



Designation: **F438—09 F438 – 15**

## Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40<sup>1</sup>

This standard is issued under the fixed designation F438; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

### 1. Scope\*

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

NOTE 1—The CPVC fittings covered by this standard were covered previously in Specification [D2466](#).

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 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.

1.4 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.

1.5 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 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.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

[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 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](#)

[D2466 Specification for Poly\(Vinyl Chloride\) \(PVC\) Plastic Pipe Fittings, Schedule 40](#)

[D2749 Symbols for Dimensions of Plastic Pipe Fittings](#)

[F412 Terminology Relating to Plastic Piping Systems](#)

[F1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings](#)

#### 2.2 Federal Standard:<sup>3</sup>

[Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)](#)

#### 2.3 Military Standard:<sup>4</sup>

[MIL-STD-129 Marking for Shipment and Storage](#)

<sup>1</sup> 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. Current edition approved ~~Aug. 1, 2009~~ [March 1, 2015](#). Published ~~August 2009~~ [July 2015](#). Originally approved in 1974. Last previous edition approved in ~~2004~~ [2009](#) as [F438—04](#). [F438 – 09](#). DOI: ~~10.1520/F0438-09~~ [10.1520/F0438-15](#).

<sup>2</sup> 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.

<sup>3</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, [http://www.dodssp.daps.mil/](#). DLA Document Services Building 4/D 700 Robbins Avenue Philadelphia, PA 19111-5094 [http://quicksearch.dla.mil/](#)

<sup>4</sup> Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, [http://www.nsf.org](#).

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

2.4 *NSF Standard*.<sup>4</sup>

Standard No. 14 for Plastic Piping Components and Related Materials

Standard No. 61 for Drinking Water Systems Components—Health Effects

### 3. Terminology

#### 3.1 Definitions:

3.1.1 Definitions are in accordance with Terminology **F412** and abbreviations are in accordance with Terminology **D1600**, unless otherwise indicated. The abbreviation for chlorinated poly(vinyl chloride) is CPVC.

### 4. Classification

4.1 *General*—This specification covers Schedule 40 CPVC pipe fittings, socket-type, 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, unions, bushings, caps, nipples, and the like, shall be molded or machined from extruded stock.

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

NOTE 3—This specification does not include requirements for pipe and fittings intended to be used to vent combustion gases.

### 5. Materials and Manufacture

5.1 This specification covers CPVC pipe fittings made from compounds meeting the requirements of Class 23447 as defined in Specification **D1784**.

NOTE 4—Mechanical strength, heat resistance, flammability, and chemical resistance requirements are covered in Specification **D1784**.

5.2 *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 **Tables 1-4** and 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 in 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.

6.1.3 The maximum angular variation of any opening shall be not more than ½ ° off the true centerline axis.

6.1.4 The minimum 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, except that for the socket, the wall thickness shall be at least equal to the minimum wall thickness of the corresponding size of Schedule 40 pipe. For any threaded transition 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.

6.1.5 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.

6.1.6 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:

$$S = P(D_o - t)/2t$$

where:

$S$  = hoop stress, psi (or MPa),

$P$  = internal pressure, psi (or MPa),

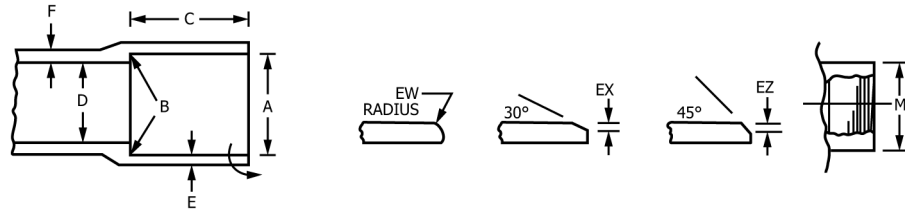
$D_o$  = average outside diameter, in. (or mm), and

$t$  = 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.

TABLE 1 Tapered Sockets for CPVC Pipe Fittings, Schedule 40, in. (mm)<sup>A</sup>



Nominal Pipe Size	A Socket Entrance Diameter			B Socket Bottom Diameter			C <sup>B</sup> Socket min in. (mm)	D <sup>C</sup> Inside Diameter, min in. (mm)	Wall Thickness, min		Outside Diameter of Hub, M, min	Entrance, min	
	Diameter in. (mm)	Tolerance on Diameter in. (mm)	Maximum Out-of-Round in. (mm)	Diameter in. (mm)	Tolerance on Diameter in. (mm)	Maximum Out-of-Round in. (mm)			E in. (mm)	F in. (mm)		EW in. (mm)	EX,EZ in. (mm)
1/4	0.552 (14.02)	±0.004 (0.10)	0.016 (0.41)	0.536 (13.6)	±0.004 (0.10)	0.016 (0.41)	0.500 (12.70)	0.320 (8.13)	0.088 (2.23)	0.110 (2.79)	0.672	1/64 (0.40)	1/64 (0.40)
3/8	0.687 (17.45)	±0.004 (0.10)	0.016 (0.41)	0.671 (17.04)	±0.004 (0.10)	0.016 (0.41)	0.594 (15.08)	0.449 (11.40)	0.091 (2.31)	0.114 (2.90)	0.821	1/32 (0.79)	1/32 (0.79)
1/2	0.848 (21.54)	±0.004 (0.10)	0.016 (0.41)	0.836 (21.23)	±0.004 (0.10)	0.016 (0.41)	0.688 (17.48)	0.578 (14.68)	0.109 (2.76)	0.136 (3.45)	0.998	1/32 (0.79)	1/32 (0.79)
3/4	1.058 (26.87)	±0.004 (0.10)	0.020 (0.51)	1.046 (26.57)	±0.004 (0.10)	0.020 (0.51)	0.719 (18.26)	0.740 (18.80)	0.113 (2.87)	0.141 (3.58)	1.221	1/32 (0.79)	1/32 (0.79)
1	1.325 (33.66)	±0.005 (0.13)	0.020 (0.51)	1.310 (33.27)	±0.005 (0.13)	0.020 (0.51)	0.875 (22.23)	0.990 (25.15)	0.133 (3.38)	0.166 (4.22)	1.504	1/16 (1.59)	1/16 (1.59)
1 1/4	1.670 (42.42)	±0.005 (0.13)	0.024 (0.61)	1.655 (42.04)	±0.005 (0.13)	0.024 (0.61)	0.938 (23.83)	1.335 (33.91)	0.140 (3.56)	0.175 (4.45)	1.871	1/16 (1.59)	1/16 (1.59)
1 1/2	1.912 (48.56)	±0.006 (0.15)	0.024 (0.61)	1.894 (48.10)	±0.006 (0.15)	0.024 (0.61)	1.094 (27.79)	1.564 (39.73)	0.145 (3.68)	0.181 (4.60)	2.127	1/16 (1.59)	1/16 (1.59)
2	2.387 (60.63)	±0.006 (0.15)	0.024 (0.61)	2.369 (60.17)	±0.006 (0.15)	0.024 (0.61)	1.156 (29.36)	2.021 (51.33)	0.154 (3.91)	0.193 (4.90)	2.634	1/16 (1.59)	1/16 (1.59)
2 1/2	2.889 (73.38)	±0.007 (0.18)	0.030 (0.76)	2.868 (72.85)	±0.007 (0.18)	0.030 (0.76)	1.750 (44.45)	2.414 (61.32)	0.203 (5.16)	0.254 (6.45)	3.170	3/32 (2.38)	1/8 (3.18)
3	3.516 (89.31)	±0.008 (0.20)	0.030 (0.76)	3.492 (88.70)	±0.008 (0.20)	0.030 (0.76)	1.875 (47.63)	3.008 (76.40)	0.216 (5.49)	0.270 (6.86)	3.841	3/32 (2.38)	1/8 (3.18)
3 1/2	4.016 (102.01)	±0.008 (0.20)	0.030 (0.76)	3.992 (101.40)	±0.008 (0.20)	0.030 (0.76)	2.000 (50.80)	3.486 (88.54)	0.226 (5.74)	0.283 (7.19)	4.374	3/32 (2.38)	1/8 (3.18)
4	4.518 (114.76)	±0.009 (0.23)	0.030 (0.76)	4.491 (114.07)	±0.009 (0.23)	0.030 (0.76)	2.000 (50.80)	3.961 (100.61)	0.237 (6.02)	0.296 (7.52)	4.907	3/32 (2.38)	1/8 (3.18)
5	5.583 (141.81)	±0.010 (0.25)	0.060 (1.52)	5.553 (141.05)	±0.010 (0.25)	0.060 (1.52)	3.000 (76.20)	4.975 (126.37)	0.258 (6.55)	0.323 (8.20)	6.039	3/32 (2.38)	1/8 (3.18)
6	6.647 (168.83)	±0.011 (0.28)	0.060 (1.52)	6.614 (168.00)	±0.011 (0.28)	0.060 (1.52)	3.000 (76.20)	5.986 (152.04)	0.280 (7.11)	0.350 (8.89)	7.203	1/8 (3.18)	3/16 (4.76)

<sup>A</sup> The sketches and designs of fittings are illustrative only.

<sup>B</sup> Socket depth, measured from socket entrance face to socket bottom face.

<sup>C</sup> See 6.1.5.