



# Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80<sup>1</sup>

This standard is issued under the fixed designation F437; 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) threaded Schedule 80 pipe fittings. Included are requirements for materials, workmanship, dimensions, and burst pressure.

NOTE 1—The CPVC fittings covered by this specification were covered previously in Specification [D2464](#).

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.*

<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.

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## 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](#)
- [D2464 Specification for Threaded Poly\(Vinyl Chloride\) \(PVC\) Plastic Pipe Fittings, Schedule 80](#)
- [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:

- [Fed Std. No. 123 Marking for Shipment \(Civil Agencies\)<sup>3</sup>](#)

### 2.3 Military Standard:

- [MIL-STD-129 Marking for Shipment and Storage<sup>3</sup>](#)

### 2.4 NSF Standard:

- [Standard No. 14 for Plastic Piping Components and Related Materials<sup>4</sup>](#)

## 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.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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> 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

**4. Classification**

4.1 *General*—This specification covers threaded Schedule 80 CPVC pipe fittings, intended for use with threaded 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, etc., 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 The dimensions and tolerances of the fittings shall be as shown in Table 1 and Table 2 when measured in accordance with Test Method D2122. Minimum dimensions have zero negative tolerances. Bushings shall have thread lengths applicable to the corresponding sizes. Counterbore, which is

optional, is not shown in Table 1, and is not included in the center-to-end or end-to-end dimensions.

6.1.2 *Fittings Not Illustrated*—All fittings, whether illustrated in Table 1 and Table 2 or not, shall have wall thicknesses and thread dimensions conforming to 6.1 and 6.2.

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:

$$S = P(D_o - t)/2t \tag{1}$$

where:

- S = hoop stress, psi (or MPa),
- P = internal pressure, psi (or MPa),
- D<sub>o</sub> = average outside diameter, in. (or mm), and
- t = minimum wall thickness, in. (or mm).

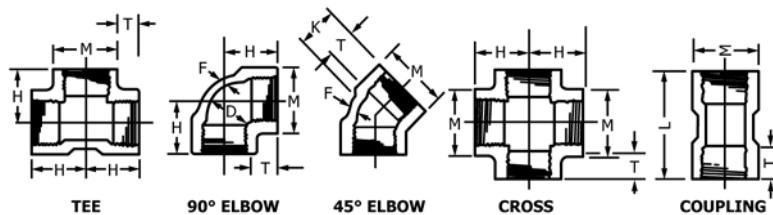
Fittings tested in accordance with 8.5 shall withstand the minimum burst pressure shown in Table 3.

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.

TABLE 1 Dimensions of 90° Ells, Tees, Crosses, 45° Elbows and Couplings (Straight Sizes), in. (mm)<sup>A,B</sup>



Nominal Pipe Size	Center to Thread End, 90° Elbows, Tees, Crosses, H, min	Length of Thread, T, min	Center to Thread End, 45° Elbow, K, min	Inside Diameter of Fitting, D, min	Nominal Wall Thickness, F, min	Outside Diameter of Hub, M, min	Thread End to Thread End of Coupling, L, min
1/4	0.812 (20.62)	0.50 (12.70)	0.688 (17.48)	0.258 (6.55)	0.135 (3.43)	0.840 (21.34)	1.063 (27.00)
3/8	0.938 (23.83)	0.50 (12.70)	0.750 (19.05)	0.379 (9.63)	0.144 (3.66)	1.000 (25.40)	1.063 (27.00)
1/2	1.125 (28.58)	0.64 (16.26)	0.750 (19.05)	0.502 (12.75)	0.198 (5.03)	1.280 (32.51)	1.344 (34.14)
3/4	1.250 (31.75)	0.65 (16.51)	1.000 (25.40)	0.698 (17.73)	0.207 (5.25)	1.500 (38.10)	1.500 (38.10)
1	1.500 (28.10)	0.81 (20.51)	1.125 (28.58)	0.911 (23.14)	0.225 (5.72)	1.810 (45.97)	1.688 (42.88)
1 1/4	1.750 (44.45)	0.85 (21.59)	1.313 (33.35)	1.227 (31.17)	0.261 (6.63)	2.200 (55.88)	1.750 (44.45)
1 1/2	1.938 (49.23)	0.85 (21.59)	1.438 (36.83)	1.446 (36.73)	0.270 (6.85)	2.500 (63.50)	2.000 (50.80)
2	2.250 (57.15)	0.90 (22.86)	1.625 (41.28)	1.881 (47.78)	0.297 (7.54)	3.000 (76.20)	2.063 (52.40)
2 1/2	2.688 (68.28)	1.21 (30.73)	1.938 (49.23)	2.250 (57.15)	0.315 (8.00)	3.560 (90.42)	2.625 (66.68)
3	3.063 (77.80)	1.30 (33.02)	2.125 (53.98)	2.820 (71.63)	0.405 (10.29)	4.300 (109.22)	2.750 (69.85)
4	3.625 (92.08)	1.38 (35.05)	2.625 (66.68)	3.737 (94.92)	0.450 (11.43)	5.430 (137.92)	3.000 (76.20)
6	5.125 (130.18)	1.50 (38.10)	3.250 (82.55)	5.646 (143.41)	0.504 (12.80)	7.625 (193.68)	3.250 (82.55)

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

<sup>B</sup> Symbols for dimensions are per Symbols D2749.

<sup>C</sup> This dimension locates the end of the fitting.

**TABLE 2 Dimensions of Plugs and Caps, in.<sup>A,B</sup>**



Nominal Pipe Size	Length of Male Thread, S, min	Length of Female Thread, T, min	Width of Flats, <sup>B</sup> Q, min	Nominal Wall Thickness, F, min	Height of Head, R, min	Cap Height, W, min	Outside Diameter of Hub, M, min
1/4	0.44 (11.18)	0.50 (12.70)	0.625 (15.88)	0.135 (3.43)	0.188 (4.78)	0.688 (17.48)	0.840 (21.34)
3/8	0.44 (11.18)	0.50 (12.70)	0.750 (19.05)	0.144 (3.66)	0.188 (4.78)	0.688 (17.48)	1.000 (25.40)
1/2	0.53 (13.46)	0.64 (16.26)	0.938 (23.83)	0.198 (5.03)	0.188 (4.73)	0.875 (22.23)	1.280 (32.51)
3/4	0.55 (13.92)	0.65 (16.51)	1.125 (28.53)	0.207 (5.26)	0.219 (5.56)	1.000 (25.40)	1.450 (35.03)
1	0.68 (17.27)	0.81 (20.57)	1.375 (34.93)	0.225 (5.72)	0.219 (5.56)	1.188 (30.18)	1.810 (45.97)
1 1/4	0.71 (18.03)	0.85 (21.59)	1.750 (44.45)	0.261 (6.63)	0.281 (7.14)	1.250 (31.75)	2.200 (55.88)
1 1/2	0.72 (18.29)	0.85 (21.59)	1.875 (47.63)	0.270 (6.85)	0.313 (7.95)	1.250 (31.75)	2.450 (62.23)
2	0.76 (19.30)	0.90 (22.86)	1.875 (47.63)	0.297 (7.54)	0.313 (7.95)	1.375 (34.93)	3.000 (76.20)
2 1/2	1.14 (28.96)	1.21 (30.25)	1.875 (47.63)	0.369 (8.00)	0.375 (9.53)	1.625 (41.28)	3.560 (90.42)
3	1.20 (30.48)	1.30 (33.02)	2.000 (50.80)	0.405 (10.29)	0.375 (9.53)	1.750 (49.45)	4.250 (107.98)
4	1.30 (33.02)	1.38 (35.05)	2.000 (50.80)	0.450 (11.43)	0.375 (9.53)	2.000 (50.60)	5.350 (125.87)
6	1.44 (36.58)	1.50 (35.10)	2.000 (50.80)	0.504 (12.80)	0.500 (12.10)	2.125 (53.98)	7.625 (193.68)

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

<sup>B</sup>Symbols for dimensions are per Symbols D2749.

<sup>C</sup>At the manufacturer's option the head of the plug shall be hexagonal, octagonal, square, or round.

**TABLE 3 Burst Pressure Requirements for Water at 73°F (23°C) for CPVC Threaded Pipe Fittings, Schedule 80**

Nominal Size, in.	Min Burst Strength <sup>A</sup>	
	Class 23447	
	psi	(MPa)
1/4	3620	(24.96)
3/8	2940	(20.27)
1/2	2720	(18.75)
3/4	2200	(15.17)
1	2020	(13.93)
1 1/4	1600	(11.44)
1 1/2	1510	(10.41)
2	1290	(8.89)
2 1/2	1360	(9.38)
3	1200	(8.27)
4	1040	(7.17)
6	890	(6.14)

<sup>A</sup>This table was calculated for Schedule 80 pipe using the ISO formula and a stress level as follows:

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

## 8. Test Methods

8.1 *Conditioning*—Condition the test specimens at 73.4 ± 3.6°F (23 ± 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 73.4 ± 3.6°F (23 ± 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 5—For individual orders or specifications where supplemental

tests are required, only those tests and numbers of tests specifically agreed upon between the purchaser and 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 with at least five specimens in accordance with Test Method D1599. Join the fittings to the pipe sufficiently strong and in such a manner that no failures shall occur in the assembly at a pressure less than the pressure requirement given in Table 3. The time of testing each assembly shall be between 60 and 70 s.

## 9. Retest and Rejection

9.1 If the results of any test(s) do not meet the requirements of this specification, the tests(s) shall be conducted again only by agreement between the purchaser and seller. Under such agreement, minimum requirements shall not be lowered, changed, or modified, nor shall specification limits be changed. If upon retest, failure occurs, the quantity of product represented by the test(s) does not meet the requirements of this specification.

## 10. Product Marking

10.1 *Quality of Marking*—The markings shall be applied to the fittings in such a manner that they remain legible under normal handling and installation practices.

10.2 *Content of Marking*:

10.2.1 Fittings shall be marked with the following:

10.2.1.1 Manufacturer's name or trademark,

10.2.1.2 Material designation CPVC for CPVC 23447,

10.2.1.3 The seal or mark of the laboratory making the evaluation for potable water contact,

10.2.1.4 Size, and

10.2.1.5 This designation "F437," with which the fitting complies.

10.3 Where the size of the fitting does not allow complete marking, omit identification marking in the following sequence: size, material designation, F437, manufacturer's name or trademark.

10.4 Markings or symbols shall be molded, hot-stamped, or applied to fittings by any other suitable method, such as printing.

10.5 Where recessed marking is used, care shall be taken to see that in no case marking causes cracks or reduces the wall thickness below the minimum specified.

## **11. Quality Assurance**

11.1 When the product is marked with this designation, F437, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of this specification.

## **SUPPLEMENTARY REQUIREMENTS**

### **GOVERNMENT/MILITARY PROCUREMENT**

These requirements apply *only* to Federal/Military procurement, not domestic sales or transfers.

S1. *Responsibility for Inspection*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless the purchaser disapproves. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

NOTE S1—In U.S. Federal contracts, the contractor is responsible for inspection.

S2. *Packaging and Marking for U.S. Government Procurement*:

S2.1 *Packaging*—Unless otherwise specified in the contract, the materials shall be packaged in accordance with the supplier's standard practice in a manner ensuring arrival at destination in satisfactory condition and which will be acceptable to the carrier at lowest rates. Containers and packing shall comply with Uniform Freight Classification rules or National Motor Freight Classification rules.

S2.2 *Marking*—Marking for shipment shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

NOTE S2—The inclusion of U.S. Government procurement requirements should not be construed as an indication that the U.S. Government uses or endorses the products described in this document.

### **POTABLE WATER REQUIREMENT**

This requirement applies whenever a Regulatory Authority or user calls for product to be used to convey or to be in contact with potable water.

S3. Products intended for contact with potable water shall be evaluated, tested and certified for conformance with ANSI/NSF Standard No. 61 or the health effects portion of NSF

Standard No. 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.

## SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F437–09) that may impact the use of this standard.

(1) 8.1 and 8.2 were revised to change the relative humidity tolerances to  $\pm 10\%$  for conditioning atmospheres and for testing.

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