Designation: F2817 – 13

Standard Specification for Poly (Vinyl Chloride) (PVC) Gas Pressure Pipe and Fittings For Maintenance or Repair[1]

This standard is issued under the fixed designation F2817; 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.

1. Scope*

1.1 This specification covers requirements for PVC pipe and tubing for use only to maintain or repair existing PVC gas piping. This specification covers requirements for fittings for use to maintain or repair existing PVC gas piping.

1.1.1 In-plant quality control programs are specified in Annex A1.

1.2 The text of this specification references notes and, 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.

1.3 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.

1.4 The following is an index of the annexes in this specification:

Annex	Subject
Annex A1	In-Plant Quality Control for PVC materials up to 6 in.

1.5 *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:*[2]

D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D618 Practice for Conditioning Plastics for Testing

D638 Test Method for Tensile Properties of Plastics

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

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D1898 Practice for Sampling of Plastics (Withdrawn 1998)[3]

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D2152 Test Method for Adequacy of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion

D2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe

D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D2444 Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

D2466 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

F412 Terminology Relating to Plastic Piping Systems

F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

2.2 *Plastic Pipe Institute:*[4]

PPI TR-4 Hydrostatic Design Bases and Maximum Recommended Hydrostatic Design Stresses for Thermoplastic Piping Materials

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.

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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] The last approved version of this historical standard is referenced on www.astm.org.

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

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

PPI TR-9 Recommended Design Factors and Design Coefficients for Thermoplastic Pressure Pipe

2.3 *Other Standards:*

ANSI B31.8 Gas Transmission and Distribution Piping Systems[5]

CFR Part 192 Transportation Of Natural And Other Gas By Pipeline: Minimum Federal Safety Standards[6]

MIL-STD-1235 Single- and Multi-Level Continuous Sampling Procedures and Tables for Inspection by Attributes[6]

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412, and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 The gas industry terminology used in this specification is in accordance with ANSI B31.8 or 49 CFR Part 192, unless otherwise indicated.

3.3 The term pipe used herein refers to both pipe and tubing unless specifically stated otherwise.

3.4 *pipe material designation code*—code for thermoplastic pipe materials defined by the Plastics Pipe Institute in PPI TR-4.

3.5 *category 1 mechanical fitting, n*—fitting for assembling pipes, which includes a compression zone(s) to provide for pressure integrity, leak tightness, and resistance to end loads sufficient to cause no less than 25 % elongation of the PVC piping as described in this specification.

3.6 *in-line fitting, n*—mechanical fitting used to make a mechanical joint where the bore axis of the compression and sealing zones of the fitting is essentially the same as the connected piping, for example, couplings, ells, and tees.

3.7 *mechanical saddle fitting, n*—mechanical fitting used to make a mechanical joint that allows a lateral connection to an existing main in which a portion of the fitting is contoured to match the O.D. of the pipe to which it is attached.

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[6] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://dodssp.daps.dla.mil.

4. Materials

4.1 *General*—The plastic used to make PVC pipe and PVC fittings shall be virgin plastic or reworked plastic (see 4.2) and shall have a Plastics Pipe Institute (PPI) long-term hydrostatic design stress and hydrostatic design basis rating.

4.2 *Rework Material*—Clean rework material of the same commercial designation, generated from the manufacturer's own pipe and fitting production shall not be used unless the pipe and fitting produced meet all the requirements of this specification.

4.3 *Compound*—The PVC compounds used for pipe and fittings shall equal or exceed the following classes described in Specification D1784, PVC 12454, or 14333. The minimum HDB at 73°F (23°C) shall be 3150 psi.

4.4 *Elevated Temperature Service*—PVC piping materials intended for use at temperatures above 73°F (23°C) shall have the PPI hydrostatic design basis (HDB) determined at the specific temperature in accordance with Test Method D2837. PVC piping materials intended for use at temperatures above 73°F (23°C) shall use the PVC temperature derating factors specified in PPI TR-9.

5. Requirements

5.1 *General*—Pipe shall be supplied in straight lengths.

5.2 *Workmanship*—The pipe and fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusion, blisters, and dents, or other injurious defects. The pipe and fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

5.3 *Pipe and Tubing:*

5.3.1 *Outside Diameter*—The outside diameters and tolerances shall be as shown in Table 1 when measured in accordance with Test Method D2122. The tolerances for out-of-roundness shall apply only on pipe prior to shipment.

5.3.2 *Wall Thickness*—The wall thicknesses and tolerances shall be as shown in Table 2 when measured in accordance with Test Method D2122.

5.4 *PVC Socket Cement Fitting Dimensions and Tolerances:*

TABLE 1 IPS PVC Pipe—Outside Diameters and Tolerances

Nominal Pipe Size (NPS)	Average Outside Diameter, in. (mm)	Tolerances, in. (mm)		
		For Average	Maximum Out-of-Roundness (Maximum – Minimum Diameter)	
			SDR21	SDR17, SDR13.5, SDR11
⅛	0.405 (10.29)	±0.004 (0.10)	...	0.016 (0.41)
¼	0.540 (13.72)	±0.004 (0.10)	...	0.016 (0.41)
⅜	0.675 (17.14)	±0.004 (0.10)	...	0.016 (0.41)
½	0.840 (21.34)	±0.004 (0.10)	...	0.016 (0.41)
¾	1.050 (26.67)	±0.004 (0.10)	...	0.020 (0.51)
1¼ 4	1.660 (42.16)	±0.005 (0.13)	0.030 (0.76)	0.024 (0.61)
1½	1.900 (48.26)	±0.006 (0.15)	0.060 (1.52)	0.024 (0.61)
2	2.375 (60.32)	±0.006 (0.15)	0.060 (1.52)	0.024 (0.61)
3	3.500 (88.90)	±0.008 (0.20)	0.060 (1.52)	0.030 (0.76)
4	4.500 (114.30)	±0.009 (0.23)	0.100 (2.54)	0.030 (0.76)
6	6.625 (168.28)	±0.011 (0.28)	0.100 (2.54)	0.070 (1.78)

TABLE 2 Wall Thicknesses and Tolerances for PVC Plastic Pipe with IPS Outside Diameters

Nominal Pipe Size, in.	Wall Thickness,[A] in.[B]					
	SDR21		SDR17		SDR13.5	
	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance
⅛	...	...	...	...	0.060	+0.020
¼	...	...	...	...	0.060	+0.020
⅜	...	...	...	...	+0.020	+0.020
½	...	...	...	...	0.062	+0.020
¾	...	...	...	...	0.078	+0.020
1	0.063	+0.020	0.077	+0.020	0.097	+0.020
1¼	0.079	+0.020	0.098	+0.020	0.123	+0.020
1½	0.090	+0.020	0.112	+0.020	0.141	+0.020
2	0.113	+0.020	0.140	+0.020	0.176	+0.020
2½	0.137	+0.020	0.169	+0.020	0.213	+0.026
3	0.167	+0.020	0.206	+0.025	0.259	+0.031
3½	0.190	+0.023	0.235	+0.028	0.296	+0.036
4	0.214	+0.026	0.265	+0.032	0.333	+0.040
5	0.265	+0.032	0.327	+0.039	0.412	+0.049
6	0.316	+0.038	0.390	+0.047	0.491	+0.059

[A] The minimum is the lowest wall thickness of the pipe at any cross section. The maximum permitted wall thickness, at any cross section, is the minimum wall thickness plus the stated tolerance. All tolerances are on the plus side of the minimum requirement.
[B] 1 in. = 25.4 mm (exact).

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

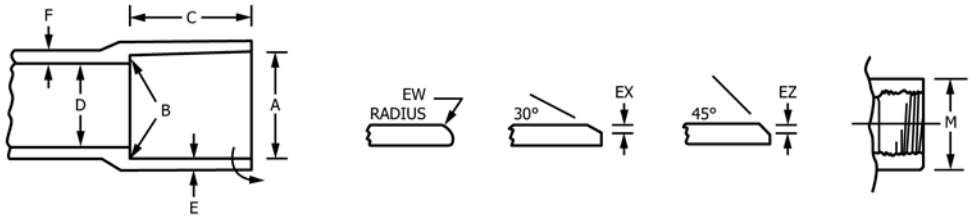
5.4.2 The minimum wall thickness of fittings shall be 125 % of the minimum wall thickness of the corresponding size of Schedule 40 pipe for which they are designed to be used, except that for the socket, the wall thickness shall be at least equal to the minimum wall thickness of the corresponding size of Schedule 40 pipe.

5.4.3 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.

5.4.4 Minimum dimensions have zero negative tolerance. Tolerances on other dimensions are shown in Table 3.

NOTE 1—References to Schedule 40 pipes for socket dimensions using PVC materials with an established HDB rating is based on historical precedents and past references to socket dimensions under Specification D2466.

TABLE 3 Tapered Sockets for PVC Pipe Fittings, Schedule 40, in.[A]



Nominal Pipe Size	A Socket Entrance Diameter			B Socket Bottom Diameter			C[B] Socket Length, min	D[C] Inside Diameter, min	Wall Thickness, min		Outside Diameter of Hub, M	Entrance, min	
	Diameter	Tolerance on Diameter	Max Out-of-Round	Diameter	Tolerance on Diameter	Max Out-of-Round			E	F		EW	EX, EZ
⅛	0.417	±0.004	0.016 (0.41)	0.401	±0.004	0.016 (0.41)	0.500	0.225	0.068	0.085	0.526	1/64	1/64
¼	0.552	±0.004	0.016 (0.41)	0.536	±0.004	0.016 (0.41)	0.500	0.320	0.088	0.110	0.672	1/64	1/64
⅜	0.687	±0.004	0.016 (0.41)	0.671	±0.004	0.016 (0.41)	0.594	0.449	0.091	0.114	0.821	1/32	1/32
½	0.848	±0.004	0.016 (0.41)	0.836	±0.004	0.016 (0.41)	0.688	0.578	0.109	0.136	0.998	1/32	1/32
¾	1.058	±0.004	0.020 (0.51)	1.046	±0.004	0.020 (0.51)	0.719	0.740	0.113	0.141	1.221	1/32	1/32
1	1.325	±0.005	0.020 (0.51)	1.310	±0.005	0.020 (0.51)	0.875	0.990	0.133	0.166	1.504	1/16	1/16
1¼	1.670	±0.005	0.024 (0.61)	1.655	±0.005	0.024 (0.61)	0.938	1.335	0.140	0.175	1.871	1/16	1/16
1½	1.912	±0.006	0.024 (0.61)	1.894	±0.006	0.024 (0.61)	1.094	1.564	0.145	0.181	2.127	1/16	1/16
2	2.387	±0.006	0.024 (0.61)	2.369	±0.006	0.024 (0.61)	1.156	2.021	0.154	0.193	2.634	1/16	1/16
2½	2.889	±0.007	0.030 (0.76)	2.868	±0.007	0.030 (0.76)	1.750	2.414	0.203	0.254	3.170	3/32	⅛
3	3.516	±0.008	0.030 (0.76)	3.492	±0.008	0.030 (0.76)	1.875	3.008	0.216	0.270	3.841	3/32	⅛
3½	4.016	±0.008	0.030 (0.76)	3.992	±0.008	0.030 (0.76)	2.000	3.486	0.226	0.283	4.374	3/32	⅛
4	4.518	±0.009	0.030 (0.76)	4.491	±0.009	0.030 (0.76)	2.000	3.961	0.237	0.296	4.907	3/32	⅛

[A] The sketches and designs of fittings are illustrative only.
[B] Socket depth, measured from socket entrance face to socket bottom face.
[C] See 5.4.4.

5.5 *Flattening*—There shall be no evidence of splitting, cracking, or breaking by the specimens subjected to this test and performed in accordance with Test Method D2412. Flatten three specimens of the pipe, 2 in. (50.8 mm) long, between parallel plates in a suitable press until the distance between the plates is 40 % of the outside diameter of the pipe or the walls of pipe touch. The rate of loading shall be uniform and such that the compression is completed within 2 to 5 min. On removal of the load, examine the specimens for evidence of splitting, cracking, or breaking.

5.6 *Impact Resistance*—The impact resistance for PVC pipe shall fall within the range specified by the manufacturer's designated Impact Classification Cell (IC). Table 4 lists impact classification cell for SDR 17 and 21 pipe. The impact classification rating for PVC pipe shall be determined in accordance with Test Method D2444 using a flat plate holder and 20-lb tup B for sizes 2 in. and less and 30-lb tup B for all larger sizes. The specimens shall be conditioned in a mixture of ice and water at 32 to 35°F (0 to 2°C) for 1 h (Note 2) and tested immediately on removal from this medium.

NOTE 2—Other conditioning media such as a refrigerated fluid bath of water and ethylene glycol at 32 to 35°F (0 to 2°C) for 1 h or a refrigerated air chamber at 32 to 35°F (0 to 2°C) for 4 h may be used if it can be demonstrated that equivalent results are obtained. However, in cases of disagreement, the ice water mixture shall be used.

5.7 *Impact Quality Assurance*—The impact quality assurance is a "GO/NO–GO" test. Five specimens shall be impacted in accordance with Test Method D2444 using the tup and holder specified in 5.5 from a height determined by the lower value of the designated Impact Classification (IC) cell. All five specimens shall pass. If one specimen fails, a second set of five specimens shall be tested. None of the second set shall fail. If nine out of the total ten specimens pass, the lot shall be considered to have met the requirements of this test.

NOTE 3—This test is intended only for use as a quality control test, not for use as a simulated service test.

5.8 *Extrusion Quality*—PVC pipe shall not flake or disintegrate when tested in accordance with the Test Method D2152.

5.9 *Outdoor Storage Stability*—PVC pipe when stored outdoors unprotected for six months from the date of extrusion shall meet all the requirements of this specification. PVC pipe stored outdoors for over six months from date of manufacture, is suitable for use if it meets the requirements of this specification.

5.10 *Chemical Resistance*—The pipe shall not increase in weight more than 0.5 % (1.0 % for toluene in methanol). Where the test specimen is a pipe ring, the material shall not change more than ±12 % in apparent tensile yield strength when measured in accordance with 6.5. Where the test specimen is a plaque, the material shall not change more than ±12 % in tensile strength at yield when measured in accordance with Test Method D638.

NOTE 4—This pipe test is only an indication of what will happen as a result of short term exposure to these chemicals. For long term results, additional testing is required

5.11 *Sustained Pressure 73°F (23°C)*—The pipe shall not fail in less than 1000 h as defined in Test Method D1598. The stress shall be as given in Table 5, when tested in accordance with 6.6.

5.12 *Minimum Hydrostatic Burst Strength/Apparent Tensile Strength*—The minimum burst pressure for PVC pipe shall be as given in Table 6 or as calculated (using the actual measured minimum wall, the actual measured average outside diameter, and the applicable fiber stress shown in Table 5) when determined in accordance with Test Method D1599. For sizes above 4-in. nominal diameter, the testing laboratory shall be allowed to replace the quick burst (Test MethodD1599) by the apparent ring tensile strength test (Test Method D2290). The minimum fiber stress shall be as given in Table 3, when tested in accordance with 6.7.

5.13 *Joints:*

5.13.1 *Solvent Cemented*—Joints of solvent cementable pipe and fittings shall be made in accordance with the user's written procedure.

5.13.1.1 *Solvent Cements for PVC Systems*—Solvent cements for PVC pipe and fittings shall meet the requirements of Specification D2564.

5.13.2 Mechanical joints shall be made in accordance with the user's written procedure and the fitting manufacturer's installation instructions.

5.14 *Fittings:*

5.14.1 *Solvent Cement Fittings*—These fittings are intended for use with corresponding sized outside diameter PVC pipe. The solvent socket dimensions shall be made to the requirements of 5.4.

5.14.2 *Mechanical fittings*—In-line mechanical fittings shall have an internal pipe reinforcing tubular insert stiffener that extends at least under the seal and gripping device where used.

TABLE 4 Impact Requirements for PVC Pipe at 32 to 35°F (0 to 2°C) for SDR 17 and 21 Pipe

Impact Classification Cell	ft•lbf (J)		
	IC-1	IC-2	IC-3
Nominal Pipe Size (NPS)			
1	30 to 50 (41 to 68)	>50 to 65 (68 to 88)	>65 (88)
1¼	30 to 51 (41 to 68)	>50 to 65 (68 to 88)	>65 (88)
1½	40 to 60 (54 to 81)	>60 to 75 (81 to 102)	>75 (102)
2	70 to 90 (95 to 122)	>90 to 100 (122 to 136)	>100 (122)
3	120 to 140 (163 to 190)	>140 to 180 (190 to 244)	>180 (244)
4	160 to 200 (217 to 271)	>200 to 240 (271 to 326)	>240 (326)
6	200 to 260 (271 to 353)	>260 to 300 (353 to 407)	>300 (407)

TABLE 5 Minimum Fiber Stress, psi (MPa)

Specification D1784 Classification	Minimum Hydrostatic Burst Strength and Apparent Tensile Tests	Sustained Pressure Test
Class 12454 (PVC 1120)	6400 (44.1)	4200 (29.0)
Class 14333 (PVC 2116)	5000 (34.5)	3650 (23.2)

TABLE 6 Minimum Burst Pressure Test Requirements for PVC Pipe at 73°F (23°C)

SDR	Minimum Burst Pressure, psi (MPa) per Specification D1784 Classification	
	Class 12454 (PVC 1120)	Class 14333 (PVC 2116)
11	1250 (8.6)	1000 (6.9)
13.5	1000 (6.9)	800 (5.5)
17	800 (5.5)	630 (4.3)
21	630 (4.3)	500 (3.4)

The saddle portion of saddle type fittings do not require an internal tubular stiffener due to the nature of the connection.

5.14.3 *Mechanical Fittings*—The gasket material must be compatible with the PVC pipe and fitting material. The minimum requirement to demonstrate compatibility shall be the requirements of the sustained pressure test when tested in accordance with 6.6

5.15 *Fitting Performance Requirements:*

5.15.1 *General*—Each nominal size of fitting shall be tested. Testing of the thickest wall pipe that the fitting is designed to be used with qualifies the use of that fitting with pipe of lesser wall thickness.

5.15.2 *Mechanical In-Line Fittings:*

5.15.2.1 *Tensile Strength*—The joint shall provide resistance to a force on the pipe joint equal to or greater than that which will cause no less than 25% elongation of pipe, or the pipe fails outside the joint area when tested in accordance with 6.8

5.15.2.2 *Sustained Pressure 73°F (23°C)*—The fitting or joint shall not fail in less than 1000 h as defined in Test Method D1598. The PVC pipe stress shall be as given in Table 5, when tested in accordance with 6.6.

5.15.2.3 *Short-Term Rupture Strength*—The minimum short term rupture strength of the fitting shall not be less than the minimum short-term rupture strength of the pipe in the system when tested in accordance with 6.7. The test equipment, procedures, and failure definitions shall be as specified in Test Method D1599.

5.15.3 *Mechanical Saddle Fitting Performance Requirements:*

5.15.3.1 *Sustained Pressure 73°F (23°C)*—The fitting or joint shall not fail in less than 1000 h as defined in Test Method D1598. The PVC pipe stress shall be as given in Table 5, when tested in accordance with 6.6.

5.15.3.2 *Short-Term Rupture Strength*—The minimum short term rupture strength of the fitting shall not be less than the minimum short-term rupture strength of the pipe in the system when tested in accordance with 6.7. The test equipment, procedures, and failure definitions shall be as specified in Test Method D1599.

6. Test Methods

6.1 *General*—The test methods in this specification cover PVC pipe and fittings to be used for gas distribution. Test methods that are applicable from other specifications will be referenced in the paragraph pertaining to that particular test.

6.2 *Sampling*—Take a representative sample of the pipe and fittings sufficient to determine conformance with this specification. About 40 ft (12 m) of pipe is required to perform all the tests prescribed. The number of fittings required varies, depending upon the size and type of fitting. A sampling plan shall be agreed upon by the purchaser and the manufacturer (see Practice D1898).

6.2.1 *Pipe Test Specimens*—Not less than 50 % of the test specimens required for any pressure test shall have at least a part of the marking in their central sections. The central section is that portion of pipe which is at least one pipe diameter away from an end closure.

6.3 *Conditioning*—Unless otherwise specified, condition the specimens prior to test at 73.4 ± 1.83.6°F (23 ± 12°C) and 50 ± 3 5 % relative humidity for not less than 24 h, in accordance with Procedure A of Practice D618 for those tests where conditioning is required and in all cases of disagreement.

6.4 *Test Conditions*—Conduct the test in the standard laboratory atmosphere of 73.4 ± 1.83.6°F (23 ± 12°C) and 50 ± 3 5 % relative humidity, unless otherwise specified.

6.5 *Chemical Resistance*—Determine the resistance to the following chemicals in accordance with Test Method D D543. Where available, the test specimen shall be a ring 2 in. SDR 11 pipe cut to the ring dimensions specified in 6.8. For materials that are not readily available as 2 in. SDR 11 pipe, the test specimen shall be a plaque of material ¼ by 2 by 4 in. (6.3 by 50.8 by 101.6 mm) with a 1 in. (25.4 mm) wide reduced section

Chemicals	Concentration (% by volume)
Mineral oil (USP)	100
Tertiary-butyl mercaptan	5 in mineral oil
Antifreeze agents (at least one shall be used):	
Methanol, or	100
Ethylene glycol	100
Toluene	15 in methanol

Test five specimens with each chemical. Weigh the specimens to the nearest 0.005 g and completely immerse them in the chemicals for 72 h. On removal from the chemicals, wipe the specimens with a clean dry cloth. Condition in air for 2 to 2¼ h and reweigh. Calculate the increase in weight to the nearest 0.01 % on the basis of initial weight. Test the specimen in tension in accordance with 6.8 within ½ h after weighing. Examine the weight and apparent tensile strength of each specimen for conformance to the requirement in 5.4. (**Warning—**Because of the possible toxicity of these reagents, refer to the Material Safety Data Sheet on each of these reagents before using or handling them.)

6.6 *Sustained Pressure Test:*

6.6.1 Select six test specimens of pipe or fittings at random, condition at the standard laboratory test temperature and humidity, and pressure test in accordance with Test Method D1598.

6.6.1.1 Test specimens shall be prepared so that the minimum length of pipe on each side of the fitting is equal to 5 times the diameter of the pipe but in no case less than 12 in. (304 mm) for sizes less than 6 in. For sizes 6 in. and larger, the minimum length shall be equal to 3 times the diameter or 30 in. (762 mm), whichever is shorter.

6.6.1.2 Pressures used shall be as shown in Table 5 or as calculated using the pipe's actual measured minimum wall thickness, outside diameter, and the applicable fiber stress,

whichever is greater. Piping intended for use at temperatures of 100°F (38°C) and higher shall be tested at both 73°F (23°C) and the maximum design temperature. The test fiber stress shall be 90 % of the hydrostatic design basis (HDB).

NOTE 5—Air, methane, or nitrogen may be substituted for water as the test medium.

6.6.2 Maintain the specimens at the pressures required, held to ±10 psi (0.07 MPa), for a period of 1000 h at the test temperature ±3.6°F (±2°C) as specified in 6.6.1.

6.6.3 Failure of two of the six specimens tested shall constitute failure in the test. Failure of one of the six specimens tested is cause for retest of six additional specimens. Failure of one of the six specimens in retest shall constitute failure in the test. Evidence of failure of the pipe shall be as defined in Test Method D1598.

6.7 *Minimum Hydrostatic Burst Pressure (Quick Burst)*—The test equipment, procedures, and failure definitions shall be as specified in Test Method D1599. Pressures shall be as shown in Table 6 or as calculated (using the pipe's actual measured minimum wall thickness, outside diameter, and the applicable fiber stress), whichever is greater.

6.8 *Tensile Strength (In-line fittings):*

6.8.1 Select six test specimens of pipe and fittings at random, condition at the standard laboratory test temperature and humidity, and pressure test in accordance with Test Method D638.

6.8.2 The procedure and test equipment shall be as specified in Test Method D638. The testing shall be performed at 73°F. The speed of testing shall be 0.2 in. (5.08 mm)/min.

6.8.3 Failure of one of the six specimens tested shall constitute failure in the test.

7. Marking

7.1 *Pipe*—All required marking shall be legible, visible, and permanent. To ensure permanence, marking shall be applied so it can only be removed by physically removing part of the pipe wall. The marking shall *(1)* not reduce the wall thickness to less than the minimum value for the pipe, *(2)* not have any effect on the long-term strength of the pipe, and *(3)* not provide leakage channels when elastomeric gasket compression fittings are used to make the joints. These marking shall consist of the word GAS, the designation ASTM F2817, the manufacturer's name or trademark, the nominal pipe size (NPS) and SDR, pipe material designation code, and date of manufacture.

7.1.1 In addition to 7.1, the pipe marking shall include a coding that will enable the manufacturer to determine the location of manufacture, pipe production and resin lots, and any additional information which is agreed upon between the manufacturer and purchaser. The manufacturer shall maintain such records for fifty years or for the design service life of the pipe, whichever is longer.

7.1.2 All the markings in 7.1 and 7.1.1 shall be repeated at intervals not exceeding 2 ft (0.61 m).

7.1.3 Impact Classification Cell, as determined by the manufacturer, shall be printed on the pipe.

7.2 *Fittings:*

7.2.1 Fittings shall be marked with the applicable fitting specification. All fittings shall be marked on the body or hub. The markings shall consist at least of the manufacturer's name or trademark, or both, the size, the symbol for the type of material. In addition, the fittings markings shall include code that will enable the manufacturer to determine the date of manufacture, the location of manufacture, fitting production and resin lots, and any additional information which may be agreed upon between the manufacturer and purchaser. The manufacturer shall maintain such records for 50 years or for the design service life of the fittings, whichever is longer.

7.2.2 Mechanical fittings shall be marked Category 1 or CAT1.

8. Quality Assurance

8.1 When the product is marked with this designation, F2817, 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.

9. Safety Requirements

9.1 1 Safety requirements for handling solvent cements shall be observed. Consult Practice F402 and the solvent cement manufacturer for appropriate precautions.

10. Keywords

10.1 gas pressure pipe; PVC; PVC gas fittings

ANNEX

(Mandatory Information)

A1. IN-PLANT QUALITY CONTROL FOR PVC MATERIALS UP TO 6 INCHES

A1.1 Quality Control

A1.1.1 The following in-plant quality control program shall be used to assure compliance with this specification. The pipe and fittings producers shall maintain records on all aspects of this program and supply these to the purchaser, if requested.

A1.1.2 *In-Plant Quality Control Test Methods*—Test methods other than those specified in Section 6 are used as long as they provide equivalent results. In case of disagreement, those test methods in the applicable ASTM standard shall be used.

A1.2 Pipe Tests

A1.2.1 *Material and Extrusion Process Qualification*—Sustained pressure tests shall be made on one pipe size in the range of 2 in., or less, and on one pipe size in the range of 2½ in., or greater. This test shall also be made on pipe from each particular commercial plastic resin initially, and at least twice a year thereafter for material and extrusion process qualification and not as a quality control on the product. This test shall be made in accordance with 6.6.

A1.2.2 *Product Quality Control (Note A1.1)*—The tests in Table A1.1 shall be made per size per extrusion die at the denoted frequencies and the test results recorded and filed for inspection on request.

NOTE A1.1—When the pipe fails to meet this specification in any test, additional tests shall be made on the pipe produced back to the previous acceptable result to select the pipe produced in the interim that does pass the requirement. Pipe that does not meet the requirement shall be rejected.

NOTE A1.2—For pipe sizes above 4-in. nominal diameter, the quick burst test (Test Method D1599) may be replaced by the Apparent Ring Tensile Strength Test (Test Method D2290) if agreed to between the purchaser and the manufacturer.

A1.2.3 *Burst Pressure Multilevel Plan*—(see Fig. A1.1)—This multilevel plan is based on MIL-STD-1235 (ORD), and is used only when the same product is extruded continuously under the same operating conditions and production is at a steady rate. Before this reduced sampling plan is considered, steady production conditions must be carefully chosen to ensure a continuous and consistent high quality output. Any interruption (shutdown) or change in resin lot number, percentage rework, or production conditions outside normal operating variations shall cause sampling to revert to Level 1. A sampling level change is considered only when approved by a production supervisor or authorized quality control personnel. Level 1 Test one specimen every 8 h. If 16 consecutive specimens have met requirements, proceed to Level 2. Level 2 Collect one specimen every 8 h. After 72 h (3 days) or portion thereof, test two randomly selected specimens. If both pass, discard the remaining 7 specimens. If any specimen fails to meet requirements, revert to Level 1 (see also Note A1.1). Product for which a specimen has been collected shall not be shipped until after the 72-h time period and randomly selected samples have been tested. Continue to test 2 out of 9 specimens for 16 three-day periods (48 days of production), then proceed to Level 3. Level 3 Collect one specimen every 8 h. After 21 days or portion thereof, test three randomly selected specimens. If all three pass, discard the remaining specimens. If any specimen fails to meet requirements, revert to Level 1 (see also Note A1.1). Product for which a specimen has been collected shall not be shipped until after the 21-day time period. Continue testing at Level 3 until production conditions necessitate reverting to Level 1.

A1.2.3.1 Other conditioning media such as a refrigerated fluid bath of water and ethylene glycol at 32 to 35°F (0 to 2°C) for 1 h or a refrigerated air chamber at 32 to 35°F (0 to 2°C) for 4 h may be used if it can be demonstrated that equivalent results are obtained. However, in cases of disagreement, the ice water mixture shall be used.

TABLE A1.1 Product Quality Control Tests

Property	Frequency
Diameter	once every hour
Wall thickness	once every hour
Ring tensile or burst pressure	Once every 8 h or multilevel plan described in A1.2.3
Flattening	once every 8 h
Extrusion quality	once every 2 h
Impact resistance	once every hour

A1.3 Fittings Test

A1.3.1 The fittings tests[7] listed in the following subparagraphs shall be conducted at the frequencies indicated.

A1.3.2 When any fitting fails to meet the requirements of this specification,or the applicable referenced fitting specification, additional tests should be made on fittings produced back to previous acceptable result to select the fittings produced in the interim that do meet the requirements. Fittings that do not meet the requirements shall be rejected.

A1.3.3 *Dimensions:*

A1.3.3.1 *Socket Fittings:*

(1) Socket Entrance, Bottom and Minimum Internal Diameters—Once an hour or one out of ten fittings, whichever is less frequent.

(2) Wall Thickness—At the beginning of each production setup for each cavity.

A1.3.4 *Other Tests:*

A1.3.4.1 *PVC Fittings*—The burst pressure shall be measured on one fitting per 8-h production.

NOTE A1.3—Separation in the knit constitutes a failure.

[7] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report: RR:F17-1018.

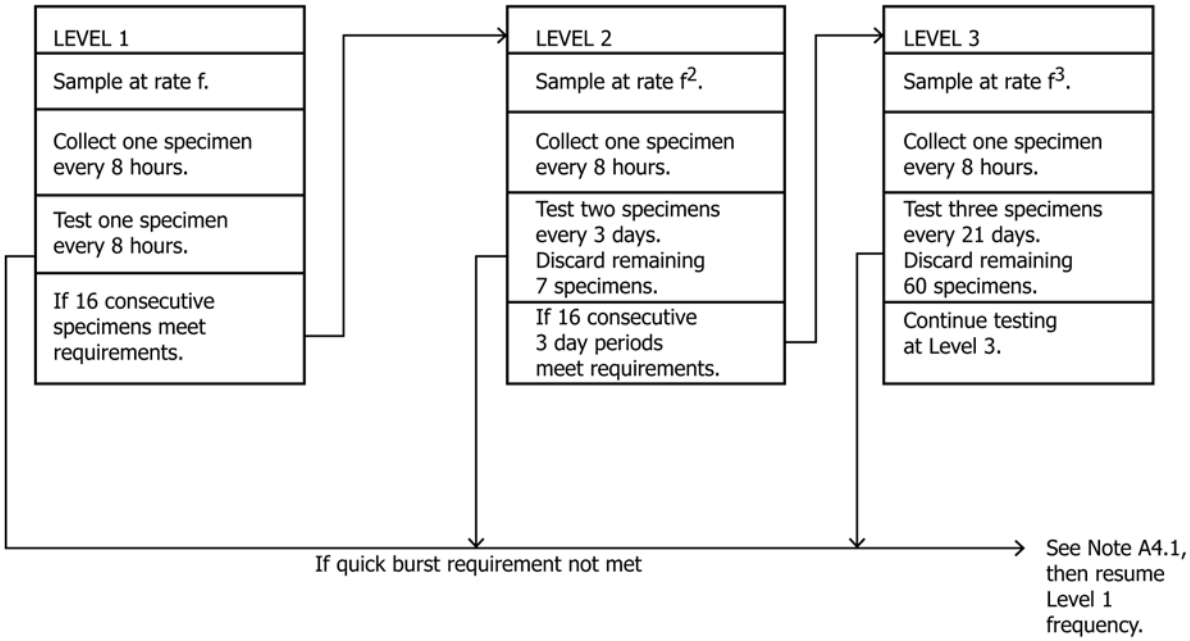


FIG. A1.1 Quick Burst Multilevel Sampling Plan

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F2817–10) that may impact the use of this standard.

(1) Specification D1784 has been added to Section 2. Referenced Documents.
(2) Specification D3915 has been removed from Section 2. Referenced Documents.
(3) Section 4.3 has been revised to require that the PVC compounds used for pipe and fittings shall equal or exceed the following classes described in Specification D1784; PVC 12454, or 14333.
(4) D3915 was replaced by Specification D1784 in Table 5.
(5) D3915 was replaced by Specification D1784 in Table 6.