



## Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe Fittings<sup>1</sup>

This standard is issued under the fixed designation D 5685; 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 “fiberglass” (glass-fiber-reinforced thermosetting-resin) fittings for use with filament wound or centrifugally cast fiberglass pipe, or both, in sizes 1 in. through 24 in. for pipe manufactured to Specification D 2996 or D 2997, or both.

1.2 The following safety hazard caveat pertains only to the test method portion, Section 7, of this specification:

1.3 *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—The term “fiberglass pipe” as described in Section 3 of this specification applies to both reinforced thermosetting resin pipe (RTRP) and reinforced polymer mortar pipe (RPMP).

NOTE 2—For the purposes of this standard, ploymer does not include natural polymers.

NOTE 3—There is no similar or equivalent ISO standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 618 Practice for Conditioning Plastics for Testing<sup>2</sup>
- D 883 Terminology Relating to Plastics<sup>2</sup>
- D 1598 Test Method for Time-To-Failure of Plastic Pipe Under Constant Internal Pressure<sup>3</sup>
- D 1599 Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings<sup>3</sup>
- D 1600 Terminology for Abbreviated Terms Relating to Plastics<sup>2</sup>
- D 2143 Test Method for Cyclic Pressure Strength of Reinforced, Thermosetting Plastic Pipe<sup>3</sup>
- D 2992 Practice for Obtaining Hydrostatic or Pressure Design Basis for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings<sup>3</sup>

- D 2996 Specification for Filament Wound “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting Resin) Pipe<sup>3</sup>
- D 2997 Specification for Centrifugally Cast “Fiberglass” (Glass-Fiber-Reinforced-Thermosetting Resin) Pipe<sup>3</sup>
- D 3567 Practice for Determining Dimensions of “Fiberglass” ( Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings<sup>3</sup>
- D 4024 Specification for Machine Made “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Flanges<sup>3</sup>
- F 412 Terminology Relating to Plastic Piping Systems<sup>3</sup>
- F 477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe<sup>3</sup>
- 2.2 *ANSI Standard:*
  - B16.5 Steel Pipe Flanges, Flanged Valves and Fittings<sup>4</sup>
- 2.3 *API Standard:*
  - 15LR Low Pressure Fiberglass Line Pipe<sup>5</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *General*—Definitions are in accordance with Terminology D 883 or F 412. Abbreviations are in accordance with Terminology D 1600, unless otherwise indicated. The abbreviation for fiberglass pipe is RTRP and the abbreviation for fiberglass fittings is RTRF.

3.1.2 *“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.

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

3.1.4 *reinforced polymer mortar pipe*—fiberglass pipe with aggregate (RPMP).

3.1.5 *reinforced thermosetting resin fitting*—fiberglass fitting without aggregate (RTRF).

3.1.6 *reinforced polymer mortar fitting*—fiberglass fitting with aggregate (RPMF).

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.23 on Reinforced Plastic Piping System and Chemical Equipment.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 08.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 08.04.

<sup>4</sup> Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036 .

<sup>5</sup> Available from American Petroleum Institute, 1220 L St., NW, Washington, DC 20005.

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

## 4. Classification

4.1 This specification covers fiberglass fittings defined by type (method of manufacture), grade (general resin type), class (general liner type), category (configuration of joining system), and pressure rating (a single letter designating the pressure class and method of manufacture).

### 4.2 Types:

4.2.1 *Type 1*—Filament-wound fittings manufactured by winding continuous fibrous-glass strand roving or roving tape, either preimpregnated or impregnated during winding, onto a mandrel, or a liner corresponding to the fitting shape.

4.2.2 *Type 2*—Compression molded fittings made by applying external pressure and heat to a molding compound that is confined within a closed mold.

4.2.3 *Type 3*—Resin transfer molded fittings manufactured by pumping a thermosetting resin into glass reinforcements that have been cut to size and clamped between matched molds.

4.2.4 *Type 4*—Centrifugally cast fittings made by applying resin and reinforcement to the inside of a mold that is rotating and heated, subsequently polymerizing the resin system.

4.2.5 *Type 5*—Contact molded fittings made by applying resin and reinforcement to a mold or to mitered filamentwound stock or centrifugally cast pipe stock. This procedure shall also cover “spray-up” fittings which are made by spraying resin and reinforcement on a mold or over mitered pipe wound stock. “Contact molding” includes both hand lay-up and spray-up manufacturing processes.

4.2.6 Fittings of Type 1 through Type 5 which require thrust blocking or external axial restraint when installed shall have the letter “R” appended to the type of designation. (For instance, a contact molded fitting requiring thrust blocking when installed would be designated a type “5R”.)

### 4.3 Grades:

4.3.1 *Grade 1*—Epoxy-resin.

4.3.2 *Grade 2*—Polyester-resin (see Note 4).

4.3.3 *Grade 3*—Furan-resin.

NOTE 4—For purpose of this specification, polyester-resins include vinyl-ester-resins.

### 4.4 Classes:

4.4.1 *Class A*—No liner.

4.4.2 *Class B*—Polyester-resin liner (nonreinforced).

4.4.3 *Class C*—Epoxy-resin liner (nonreinforced).

4.4.4 *Class E*—Polyester-resin liner (reinforced).

4.4.5 *Class F*—Epoxy-resin liner (reinforced).

4.4.6 *Class H*—Thermoplastic-resin liner (specify).

4.4.7 *Class I*—Furan-resin liner (reinforced).

### 4.5 Joint Categories (Method of Joining):

4.5.1 *Category 1*—Taper-to-taper adhesive-bonded joint fittings manufactured with a tapered socket to be used in conjunction with a pipe or fitting with a matching spigot section and a suitable adhesive. This joining method provides an interference fit over the entire length of the bond line.

4.5.2 *Category 2*—Straight-taper adhesive-bonded joint fitting manufactured with a tapered socket to be used with a pipe or fitting with an untapered spigot section and a suitable adhesive. This joining method provides an interference fit at the bottom of the socket.

4.5.3 *Category 3*—Straight adhesive bonded joint fitting manufactured with an untapered socket for use with a pipe or fitting with an untapered spigot and a suitable adhesive. This joining provides no interference fit.

4.5.4 *Category 4*—Butt and strap joint made by a contact molding process which involves hand lay-up with glass-woven roving or chopped strand mat, or both, which is saturated with resin.

4.5.5 *Category 5*—Flanged fittings are available as all outlets flanged or as flange-by-joint specified in this specification. Flanges are in compliance with Specification D 4024.

4.5.6 *Category 6*—Elastomeric (gasket) sealed joints with sealant manufactured in compliance with Specification F 477 for joints which have integral longitudinal restraint and do not require thrust blocking or external longitudinal restraint.

4.5.7 *Category 7*—Elastomeric (gasket) sealed joints with seals manufactured in compliance with Specification F 477 for joints which require thrust blocking or external longitudinal restraint.

4.6 *Pressure Rating*—Pressure rating shall be categorized by a single letter designation. Pressure designations are shown in Table 1. The pressure ratings are applicable for the temperature at which the fittings were tested and for lower temperatures down to  $-50^{\circ}\text{F}$  ( $-46^{\circ}\text{C}$ ). When agreed upon between purchaser and manufacturer, pressure ratings determined by tests conducted following Practice D 2992 are acceptable.

4.7 *Designation Code*—The fitting designation code shall consist of the abbreviation RTRF or RPMF followed by the type, grade, and class in Arabic numerals and the pressure rating category as a capital letter.

NOTE 5—An example is RTRF 21A2E. This designation describes a (Type 2) compression molded fitting with a (Grade 1) epoxy-resin without a liner (Class A), which is joined with a (Category 2) taper-to-taper adhesive joining system and has a 200 psig (1380 kPa) pressure rating.

NOTE 6—Fittings with identical classification from different manufacturers may not be interchangeable due to non-standardization of pipe or socket diameter, socket length, taper angle, or combination thereof.

## 5. Materials

5.1 Fittings manufactured in accordance with this specification shall be composed of reinforcement embedded in or surrounded by cured thermosetting-resin. The composite structure may contain granular or platelet fillers, thixotropic agents, pigments, or dyes.

**TABLE 1 Pressure Categories**

Designation	Pressure Rating <sup>A</sup> , psig (kPa)
A	25 (172)
B	50 (345)
C	100 (690)
D	150 (1034)
E	200 (1380)
F	250 (1724)
G	300 (2068)
H	400 (2759)
I	500 (3448)
J	1000 (6896)

<sup>A</sup> Pressure ratings are applicable only for the temperature at which the fittings were tested and for lower temperatures.