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Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings[1]

This standard is issued under the fixed designation D 2729; 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 Department of Defense.

1. Scope

1.1 This specification covers requirements and test methods for materials, dimensions, workmanship, chemical resistance, water resistance, and joint tightness of poly(vinyl chloride) (PVC) sewer and drain pipe and fittings. Four-inch perforated pipe is also covered; the joint tightness test is not applicable for this product. A form of marking to indicate compliance with this specification is also included.

1.2 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.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following precautionary caveat pertains only to the test methods portion, Section 6, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[2]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2,3]

D 1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds[3]

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings[3]

D 2152 Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion[3]

D 2321 Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe[3]

D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading[3]

D 2444 Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)[3]

D 2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems[3]

F 412 Terminology Relating to Plastic Piping Systems[3]

2.2 *Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[4]

2.3 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[4]

3. Terminology

3.1 *Definitions*—Definitions used are in accordance with Terminology F 412, and abbreviations are in accordance with Terminology D 1600, unless otherwise specified. The abbreviation for poly(vinyl chloride) is PVC.

3.1.1 Pipe having perforations is called perforated pipe; without perforations it is called standard pipe.

4. Materials

4.1 *General*—The pipe shall be made from virgin cell 12164B with a minimum tensile strength of 4000 psi (28 MPa), 12454B or 12454C poly(vinyl chloride) compounds, as defined and described in Specification D 1784. The fittings shall be made from virgin poly(vinyl chloride) compounds of cell classification PVC 12454B, PVC 12454C, or PVC 13343C. Compounds that have different cell classification because one or more properties are superior to those of the specified compounds are also acceptable.

4.2 *Rework Material*—The manufacturer shall use only his own clean pipe or fitting rework material; the pipe and fittings produced shall meet all the requirements of this specification.

5. Requirements

5.1 *Qualification and Referee Testing:*

5.1.1 *Water Resistant*—The pipe and fittings shall not increase in weight more than 0.6 % or change in tensile strength more than +15 % when tested in accordance with 6.5.

5.1.2 *Joint Testing*—Joints made with pipe and fittings or

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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.04.

[4] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

belled end pipe shall show no signs of leakage when tested in accordance with 6.6. This test is not required for perforated pipe.

5.2 *Quality Control Testing:*

5.2.1 *Workmanship*—The pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

5.2.2 *Flattening*—There shall be no evidence of splitting, cracking, or breaking when the pipe is tested in accordance with 6.4.

5.2.3 *Extrusion Quality*—The pipe or fittings shall not flake or disintegrate when tested in accordance with Test Method D 2152. In the case of fittings, slight flaking in the gate area is acceptable.

NOTE 1—This test is intended only for use as a quality control test, not for use as a simulated service test.

5.2.4 *Impact Resistance*—The impact resistance of pipe shall be determined in accordance with Test Method D 2444, using a 20-lb (10-kg) Tup A and Holder B (flat plate), and shall comply with the requirements given in Table 1 (Note 1). For perforated pipe, samples are to be cut and tested at random without regard to hole location, except that the point of impact shall not coincide with a perforation.

5.2.5 *Dimensions*:

5.2.5.1 Pipe and fittings dimensions (for both standard and perforated pipe) shall comply with Table 2, Table 3, or Table 4, as applicable, when measured in accordance with Test Method D 2122.

5.2.5.2 Pipe shall be supplied in 10 ft ± ¼-in. laying lengths unless otherwise specified.

5.2.5.3 For belled pipe and fittings fabricated from pipe sections, the thickness of the belled section shall be considered satisfactory if the bell was formed from pipe meeting the requirements of Table 3.

5.2.5.4 For molded fittings, the wall thickness of the waterway and socket or bell shall be no less than the respective minimum thickness listed for the equivalent pipe wall in Table 3. For reducing fittings or those with smaller inlets, the minimum wall thickness of each inlet shall be no less than the minimum wall thickness for that size pipe.

5.2.6 *Pipe Stiffness*—The pipe stiffness at 5 % deflection ($F/\Delta y$) shall not be less than the values given in Table 5 when tested in accordance with Test Method D 2412. This requirement does not apply to fittings.

NOTE 2—The 5 % deflection criterion, which was arbitrarily selected for testing convenience, should not be considered as a limitation with respect to in-use deflection. The engineer is responsible for establishing the acceptable limit.

TABLE 1 Impact Strength Requirements for PVC Sewer and Drain Pipe at 23°C (73°F)

Nominal Pipe Size, in.	Drop Height	
	ft (20-lb Tup A)	mm (10-kg Tup A)
2	1.75	485
3	2.00	555
4[A]	2.25	625
5	3.00	830
6	3.50	970

[A]Standard and perforated pipe.

TABLE 2 Diameters and Tolerances for PVC Sewer and Drain Pipe

Nominal Pipe Size, in.	Average Outside Diameter, mm (in.)	Average Inside Diameter, min, mm (in.)
2	57.15 ± 0.15 (2.250 ± 0.006)	50.80 (2.000)
3	82.55 ± 0.20 (3.250 ± 0.008)	73.02 (2.875)
4[A]	107.06 ± 0.22 (4.215 ± 0.009)	98.42 (3.875)
5	134.62 ± 0.25 (5.300 ± 0.010)	123.82 (4.875)
6	159.39 ± 0.28 (6.275 ± 0.011)	149.22 (5.875)

[A]Standard and perforated pipe.

TABLE 3 Minimum Wall Thicknesses for PVC Sewer and Drain Pipe

Nominal Pipe Size, in.	Min Wall Thickness, mm (in.)[A]
2	1.78 (0.070)
3	1.78 (0.070)
4[B]	1.90 (0.075)
5	2.27 (0.090)
6	2.54 (0.100)

[A]*Fitting Wall Thickness*—The wall thickness is a minimum value except that a ±10 % variation resulting from core shift is allowable. In such a case, the average of two opposite wall thicknesses shall equal or exceed the value shown in the table.
[B]Standard and perforated pipe.

NOTE 3—The strength and load-carrying capabilities of plastic drain and sewer pipe are measured and reported as Pipe Stiffness which is determined in accordance with Test Method D 2412. The term "crush strength" is not applicable to plastic piping because (*a*) the values obtained can be significantly different, depending on the bedding, loading, or testing technique used; and (*b*) the term derives from rigid pipe and refers to its ultimate strength at rupture.

5.2.7 *Solvent Cement*—The cement shall comply with Specification D 2564.

5.2.8 *Perforations*—Unless otherwise specified, the perforated pipe shall have two rows of holes 13 mm (½in.) in diameter on 125-mm (5-in.) centers, with allowable tolerances of ±1 mm (1⁄16in.) on the diameter and +6, −0 mm (+¼, −0 in.) on the spacing, and the rows shall be parallel to the axis of the pipe and 120 ± 5° apart when measured in accordance with 6.7.

6. Test Methods

6.1 *Conditioning*:

6.1.1 *Qualification and Referee Conditioning*—Condition the specimens prior to test at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity for not less than 40 h in accordance with Procedure A of Practice D 618 for those tests where conditioning is required.

6.1.2 *Quality Control Testing*—Condition specimens for a minimum of 4 h in air or 1 h in water at 23 + 2°C (73.4 + 3.6°F). Test the specimens at 23 + 2°C without regard to relative humidity.

6.2 *Test Conditions*—Conduct the tests in the standard laboratory atmosphere of 23 ± 2°C and 50 ± 5 % relative humidity, unless otherwise specified.