



Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40¹

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

1. Scope*

1.1 This specification covers poly(vinyl chloride) (PVC) Schedule 40 pipe fittings. Included are requirements for materials, workmanship, dimensions, and burst pressure.

NOTE 1—Socket-type CPVC plastic pipe fittings, Schedule 40, which were formerly included in this standard, are now covered by Specification **F438**.

1.2 The products covered by this specification are intended for use with the distribution of pressurized liquids only, which are chemically compatible with the piping materials. Due to inherent hazards associated with testing components and systems with compressed air or other compressed gases, some manufacturers do not allow pneumatic testing of their products. Consult with specific product/component manufacturers for their specific testing procedures prior to pneumatic testing.

NOTE 2—Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious safety hazards should a system fail for any reason.

1.3 Fitting such as unions, flanges, special plastic-to-metal transitions and appurtenances intended for use with PVC piping are covered under Specification **F1970**.

1.4 The text of this specification references notes, footnotes, and appendixes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The following safety hazards caveat pertains only to the test method portion, Section 7, 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, health, and*

environmental practices and determine the applicability of regulatory limitations prior to use.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- D618** Practice for Conditioning Plastics for Testing
- D1599** Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
- D1600** Terminology for Abbreviated Terms Relating to Plastics
- D1784** Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- D2122** Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2749** Symbols for Dimensions of Plastic Pipe Fittings
- F412** Terminology Relating to Plastic Piping Systems
- F438** Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
- F1498** Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings
- F1970** Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems

2.2 NSF/ANSI Standards:³

- NSF/ANSI Standard No. 14** for Plastic Piping Components and Related Materials
- NSF/ANSI Standard No. 61** Drinking Water Systems Components—Health Effects

¹ This specification is under the jurisdiction of ASTM Committee **F17** on Plastic Piping Systems and is the direct responsibility of Subcommittee **F17.10** on Fittings.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, <http://www.nsf.org>.

3. Terminology

3.1 **General**—Definitions are in accordance with Terminology F412, and abbreviations are in accordance with Terminology D1600, unless otherwise indicated. The abbreviation for poly(vinyl chloride) plastic is PVC.

4. Classification

4.1 **General**—This specification covers Schedule 40 PVC pipe fittings, made from four PVC plastic compounds and intended for use with Iron Pipe Size (IPS) outside-diameter plastic pipe.

4.1.1 Fittings covered by this specification are normally molded. In-line fittings, such as couplings, bushings, caps, nipples, etc., shall be molded or machined from extruded stock.

4.1.2 Fittings fabricated by welding are not included in this specification.

5. Materials

5.1 This specification covers PVC pipe fittings made from five PVC plastics as classified in Specification D1784. These are PVC 12454, 12454, 13354, 11443, and 14333.

5.2 **Compound**—The PVC plastic compound shall meet the requirements of PVC 12454, 12454, 11443, or 14333, as described in Specification D1784.

NOTE 3—Mechanical strength, heat resistance, flammability, and chemical resistance requirements are covered in Specification D1784.

5.3 **Rework Material**—The manufacturers shall use only their own clean rework fitting material and the fittings produced shall meet all the requirements of this specification.

6. Requirements

6.1 Dimensions and Tolerances:

6.1.1 Fitting sockets inside diameters (waterways), minimum wall thicknesses, and dimensions shall be as shown in Table 1, Table 2, and Table 3 when measured in accordance with Test Method D2122.

6.1.2 When multistep reducer bushings are cored out, the inner socket shall be reinforced from the outer wall by a minimum of three ribs extending from the top of the inner socket to the deepest extremity of the coring. The transition from D to DJ (Table 3) shall be straight, tapered as shown, or radiused. A positive taper in the same direction of the taper in the socket on the outside diameter of the bushing is optional (See XA/XB in Table 3). Any point measured along the outside diameter of the bushing (between points XA and XB) shall not fall below minimum pipe OD.

6.1.3 The minimum body wall thickness of fittings shall be 125 % of the minimum wall thickness of the corresponding size of Schedule 40 pipe for which they are designed to be used. For the socket, the wall thickness shall be at least equal to the minimum wall thickness of the corresponding size of Schedule 40 pipe, except in fittings designed with a socket nested in a spigot such as reducer bushings or nesting couplings. For any threaded fitting the minimum wall thickness of the threaded portion shall be at least equal to the thickness of material under the thread root of threaded Schedule 80 pipe of the same size.

6.1.4 The minimum inside diameter of the fittings shall be not less than the minimum specified inside diameter of the corresponding size of Schedule 40 pipe. Any fitting having a male thread shall have an internal diameter not larger than Schedule 80 pipe of the same size.

6.1.5 Minimum dimensions have zero negative tolerance. Tolerances on other dimensions are shown in Table 1 and Table 3.

6.2 **Threads**—For all fittings having taper pipe threads, threads shall conform to Specification F1498 and be gaged in accordance with 8.4.

6.3 Burst Pressure:

6.3.1 The minimum burst strength of the fittings shall be not less than that calculated for the size and wall thickness of the pipe with which it is to be used, when calculated from the following equation:

$$S = P(D_o - t)/2t \quad (1)$$

where:

S = hoop stress, psi (or MPa),
 P = internal pressure, psi (or MPa),
 D_o = average outside diameter, in. (or mm), and
 t = minimum wall thickness, in. (or mm).

Fittings tested in accordance with 8.5 shall withstand the minimum burst pressure shown in Table 4.

6.3.2 Pressures shown are minimum burst pressures and do not imply rated working pressures. The burst pressure shall be used only as an indication of quality.

7. Workmanship, Finish, and Appearance

7.1 The fittings shall be homogeneous throughout and free of cracks, holes, foreign inclusions, or other defects. The fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

8. Test Methods

8.1 **Conditioning**—Condition the test specimens at 73 °F ± 4 °F (23 °C ± 2 °C) and 50 % ± 10 % relative humidity for not less than 40 h prior to test in accordance with Procedure A of Practice D618, for those tests where conditioning is required.

8.2 **Test Conditions**—Conduct tests in the Standard Laboratory Atmosphere of 73 °F ± 4 °F (23 °C ± 2 °C) and 50 % ± 10 % relative humidity, unless otherwise specified in the test methods or in this specification.

8.3 **Sampling**—A sufficient quantity of fittings as agreed upon between the seller and the purchaser shall be selected at random from each lot or shipment and tested to determine that the basic design is in conformance with this specification.

NOTE 4—For individual orders or specifications, only those tests and numbers of tests specifically agreed upon between the purchaser and the seller need be conducted.

8.4 **Threads**—All taper pipe threads shall be gaged in accordance with Specification F1498.

8.5 **Burst Pressure**—Determine the minimum burst pressure in accordance with Test Method D1599, Procedure B. The