *surface layer*—a resin layer, with or without filler or reinforcement, or both, applied to the exterior surface of the pipe structural wall.

4. Classification

4.1 *General*—This specification covers fiberglass sewer pipe defined by raw materials in the structural wall (type) and liner, surface layer material (grade), and pipe stiffness. Table 1 lists the types, liners, grades, and stiffnesses covered.

NOTE 2—All possible combinations of types, liners, grades, and stiffnesses may not be commercially available. Additional types, liners, grades, and stiffnesses may be added as they become commercially available. The purchaser should determine for himself or consult with the manufacturer for the proper type, liner, grade, and stiffness of pipe to be used under the installation and operating conditions that will exist for the project in which pipe is to be used.

4.2 *Designation Requirements*—The pipe materials designation code shall consist of the standard designation, ASTM D 3262, followed by type, liner, and grade indicated in Arabic numerals, and pipe stiffness by a capital letter. Table 1 presents a summary of the designation requirements. Thus a complete material code shall consist of ASTM D 3262, three numerals, and a capital letter.

NOTE 3—Examples of the designation codes are as follows: (1) ASTM D 3262-1-1-3-A for glass-fiber-reinforced aggregate and polyester resin mortar pipe with a reinforced thermoset liner and an unreinforced polyester resin and sand surface layer having a minimum pipe stiffness of 9 psi (62 kPa). (2) ASTM D 3262-4-2-6-C for glass-fiber-reinforced epoxy resin pipe with an unreinforced thermoset liner, no surface layer, having a minimum pipe stiffness of 36 psi (248 kPa).

NOTE 4—Although the *Form and Style for ASTM Standards* manual requires that the type classification be roman numerals, it is recognized

that few companies have stencil-cutting equipment for this style of type, and it is therefore acceptable to mark the product type in Arabic numbers.

5. Materials and Manufacture

5.1 *General*—The resins, reinforcements, colorants, fillers, and other materials, when combined as a composite structure, shall produce a pipe that shall meet the performance requirements of this specification.

5.2 *Wall Composition*—The basic structural wall composition shall consist of a thermosetting resin, glass-fiber reinforcement, and if used, an aggregate filler.

5.2.1 *Resin*—A thermosetting polyester or epoxy resin, with or without filler.

5.2.2 *Reinforcement*—A commercial grade of glass fibers with a sizing compatible with the resin used.

5.2.3 *Aggregate*—A siliceous sand conforming to the requirements of Specification C 33, except that the requirements for gradation shall not apply.

5.3 *Liner and Surface Layer*—A liner or surface layer, or both, when incorporated into or onto the pipe, shall meet the structural requirements of this specification.

5.4 *Joints*—The pipe shall have a joining system that shall provide for fluid tightness for the intended service condition.

5.4.1 *Unrestrained*—Pipe joints capable of withstanding internal pressure but not longitudinal forces.

5.4.1.1 *Coupling or Bell-and-Spigot Gasket Joints*, with a groove either on the spigot or in the bell to retain an elastomeric gasket that shall be the sole element of the joint to provide watertightness. For typical joint detail see Fig. 1.

5.4.1.2 *Mechanical Couplings*.

5.4.2 *Restrained*—Pipe joints capable of withstanding internal pressure and longitudinal forces.

5.4.2.1 Joints similar to those in 5.4.1.1 with supplemental restraining elements.

5.4.2.2 *Butt Joint*, with laminated overlay.

5.4.2.3 *Bell-and-Spigot*, with laminated overlay.

5.4.2.4 *Bell-and-Spigot*, adhesive bonded.

5.4.2.5 *Flanged*.

5.4.2.6 *Mechanical*.

TABLE 1 General Designation Requirements for Fiberglass Sewer Pipe

Designation Order	Property	Cell Limits ^A					
		1	2	3	4	5	6
1	Type	glass-fiber-reinforced thermosetting polyester ^B resin mortar (RPMP polyester ^B)	glass-fiber-resin-reinforced thermosetting polyester ^B resin (RTRP polyester ^B)	glass-fiber-reinforced thermosetting epoxy resin mortar (RPMP epoxy)		glass-fiber-reinforced thermosetting epoxy resin (RTRP epoxy)	
2	Liner	1 reinforced thermoset liner	2 non-reinforced thermoset liner	3 thermoplastic liner		4 no liner	
3	Grade	1 polyester ^B resin surface layer—reinforced	2 polyester ^B resin surface layer—nonreinforced	3 polyester ^B resin and sand surface layer non-reinforced	4 epoxy resin surface layer—reinforced	5 epoxy resin surface layer—non-reinforced	6 no surface layer
4	Pipe stiffness psi (kPa)	A 9 (62)	B 18 (124)	C 36 (248)			D ^{A,B} 72 (496)

^A This cell-type format provides the means of identification and specification of piping materials. This cell-type format, however, is subject to misapplication since unobtainable property combinations can be selected if the user is not familiar with non-commercially available products. The manufacturer should be consulted.

^B For the purposes of this specification, polyester includes vinyl ester resins.

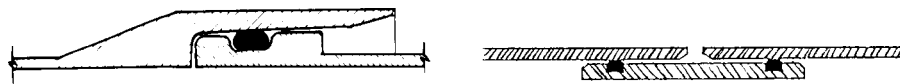


FIG. 1 Typical Joints

NOTE 5—Other types of joints may be added as they become commercially available.

5.5 *Gaskets*—Elastomeric gaskets used with this pipe shall conform to the requirements of Specification F 477, except that composition of the elastomer shall be as agreed upon between the purchaser and the supplier for the particular exposure to oily or aggressive chemical environments.

6. Requirements

6.1 *Workmanship*—Each pipe shall be free from all defects including indentations, delaminations, bubbles, pinholes, cracks, pits, blisters, foreign inclusions, and resin-starved areas that, due to their nature, degree, or extent, detrimentally affect the strength and serviceability of the pipe. The pipe shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

6.1.1 The inside surface of each pipe shall be free of bulges, dents, ridges, and other defects that result in a variation of inside diameter of more than 1/8 in. (3.2 mm) from that obtained

on adjacent unaffected portions of the surface. No glass fiber reinforcement shall penetrate the interior surface of the pipe wall.

6.1.2 Joint sealing surfaces shall be free of dents, gouges, and other surface irregularities that will affect the integrity of the joints.

6.2 Dimensions:

6.2.1 *Pipe Diameters*—The pipe shall be supplied in the nominal diameters shown in Table 2 or Table 3. The tolerances shall be as shown in Table 2 or Table 3, when measured in accordance with 8.1.1.

6.2.2 *Lengths*—Pipe shall be supplied in nominal lengths of 10, 20, 30, 40, and 60 ft (3.05, 6.10, 9.15, 12.19, and 18.29 m). The actual laying length shall be the nominal length ±2 in. (±51 mm), when measured in accordance with 8.1.2. At least 90 % of the total footage of any one size and stiffness, excluding special-order lengths, shall be furnished in the nominal lengths specified by the purchaser. Random lengths, if furnished, shall not vary from the nominal lengths by more

TABLE 2 Nominal Inside Diameters (ID) and Tolerances Inside Diameter Control Pipe

Inch-Pound Series		SI Series			
Nominal Diameter ^A , in.	Tolerance, in.	Nominal Metric Diameter ^B , mm	ID Range ^B , mm		Tolerance ^B on Declared ID, mm
			Minimum	Maximum	
8	±0.25	200	196	204	±1.5
10	±0.25	250	246	255	±1.5
12	±0.25	300	296	306	±1.8
14	±0.25	400	396	408	±2.4
15	±0.25	500	496	510	±3.0
16	±0.25	600	595	612	±3.6
18	±0.25	700	695	714	±4.2
20	±0.25	800	795	816	
21	±0.25	900	895	918	
24	±0.25	1000	995	1020	
27	±0.27	1200	1195	1220	±5.0
30	±0.30	1400	1395	1420	
33	±0.33	1600	1595	1620	
36	±0.36	1800	1795	1820	
39	±0.39	2000	1995	2020	±6.0
42	±0.42	(2200)	2195	2220	
45	±0.45	2400	2395	2420	
48	±0.48	(2600)	2595	2620	
51	±0.51	2800	2795	2820	±7.0
54	±0.54	(3000)	2995	3020	
60	±0.60	3200	3195	3220	
66	±0.66	(3400)	3395	3420	
72	±0.72	3600	3595	3620	±7.0
78	±0.78	(3800)	3795	3820	
84	±0.84	4000	3995	4020	
90	±0.90	...	...	...	...
96	±0.96	...	...	...	...
102	±1.00	...	...	...	...
108	±1.00	...	...	...	...
114	±1.00	...	...	...	...
120	±1.00	...	...	...	...
132	±1.00	...	...	...	...
144	±1.00	...	...	...	...

^A Inside diameters other than those shown shall be permitted by agreement between the purchaser and the supplier.

^B Values are taken from International Standards Organization documents. Parentheses indicate non-preferred diameters.

TABLE 3 Nominal Outside Diameters (OD) and Tolerances

Outside Diameter Control Pipe				
Nominal Pipe Size, in.	Steel Pipe Equivalent (IPS) OD's, in.	Tolerance, in.	Cast Iron Pipe Equivalent OD's, in.	Tolerance, in.
8	8.625	+0.086 -0.040	9.05	±0.06
10	10.750	+0.108 -0.048	11.10	
12	12.750	+0.128 -0.056	13.20	
14	14.000	+0.140 -0.062	15.30	
16	16.000	+0.160 -0.070	17.40	+0.05 -0.08
18	19.50	±0.06
20	...	...	21.60
24	...	...	25.80
30	...	...	32.00
36	38.30	+0.08 -0.06
42	...	...	44.50
48	...	...	50.80
54	...	...	57.56
60	61.61	

Metric Pipe Size, mm	Ductile Iron Pipe Equivalent, mm	Tolerance, mm	International OD, mm	Tolerance, mm
200	222	-3.0		+2.0
250	274	-3.1		+2.1
300	326	-3.3		+2.3
350	378	-3.4		+2.4
400	429	-3.5		+2.5
500	532	-3.8		+2.8
600	635	-4.0		+3.0
700	738	-4.3		+3.3
800	842	-4.5		+3.5
900	945	-4.8		+3.8
1000	1048	-5.0	1.02 × nominal plus 4	+4.0
1100	1152	-5.3		+4.3
1200	1255	-5.5		+4.5
1400	1462	-6.0		+5.0
1600	1668	-7.4		+5.5
1800	1875	-8.2		+6.0
2000	2082	-9.0		+6.5
2200 to 4000	...	...		increase (+) tolerance 0.5 each 200 mm

than 5 ft (1.53 m), or 25 %, whichever is less.

6.2.3 *Wall Thickness*—The average wall thickness of the pipe shall not be less than the nominal wall thickness published in the manufacturer’s literature current at the time of purchase, and the minimum wall thickness at any point shall not be less than 87.5 % of the nominal wall thickness when measured in accordance with 8.1.3.

6.2.4 *Squareness of Pipe Ends*—All points around each end of a pipe unit shall fall within ±¼ in. (±6.4 mm) or ±0.5 % of the nominal diameter of the pipe, whichever is greater, to a

plane perpendicular to the longitudinal axis of the pipe, when measured in accordance with 8.1.4.

6.3 *Chemical Requirements:*

6.3.1 *Long-Term*—Pipe specimens, when tested in accordance with 8.2.1, shall be capable of being deflected, without failure, at the 50 year strain level given in Table 4 when exposed to 1.0 N sulfuric acid.

NOTE 6—See Appendix X1 for derivation of the minimum sewer pipe chemical requirements given in Table 4.

TABLE 4 Minimum Sanitary Sewer Pipe Chemical Requirements ε_{SCV}

Pipe Stiffness, psi (kPa)	Minimum Strain					
	6 min	10 h	100 h	1000 h	10 000 h	50 years
9 (62)	0.97 (<i>t/d</i>)	0.84 (<i>t/d</i>)	0.78 (<i>t/d</i>)	0.73 (<i>t/d</i>)	0.68 (<i>t/d</i>)	0.60 (<i>t/d</i>)
18 (124)	0.85 (<i>t/d</i>)	0.72 (<i>t/d</i>)	0.66 (<i>t/d</i>)	0.61 (<i>t/d</i>)	0.56 (<i>t/d</i>)	0.49 (<i>t/d</i>)
36 (248)	0.71 (<i>t/d</i>)	0.60 (<i>t/d</i>)	0.55 (<i>t/d</i>)	0.51 (<i>t/d</i>)	0.47 (<i>t/d</i>)	0.41 (<i>t/d</i>)
72 (496)	0.56 (<i>t/d</i>)	0.48 (<i>t/d</i>)	0.44 (<i>t/d</i>)	0.41 (<i>t/d</i>)	0.38 (<i>t/d</i>)	0.34 (<i>t/d</i>)

Where: *t* and *d* are the nominal total wall thickness and the mean diameter (inside diameter plus *t*) as determined in accordance with 8.1, and ε_{SCV}= strain corrosion value.