



Designation: **F438—17 F438 – 23**

An American National Standard

Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40¹

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 (ϵ) 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 appendices 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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

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. Current edition approved Aug. 1, 2017/April 1, 2023. Published August 2017/July 2023. Originally approved in 1974. Last previous edition approved in 2015/2017 as F438—15. F438—17. DOI: 10.1520/F0438-17; 10.1520/F0438-23.

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.

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

- 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
- 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*.³

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

2.3 *Military Standard*.⁴

MIL-STD-129 Marking for Shipment and Storage

2.4 *NSF Standard*.⁴

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/Classification D1784.

NOTE 4—Mechanical strength, heat resistance, flammability, and chemical resistance requirements are covered in Specification/Classification 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

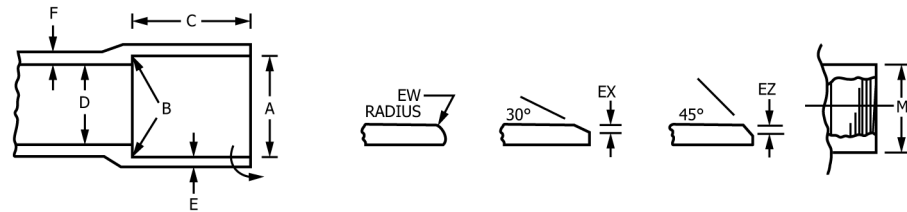
6.1 Dimensions and Tolerances:

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.

³ DLA Document Services Building 4/D 700 Robbins Avenue Philadelphia, PA 19111-5094 <http://quicksearch.dla.mil/>

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

TABLE 1 Tapered Sockets for CPVC Pipe Fittings, Schedule 40, in. (mm)^A



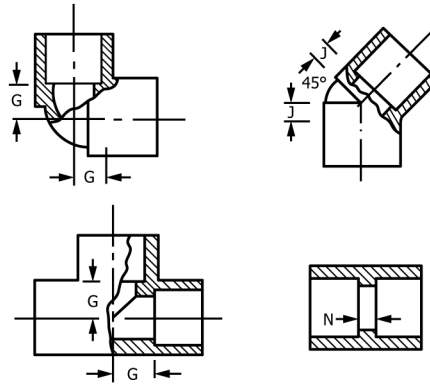
Nominal Pipe Size	A Socket Entrance Diameter			B Socket Bottom Diameter			C ^B Socket min in. (mm)	D ^C Inside Diameter, min in. (mm)	Wall Thickness, min		Outside Diameter of Hub, M, min	Entrance, min	
	Diameter in. (mm)	Tolerance on Diameter in. (mm)	Maximum Out-of-Round in. (mm)	Diameter in. (mm)	Tolerance 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)

^A The sketches and designs of fittings are illustrative only.

^B Socket depth, measured from socket entrance face to socket bottom face.

^C See 6.1.5.

TABLE 2 Minimum Dimension from Center to End of Sockets (Laying Length) for Couplings, Tees, 90° and 45° Elbows, CPVC Socket-Type Pipe Fittings, Schedule 40, in. (mm)^A



Nominal Pipe Size	G, min in. (mm)	J, min in. (mm)	N, min in. (mm)
1/4	5/16 (7.94)	5/32 (3.97)	1/16 (1.59)
3/8	3/8 (9.53)	3/16 (4.76)	3/32 (2.38)
1/2	1/2 (12.70)	1/4 (6.35)	3/32 (2.38)
3/4	9/16 (14.29)	5/16 (7.94)	3/32 (2.38)
1	1 1/16 (17.46)	5/16 (7.94)	3/32 (2.38)
1 1/4	7/8 (22.22)	3/8 (9.53)	3/32 (2.38)
1 1/2	1 (25.40)	7/16 (11.11)	3/32 (2.38)
2	1 1/4 (31.75)	5/8 (15.88)	3/32 (2.38)
2 1/2	1 1/2 (38.10)	1 1/16 (17.46)	3/16 (4.76)
3	1 3/16 (46.04)	3/4 (19.05)	3/16 (4.76)
3 1/2	2 1/8 (53.98)	1 (25.40)	3/16 (4.76)
4	2 5/16 (58.74)	1 (25.40)	3/16 (4.76)
5	3 (76.20)	1 3/8 (34.92)	3/16 (4.76)
6	3 1/2 (88.90)	1 3/4 (44.45)	1/4 (6.35)

^A The sketches and designs of fittings are illustrative only.

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<https://standards.iteh.ai/catalog/standards/sist/7168de4f-0577-4430-9921-ebc5faa0f38a/astm-f438-23>

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 1/2 ° 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.

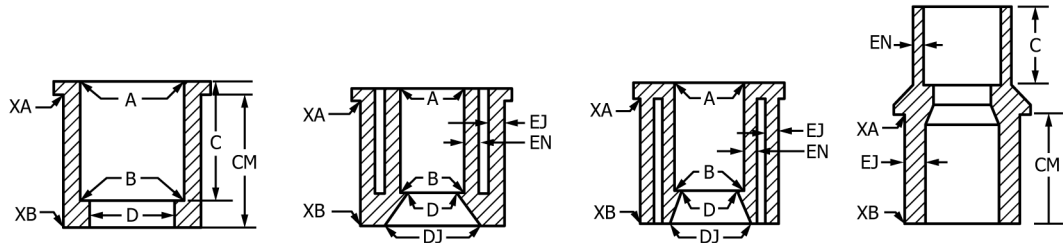
6.1.5 The minimum inside diameter of the fittings shall be not less than the minimum specified inside diameter of the corresponding size of Schedule 40 pipe. Any fitting having a male thread shall have an internal diameter not larger than Schedule 80 pipe of the same size.

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*:

TABLE 3 Dimensions of Reducer Bushings, CPVC Socket-Type Pipe Fittings, Schedule 40,^A in.



Nominal Size	Outside Diameter XA	Tolerance on Outside Diameter	Outside Diameter XB	Tolerance on Outside Diameter	Maximum Out of Roundness (max. minus min.)
1/4 by 1/8	0.540 (13.72)	+ 0.007 - 0.004 (0.18 - 0.10)	0.540 (13.72)	±0.004 (0.10)	0.016 (0.41)
3/8 by 1/4, 1/8	0.675 (17.41)	+ 0.007 - 0.004 (0.18 - 0.10)	0.675 (17.41)	±0.004 (0.10)	0.016 (0.41)
1/2 by 3/8, 1/4	0.840 (21.34)	+ 0.007 - 0.004 (0.18 - 0.10)	0.840 (21.34)	±0.004 (0.10)	0.016 (0.41)
3/4 by 1/2, 3/8, 1/4	1.050 (26.67)	+ 0.007 - 0.004 (0.18 - 0.10)	1.050 (26.67)	±0.004 (0.10)	0.020 (0.51)
1 by 1/2, 3/4	1.315 (33.40)	+ 0.008 - 0.005 (0.20 - 0.13)	1.315 (33.40)	±0.005 (0.13)	0.020 (0.51)
1 1/4 by 1/2, 3/4, 1	1.660 (42.16)	+ 0.008 - 0.005 (0.20 - 0.13)	1.660 (42.16)	±0.005 (0.13)	0.024 (0.61)
1 1/2 by 1/2, 3/4, 1, 1 1/4	1.900 (48.26)	+ 0.010 - 0.006 (0.25 - 0.15)	1.900 (48.26)	±0.006 (0.15)	0.024 (0.61)
2 by 1/2, 3/4, 1, 1 1/4, 1 1/2	2.375 (60.33)	+ 0.010 - 0.006 (0.25 - 0.15)	2.375 (60.33)	±0.006 (0.15)	0.024 (0.61)
2 1/2 by 2	2.875 (73.03)	+ 0.012 - 0.007 (0.30 - 0.18)	2.875 (73.03)	±0.007 (0.18)	0.030 (0.76)
3 by 2 1/2, 2	3.500 (88.90)	+ 0.013 - 0.008 (0.33 - 0.20)	3.500 (88.90)	±0.008 (0.20)	0.030 (0.76)
3 1/2 by 2 1/2, 2	4.000 (101.60)	+ 0.013 - 0.008 (0.33 - 0.20)	4.000 (101.60)	±0.008 (0.20)	0.030 (0.76)
4 by 3 1/2, 3, 2 1/2, 2	4.500 (114.30)	+ 0.015 - 0.009 (0.38 - 0.23)	4.500 (114.30)	±0.009 (0.23)	0.030 (0.76)
5 by 4	5.563 (141.30)	+ 0.017 - 0.010 (0.43 - 0.25)	5.563 (141.30)	±0.010 (0.25)	0.060 (1.52)
6 by 5	6.625 (168.28)	+ 0.018 - 0.011 (0.46 - 0.28)	6.625 (168.28)	±0.011 (0.28)	0.070 (1.78)

^A The sketches and designs of fittings are illustrative only—per Symbols D2749.

TABLE 4 Burst Pressure Requirements for Water at 73°F (23°C) for CPVC Socket-Type Pipe Fittings, Schedule 40

Nominal Size, in.	Min Burst Strength, ^A	
	Class 23447	
	psi	(MPa)
1/4	2490	(17.17)
3/8	1990	(13.72)
1/2	1910	(13.17)
3/4	1540	(10.62)
1	1440	(9.93)
1 1/4	1180	(8.14)
1 1/2	1060	(7.31)
2	890	(6.14)
2 1/2	970	(6.69)
3	840	(5.79)
3 1/2	770	(5.31)
4	710	(4.90)
5	620	(4.27)
6	560	(3.86)

^A This table was calculated for Schedule 40 pipe using the ISO formula and a stress level as follows:

Class 23447 (Type IV, Grade 1 (CPVC)) psi (MPa)
6400 (44.1)

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),