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An American National Standard

Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems[1]

This standard is issued under the fixed designation D2846/D2846M; 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 requirements, test methods, assembly, and methods of marking for chlorinated poly(vinyl chloride) plastic hot- and cold-water distribution system components made in one standard dimension ratio and intended for water service up to and including 180°F (82°C). These components comprise pipe and tubing, socket-type fittings, street fittings, plastic-to-metal transition fittings, solvent cements, and adhesives. Requirements and methods of test are included for materials, workmanship, dimensions and tolerances, hydrostatic sustained pressure strength, and thermocycling resistance. The components covered by this specification are intended for use in residential and commercial, hot and cold, potable water distribution systems.

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 1—Pressurized (compressed) air or other compressed gases contain large amounts of stored energy which present serious saftey 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 either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

NOTE 2—Suggested hydrostatic design stresses and hydrostatic pressure ratings for pipe, tubing, and fittings are listed in Appendix X1. Design and installation considerations are discussed in Appendix X2. An optional performance qualification and an in-plant quality control program are recommended in Appendix X3.

1.5 The following safety hazards caveat pertains only to the test method portion, Sections 9 and 10, 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~~ safety, health, and ~~health~~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]

D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings

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

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.61 on Water.

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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.

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

D2855 Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
D2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
F412 Terminology Relating to Plastic Piping Systems
F493 Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
F645 Guide for Selection, Design, and Installation of Thermoplastic Water- Pressure Piping Systems
F1498 Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings
F1960 Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
F1961 Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing
F1807 Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
F2080 Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe
F2098 Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings
F2159 Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
F2434 Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing
F2735 Specification for Plastic Insert Fittings For SDR9 Cross-linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing

2.2 *ANSI Standards:*
ANSI Z17.1-1958 Preferred Numbers[3]

2.3 *Federal Standard:*
Fed. Std. No. 123 Marking for Shipments (Civil Agencies)[4]

2.4 *Military Standard:*
MIL-STD-129 Marking for Shipment and Storage[4]

2.5 *NSF Standards:*
Standard No. 14 for Plastic Piping Components and Related Materials[5]
Standard No. 61 for Drinking Water Systems Components—Health Effects[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *General*—Definitions used in this specification are in accordance with Terminology F412, unless otherwise specified. The abbreviation for chlorinated poly(vinyl chloride) is CPVC. Plastic tubing denotes a particular diameter schedule of plastic pipe in which the outside diameter of the tubing is equal to the nominal size plus ⅛ in. (3.18 mm).

3.1.2 *relation between standard dimension ratio, stress, and internal pressure*—the following expression is used to relate standard dimension ratio, stress, and internal pressure for pipe and tubing:

$$2S/P = R - 1 \tag{1}$$

or

$$2\,S/P = (D_0 / t\ ) - 1 \tag{2}$$

where:

S = stress in circumferential or hoop direction, psi (MPa),
P = internal pressure, psi (MPa),
D_0 = average outside diameter, in. (mm),
t = minimum wall thickness, in. (mm), and

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[4] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.
[5] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

R = standard dimension ratio, SDR

3.1.3 *standard dimension ratio (SDR)*—a selected series of numbers in which the average outside diameter to minimum wall thickness dimension ratios are constant for all sizes of pipe and tubing in each standard dimension ratio, and which are the ANSI Z17.1 Preferred Number Series 10 modified by +1. SDR fittings shall by definition be equivalent in minimum socket wall thickness to the minimum wall thickness of the corresponding SDR and size of pipe or tubing, and the minimum body wall thickness shall be 125 % of that value.

3.1.4 *standard material designation code*—the chlorinated poly(vinyl chloride) material designation code shall consist of the abbreviation CPVC followed by two digits indicating the ASTM type and grade in Arabic numerals. Where necessary, a third and fourth digit shall be added to indicate the hydrostatic design stress for water at 73°F [23°C] in units of 100 psi [0.69 MPa].

4. Classification

4.1 *Pipe, Tubing, and Fittings*—This specification classifies CPVC 4120 pipe, tubing, and fittings by a single standard dimension ratio which shall be SDR 11, by a maximum continuous use temperature which shall be 180°F [82°C] and by nominal pipe or tubing diameters from ¼ in. [9.5 mm] through 2 in. [50 mm].

4.2 *Transition Fittings*—This specification classifies transition fittings intended for use up to and including 180°F [82°C] as CPVC-180°F on the basis of resistance to failure by thermocycling.

4.3 *Solvent Cements and Adhesives*—This specification classifies solvent cements and adhesives meeting the requirements contained herein as CPVC Solvent Cement or CPVC Adhesive.

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

5. Materials

5.1 *Basic Materials Description*—Chlorinated poly(vinyl chloride) plastics used to make pipe, tubing, and fittings meeting the requirements of this specification are categorized by two criteria; namely, basic short-term properties, and long-term hydrostatic strength. Sections 5.1.1 and 5.1.2 respectively define these categories.

5.1.1 *Basic Short-Term Properties*—This specification covers CPVC 41 pipe, tubing, and fittings made from plastic materials meeting the mechanical strength, heat resistance, flammability, and chemical resistance requirements for CPVC 23447 in Specification D1784.

NOTE 4—CPVC 23447 was formerly designated as CPVC Type IV Grade 1, and is herein designated as CPVC 41. This is also used in marking pipe, tubing, or fittings.

5.1.2 *Long-Term Hydrostatic Strength*—This specification covers CPVC 41 pipe, tubing, and fittings which are further defined by hydrostatic design stress as CPVC 4120. Pipe and tubing are so defined on the basis of long-term hydrostatic strength tests and are made from compounds having an established 180°F [82°C] hydrostatic design stress of 500 psi [3.45 MPa] or greater in accordance with Test Method D2837. Fittings are so defined by hydrostatic sustained pressure tests on fitting assemblies, required by this specification (see 6.2), based on the hydrostatic strength of the corresponding pipe or tubing.

NOTE 5—No hydrostatic design stress, as such, exists for fittings until such time as long-term hydrostatic strength test methods for fittings are developed.

5.2 The PEX fitting ends of CPVC to PEX transition fittings shall meet the material and dimensional requirements of the corresponding PEX fitting standard.

5.3 The PERT fitting ends of CPVC to PERT transition fittings shall meet the material and dimensional requirements of the corresponding PERT fitting standard.

5.4 *Rework Material*—Clean rework plastic material generated from the manufacturer's own plastic tube or fitting production may be used by the same manufacturer provided the pipe, tubing, or fittings meet all the requirements of this specification.

6. Requirements for Pipe, Tubing and Fittings

6.1 *Dimensions and Tolerances:*

6.1.1 *General:*

6.1.1.1 *Wall Minimums*—Table 1 and Table 2 show wall thickness minimums. Calculated SDR 11 fitting wall thicknesses that fall below 0.102 in. [2.59 mm] for the fitting socket bottom, or 0.128 in. [3.25 mm] for the fitting body, shall be arbitrarily increased to these values.

6.1.1.2 *Interference Fit*—The diameters and tolerances in Table 1 and Table 2 provide for socket-type joints having an interference fit based on the major diameter of pipe and tubing having a degree of out-of-roundness.

6.1.1.3 *Out-of-Roundness*—The maximum out-of-roundness requirements shown in Table 1 and Table 2 for pipe, tubing, and fittings apply to the average measured diameter.

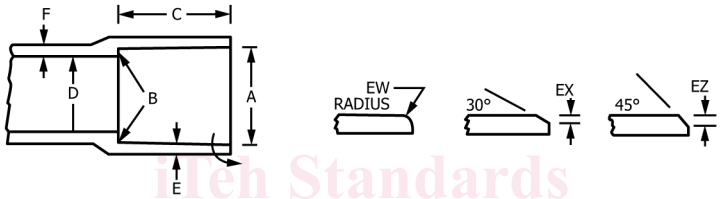
NOTE 6—*Example*: In the 1-in. [25 mm] tubing size, if the measured average tubing diameter was 1.123 in. [28.52 mm], then the extreme measured

TABLE 1 Outside Diameters, Wall Thicknesses, and Tolerances for CPVC 41, SDR 11, Plastic Pipe and Tubing[A]

Nominal Tube or Pipe Size		Outside Diameter, in. [mm]			Wall Thickness, in. [mm][B]	
		Average	Tolerance on Average	Max Out-of-Round[C]	SDR 11	
					Min	Tolerance
¼ Tubing		0.375 [9.5]	±0.003 [±0.08]	±0.003 [±0.08]	0.055 [1.40][D]	+0.020 [+0.51]
⅜ Tube	[10]	0.500 [12.7]	±0.003 [±0.08]	±0.003 [±0.08]	0.060 [1.52][D]	+0.020 [+0.51]
½ Tube	[15]	0.625 [15.9]	±0.003 [±0.08]	±0.004 [±0.10]	0.060 [1.52][D]	+0.020 [+0.51]
¾ Tube	[20]	0.875 [22.2]	±0.003 [±0.08]	±0.005 [±0.13]	0.080 [2.03]	+0.020 [+0.51]
1 Tube	[25]	1.125 [28.6]	±0.003 [±0.08]	±0.006 [±0.15]	0.102 [2.59]	+0.020 [+0.51]
1¼ Tube	[32]	1.375 [34.9]	±0.003 [±0.08]	±0.007 [±0.18]	0.125 [3.18]	+0.020 [+0.51]
1½ Tube	[40]	1.625 [41.3]	±0.004 [±0.10]	±0.008 [±0.20]	0.148 [3.76]	+0.020 [+0.51]
2 Tube	[50]	2.125 [54.0]	±0.004 [±0.10]	±0.010 [±0.25]	0.193 [4.90]	+0.023 [+0.58]
1½ Pipe	[40]	1.900 [48.6]	+0.006, −0.002 [+0.15, −0.05]	±0.008 [±0.20]	0.173 [4.39]	+0.021 [+0.53]
2 Pipe	[50]	2.375 [60.7]	+0.006, −0.002 [+0.15, −0.05]	±0.010 [±0.25]	0.216 [5.49]	+0.026 [+0.66]

[A] All dimensions are in inches and millimetres. (1 in. = 25.4 mm.)
[B] The minimum is the lowest wall thickness at any cross section. The maximum permitted wall thickness, at any cross section, is the minimum wall thickness plus the stated tolerance. All wall tolerances are on the plus side of the minimum requirement.
[C] The maximum out-of-roundness applies to the average measured outside diameter.
[D] For tubing sizes of ½ in. and below, wall thickness minimums are not a function of SDR.

TABLE 2 Tapered Socket Dimensions for CPVC 41, SDR 11, Plastic Pipe and Tubing Fittings[A,B]



Nominal Tube or Pipe Size		*A* Socket Entrance Diameter, in. [mm]			*B* Socket Bottom Diameter, in. [mm]		
		Average	Tolerance on Average	Max Out-of-Round [C]	Average	Tolerance on Average	Max Out-of-Round [C]
⅜ Tube	[10]	0.508 [12.90]	±0.003 [±0.08]	±0.003 [±0.08]	0.494 [12.55]	±0.003 [±0.08]	±0.003 [±0.08]
½ Tube	[15]	0.633 [16.08]	±0.003 [±0.08]	±0.004 [±0.10]	0.619 [15.72]	±0.003 [±0.08]	±0.004 [±0.10]
¾ Tube	[20]	0.884 [22.45]	±0.003 [±0.08]	±0.005 [±0.13]	0.870 [22.10]	±0.003 [±0.08]	±0.005 [±0.13]
1 Tube	[25]	1.135 [28.83]	±0.003 [±0.08]	±0.006 [±0.15]	1.121 [28.47]	±0.003 [±0.08]	±0.006 [±0.15]
1¼ Tube	[32]	1.386 [35.20]	±0.003 [±0.08]	±0.007 [±0.18]	1.372 [34.85]	±0.003 [±0.08]	±0.007 [±0.18]
1½ Tube	[40]	1.640 [41.66]	±0.004 [±0.10]	±0.008 [±0.20]	1.622 [41.20]	±0.004 [±0.10]	±0.008 [±0.20]
2 Tube	[50]	2.141 [54.38]	±0.004 [±0.10]	±0.010 [±0.25]	2.123 [53.92]	±0.004 [±0.10]	±0.010 [±0.25]
1½ Pipe	[40]	1.918 [48.72]	±0.004 [±0.10]	±0.008 [±0.20]	1.900 [48.26]	±0.004 [±0.10]	±0.008 [±0.20]
2 Pipe	[50]	2.393 [60.78]	±0.004 [±0.10]	±0.010 [±0.25]	2.375 [60.33]	±0.004 [±0.10]	±0.010 [±0.25]

C Socket Length, min, in. [mm]	*D* Inside Diameter, min, in. [mm]	Wall Thickness, min,[D] in. [mm]			Entrance; min *EW EX EZ*, in. [mm]
		(E_a) Socket Entrance	(E_b) Socket Bottom	*F*	
0.500 [12.70]	0.364 [9.25]	0.068 [1.73]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.500 [12.70]	0.489 [12.42]	0.068 [1.73]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.700 [17.78]	0.715 [18.16]	0.080 [2.03]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
0.900 [22.86]	0.921 [23.39]	0.102 [2.59]	0.102 [2.59]	0.128 [3.25]	0.034 [0.86]
1.100 [27.94]	1.125 [28.58]	0.125 [3.18]	0.125 [3.18]	0.156 [3.96]	0.042 [1.07]
1.300 [33.02]	1.329 [33.76]	0.148 [3.76]	0.148 [3.76]	0.185 [4.70]	0.049 [1.24]
1.700 [43.18]	1.739 [44.17]	0.193 [4.90]	0.193 [4.90]	0.241 [6.12]	0.064 [1.63]
1.375 [34.92]	1.494 [37.95]	0.173 [4.39]	0.173 [4.39]	0.216 [5.49]	0.058 [1.47]
1.500 [38.10]	1.933 [49.10]	0.216 [5.49]	0.216 [5.49]	0.270 [6.86]	0.072 [1.83]

[A] All dimensions are in inches and millimetres. (1 in. = 25.4 mm.)
[B] All sketches and designs of fittings are illustrative only.
[C] Maximum out-of-roundness applies to the average measured inside diameter.
[D] The minimum is the lowest wall thickness at any cross section.

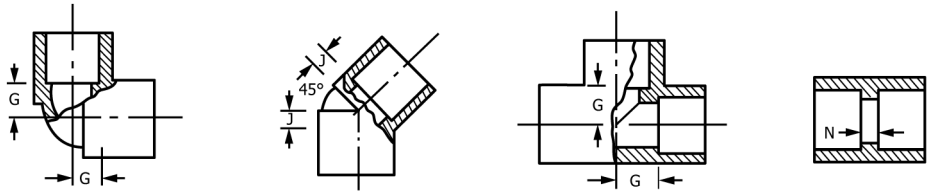
diameters due to ovality could be 1.129 in. [28.68 mm] maximum and 1.117 in. [28.37 mm] minimum.

6.1.2 *Pipe and Tubing:*

6.1.2.1 *Outside Diameter and Wall Thickness*—The outside diameters and wall thicknesses for pipe and tubing shall meet the requirements for dimension and tolerance given in Table 1 when measured in accordance with Test Method D2122.

6.1.2.2 *Wall Thickness Range*—The wall thickness range for pipe and tubing shall be within 12 % when measured in accordance with Test Method D2122.

TABLE 3 Minimum Dimensions from Center to End of Socket (Laying Length) for CPVC 41, SDR 11 Plastic Pipe and Tubing Fittings[A,B,C]



Nominal Tube or Pipe Size		*G* Min[D], in. [mm]	*J* Min[D], in. [mm]	*N* Min[D], in. [mm]
⅜ Tube	[10]	0.359 [9.12]	0.174 [4.42]	0.102 [2.59]
½ Tube	[15]	0.382 [9.70]	0.183 [4.65]	0.102 [2.59]
¾ Tube	[20]	0.507 [12.88]	0.235 [5.97]	0.102 [2.59]
1 Tube	[25]	0.633 [16.08]	0.287 [7.29]	0.102 [2.59]
1¼ Tube	[32]	0.758 [19.25]	0.339 [8.61]	0.102 [2.59]
1½ Tube	[40]	0.884 [22.45]	0.391 [9.93]	0.102 [2.59]
2 Tube	[50]	1.134 [28.83]	0.495 [12.57]	0.102 [2.59]
1½ Pipe	[40]	1.022 [25.96]	0.448 [11.38]	0.102 [2.59]
2 Pipe	[50]	1.260 [32.00]	0.547 [13.89]	0.102 [2.59]

[A] All dimensions are in inches and millimetres. (1 in. = 25.4 mm.)
[B] All dimensions not shown shall be in accordance with those in Table 2.
[C] The sketches and designs of fittings are illustrative only.
[D] Minimum dimensions have zero negative tolerance.

6.1.2.3 *Flattening*—There shall be no evidence of splitting, cracking, or breaking when the pipe is tested in accordance with 9.2.

6.1.2.4 *Length*—Pipe and tubing supplied in straight lengths shall have a tolerance on any specified length of +½, –0 in. [+12.5, –0 mm].

6.1.3 *Socket-Type Fittings:*

6.1.3.1 *Dimensions*—Fitting sockets, inside diameters (waterways), wall thicknesses, laying lengths, and reducing bushing minimums shall meet the requirements for dimension and tolerance given in Table 2, Table 3, and Table 4 when measured in accordance with Test Method D2122. The spigot ends of street fittings shall meet the outside diameter and minimum wall requirements of Table 1.

6.1.3.2 *Alignment*—The maximum angular variation of any socket opening shall not exceed ½ ° off the true centerline axis.

6.1.4 *Plastic-to-Metal Transition Fittings:*

6.1.4.1 *Basic Dimensions*—Plastic parts of plastic-to-metal transition fittings shall meet the dimensional requirements of Table 1 and Table 2, where applicable, with the following exceptions. Such parts shall be exempted from the requirements for inside diameter (waterway) and wall thickness tolerance.

6.1.4.2 *Threads*—For all fittings having taper pipe threads, threads shall conform to Specification F1498 and be gaged in accordance with 9.5.

6.1.5 *CPVC to PEX and CPVC to PERT Transition Fittings:*

6.1.5.1 Basic Dimensions:

(1) CPVC spigot-ends of CPVC to PEX and CPVC to PERT fittings shall meet the dimensional requirements of Table 1, where applicable, with the following exceptions. Such parts shall be exempted from the requirements for inside diameter (waterway) and wall thickness tolerance and,

(2) CPVC tapered socket-ends of CPVC to PEX and CPVC to PERT transition fittings shall meet the dimensional requirements of Table 2 where applicable.

(3) The PEX fitting end of CPVC to PEX and CPVC to PERT transition fittings shall meet the applicable requirements of the corresponding ASTM fitting standard. See the following specifications for these requirements: F1960, F1961, F1807, F2080, F2098, F2159, F2434 and F2735.

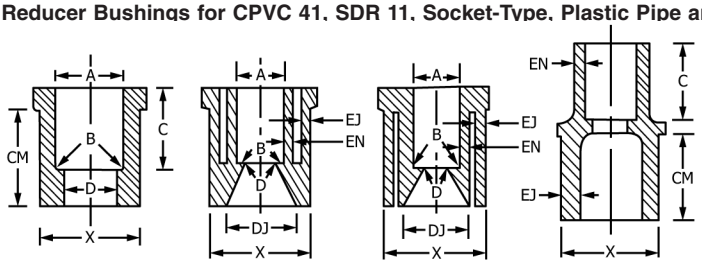
6.2 *Hydrostatic Sustained Pressure:*

6.2.1 *General*—Pipe, tubing, and fittings (tested as assemblies) shall meet the minimum hydrostatic sustained pressure requirements of both test conditions shown in Table 5 when tested in accordance with 9.3.

6.2.2 *Pipe and Tubing Quality*—Test Condition B shall be termed the primary sustained pressure test for pipe and tubing and shall be used for quality control (see Appendix X3). Test Condition A shall be termed the secondary sustained pressure test for pipe and tubing and shall be used for periodic performance qualification. Failure to pass either test is cause for rejection.

6.2.3 *Fitting Quality*—Test Condition A shall be termed the primary sustained pressure test for fittings and shall be used for quality control (see Appendix X3). Test Condition B shall be termed the secondary sustained pressure test for fittings and shall be used for periodic performance qualification. Failure to pass either test is cause for rejection.

TABLE 4 Dimensions of Reducer Bushings for CPVC 41, SDR 11, Socket-Type, Plastic Pipe and Tubing Fittings[A,B,C,D]



[A] Tubing socket dimensions, *A*,*B*, and *C*, and tolerances on these dimensions shall be the same as in Table 2. The minimum length of the male end of the bushing or coupling, *CM*, shall be the same as *C* in Table 2, but in any case the male end shall bottom in the mating fitting. Minimum waterway dimensions, *D* and *DJ*, shall be the same as *D* in Table 2. Minimum wall dimensions, *EJ* and *EN*, apply to the larger and smaller sizes joined respectively, and shall be the same as the corresponding values for E_a in Table 2.

[B] The minimum socket wall thickness for reducing bushings shall be 102 in. [2.59 mm]. If the socket wall thickness exceeds the total of *EJ* and *EN* calculated from the appropriate E_b values in Table 2 and the reducer bushing is cored, the inner socket shall be reinforced from the outer wall by a minimum of three ribs extending the full depth of the coring.

[C] The transition from *D* to *DM* shall be straight, tapered as shown, or radiused, at the discretion of the manufacturer.

[D] A taper on the male end of a bushing is optional. If a taper is used, it shall be a positive taper in the same direction as the taper in the socket. Whether a taper is used or not, all diameters *X* shall conform to the diameter and tolerance for the corresponding size of tubing shown in Table 1.

TABLE 5 Minimum Hydrostatic Sustained Pressure Requirements for CPVC 4120, SDR 11, Pipe, Tubing, and Fitting Assemblies Tested in Either Water or Air Bath External Environment at 180°F [82°C][A]

Test Condition	Test Duration	Hydrostatic Test Pressure	
		Water Bath	Air Bath
A	6 min	521 psi [3 590 kPa]	551 psi [3 800 kPa]
B	4 h	364 psi (2 510 kPa)	403 psi [2 780 kPa]

[A] Test conditions were calculated from the following experimentally derived, 95 % confidence, rupture pressure versus time relationships for CPVC 41, SDR 11, pipe and tubing at 180°F [82°C]. Pressure, *P*, and time, *t*, are in psi and h respectively. The 50 % confidence relationships are given for information only.

log P = – 0.085155 log t + 2.726805 (50 % confidence in air)
log P = –0.085155 log t + 2.656225 (95 % confidence in air)
log P = –0.097269 log t + 2.690464 (50 % confidence in water)
log P = –0.097269 log t + 2.619884 (95 % confidence in water)

NOTE 7—Drop weight impact resistance is correlatable with hydrostatic sustained pressure resistance for CPVC 41 components, and may be useful for predicting compliance with the sustained pressure requirements of Table 5. Such correlations will necessarily differ with the size, wall thickness, and geometry of individual components. Test Method D2444 using Tup A and Holder A is suggested for nominal diameters of 1 in. [25 mm] and above. For smaller components, a guided mandrel type of impacter such as the Gardner Impacter[6] equipped with a ½ in. [12.7 mm] radius mandrel is suggested. Drop impact is not included in this specification directly as a quality requirement because of the wide test scatter normally associated with this test, and also because of the wide differences in value over the range of sizes and components covered in this specification.

6.3 *Thermocycling*—Transition fittings (other than metal socket-type transitions for use with adhesives), assembled according to the manufacturer's instructions, shall not separate or leak when thermocycled 1000 times between the temperatures of 60°F and 180°F [16°C and 82°C] in accordance with 9.3.[7]

7. Requirements for Solvent Cement and Adhesive Joints

7.1 *CPVC Solvent Cements:*

NOTE 8—CPVC solvent cements may exist which meet the requirements of the specification when used in accordance with the manufacturer's recommendations, without a primer or cleaner. It is recommended that those CPVC solvent cements which may be used without a primer or cleaner be clear or yellow in color. Otherwise, it is recommended that CPVC solvent cement requiring the use of a primer or cleaner be orange in color. Color identification is recommended to facilitate cement recognition, to prevent the misuse of the cement and to minimize the unintentional use of other cements that may fail at elevated service temperatures.

7.1.1 *General*—CPVC solvent cements, for use in CPVC 41, plastic-to-plastic, socket-type joints shall meet the requirements set forth in Specification F493.

[6] Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, http://www.plasticpipe.org.

[7] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:F17-1039.