



Standard Specification for Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields¹

This standard is issued under the fixed designation F810; 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 and test methods for workmanship, flattening, dimensions, tolerances, stiffness, perforations, environmental stress cracking, bonding, and impact resistance for smoothwall perforated and nonperforated polyethylene (PE) pipe, including coextruded and closed profile pipe. Methods of marking are also included.

1.2 This specification includes two stiffness classes, referred to as, “Standard” and “Heavy Duty.”

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 text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of this specification.

1.5 The following precautionary caveat pertains only to the test method portion, Section 7, of this specification: *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards*:²

- D618 Practice for Conditioning Plastics for Testing
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.65 on Land Drainage.

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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.

- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
 - D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - 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)
 - D2729 Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - D2751 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings (Withdrawn 2014)³
 - D2852 Specification for Styrene-Rubber (SR) Plastic Drain Pipe and Fittings
 - D3033 Specification for Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings (Withdrawn 1987)³
 - D3034 Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - D3350 Specification for Polyethylene Plastics Pipe and Fittings Materials
 - F412 Terminology Relating to Plastic Piping Systems
 - F481 Practice for Installation of Thermoplastic Pipe and Corrugated Pipe in Septic Tank Leach Fields
- 2.2 *Federal Standard*:
Fed. Std. No. 123 Marking for Shipments (Civil Agencies)⁴
- 2.3 *Military Standard*:⁴
MIL-STD-129 Marking for Shipment and Storage

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412 and abbreviations are in accordance with Terminology D1600, unless otherwise specified. The abbreviation for polyethylene is PE.

4. Significance and Use

4.1 The requirements of this specification are intended to provide smoothwall pipe suitable for soil drainage and waste disposal system absorption fields.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

NOTE 1—Industrial waste disposal lines should be installed only with the specific approval of the cognizant code authority since chemicals not commonly found in drains and sewers and temperatures in excess of 140°F (60°C) may be encountered.

NOTE 2—The recommended uses of PE smoothwall pipe covered by this specification do not require watertight pressure rated joints. ABS, PVC, or styrene fittings may be used provided they conform to Specifications D2729, D2751, D3033, D3034, or D2852.

5. Materials

5.1 *General*—Those PE compounds used in the manufacture of PE smoothwall pipe shall conform with the requirements of cell class 424410 as defined and described in Specification D3350. The compound ingredients may consist of lubricants, stabilizers, nonpoly(ethylene) resin modifiers, and pigments essential for processing, property control, and coloring. Compounds that have higher cell classifications in one or more properties are acceptable provided product requirements are met.

5.1.1 Both Class C and Class B pigments may be used. The use of either pigment, used separately or together as is the case in coextruded tubing, should provide adequate ultraviolet protection and be acceptable to the purchaser as satisfactory for the intended use.

6. Requirements

6.1 *Workmanship*—The pipe or each layer of coextruded pipe shall be homogeneous throughout and essentially uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semi-matte or glossy in appearance and free of chalking, sticky, or tacky material. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity. Holes deliberately placed in perforated pipe are acceptable. The surfaces shall be free of excessive bloom. Bloom or chalking may develop in pipe exposed to direct rays of the sun (ultraviolet radiant energy) for extended periods and consequently these requirements do not apply to pipe after extended exposure to direct rays of the sun.

6.2 *Flattening*—There shall be no evidence of splitting, cracking, or breaking when the pipe is tested in accordance with 7.3.

6.3 *Impact Resistance*—The impact resistance of the pipe shall be tested in accordance with Test Method D2444, using the 20-lb (9.1-kg) Tup B and Holder A, and shall comply with the requirements given in Table 1. Five specimens shall be tested, and all five must pass. For perforated pipe, samples are to be cut and tested at random without regard to hole locations, except that the point of impact shall not coincide with a perforation.

TABLE 1 Impact Strength Requirements for PE Smoothwall Pipe at 73°F (23°C)

Nominal Pipe Size, in. (mm)	Impact Strength	
	ft-lbf	J
3 (75)	40	54
4 (100)	45	61
6 (150)	70	95

6.4 Dimensions:

6.4.1 Pipe dimensions (for both perforated and nonperforated pipe) shall comply with Table 2 when measured in accordance with Test Method D2122.

6.4.2 Pipe shall be supplied in 10 ft ± ¼ in. (3.05 m ± 6.4 mm) laying lengths unless otherwise specified. The length of pipe is to be measured in accordance with Test Method D2122.

6.4.3 For belled pipe 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 2. The minimum bell depth shall be 1¾ in. (44 mm). The length of bell is to be measured in accordance with Test Method D2122 on socket depth.

6.5 *Pipe Stiffness*—The pipe stiffness at 5 % deflection ($F/\Delta y$) shall not be less than the values given in Table 3 for the two stiffness classes when tested in accordance with Test Method D2412.

NOTE 3—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.

NOTE 4—The strength and load-carrying capabilities of PE smoothwall pipe are measured and reported as pipe stiffness, which is determined in accordance with Test Method D2412. 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.

6.6 *Perforations*—When perforations are necessary, they shall be cleanly cut and uniformly spaced along the length and circumference of the tubing in a size, shape, and pattern to suit the needs of the specifier. Unless otherwise specified, absorption field tubing shall have two or more rows of equispaced holes from ½ to ¾ in. (12.5 to 19 mm) in diameter at a maximum of 5-in. (125-mm) centers. Rows and spacing shall be parallel to the axis of the pipe and 120 ± 5° apart when measured in accordance with 7.4. The tubing shall be marked as designated in accordance with 9.1 at the 12 o’clock position, relative to the holes at the nominal 4 and 8 o’clock positions.

6.7 *Environmental Stress Cracking*— There shall be no cracking or splitting of pipe when tested in accordance with 7.5.

6.8 *Bond*—For coextruded pipe, the bond between the layers shall be strong and uniform. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly at any point, nor shall

TABLE 2 Diameters, Tolerance, and Minimum Wall Thickness for PE Smoothwall Pipe

Nominal Pipe Size, in. (mm)	Average Outside Diameter, in. (mm)	Average Inside Diameter, min. in. (mm)	Minimum Wall Thickness, in. (mm)
3 (75)	3.250 ± 0.008 (82.55 ± 0.15)	2.875 (73.02)	0.090 (2.28)
4 (100)	4.215 ± 0.009 (107.06 ± 0.22)	3.875 (98.42)	0.095 (2.41)
6 (150)	6.275 ± 0.011 (159.39 ± 0.28)	5.875 (149.22)	0.125 (3.18)

TABLE 3 Minimum Pipe Stiffness, $F/\Delta y$, at 5 % Deflection
Minimum Pipe Stiffness, psi (kPa)

Nominal Pipe Size, in. (mm)	Standard		Heavy Duty	
	psi	kPa	psi	kPa
3 (75)	19	131	40	275
4 (100)	11	75	22	150
6 (150)	8	55	18	125

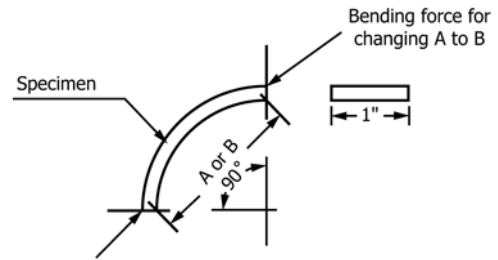


FIG. 1 Specimen Configuration

separation of bond occur, between layers, during testing performed under the requirements of this specification.

7. Test Methods

7.1 *Conditioning*—Condition the specimen prior to test at 70 to 77°F (23 ± 2°C) for not less than 24 h in accordance with Procedure A in Practice D618 for those tests where conditioning is required and in all cases of disagreement.

7.2 *Test Conditions*—Conduct the test in a laboratory temperature of 70 to 77°F (23 ± 2°C) unless otherwise specified.

7.3 *Flattening*—Flatten three specimens of pipe, 6-in. (152-mm) long, between parallel plates in a suitable press until the distance between the plates is 40 % of the original outside diameter of the pipe. The rate of vertical displacement shall be uniform and such that the flattening is completed within 2 to 5 min. On removal of the load, examine the specimens for evidence of splitting, cracking, or breaking.

7.4 *Perforations*—For the perforated pipe, the hole diameter and the distance between hole centers shall be measured with a steel rule having at the largest 1/16-in. (1-mm) graduations. The angle between the two rows of holes shall be measured with an index head capable of measuring accurately to within 1°.

7.5 *Environmental Stress Cracking*—Test sections of tubing for environmental stress cracking in accordance with Test Method D1693, except for the following modifications:

7.5.1 Three specimens shall be tested.

7.5.2 Each specimen shall consist of a strip of pipe 1-in. (25.4-mm) wide and 1/4 circumference (90° arc) long without perforations.

7.5.3 Bend the specimens for testing in the amount of 20 ± 1 % and retain in this position. Determine the arc chord dimension *B*, (see Fig. 1) of the specimen under test as follows:
 $B = 0.8 A$

where:

A = the arc chord dimension before bending, and

B = the same dimension taken after bending (see Fig. 1).

7.5.4 Place the specimens in a beaker of suitable size and cover completely with a preheated wetting agent (Note 5) at 122°F (50°C).

NOTE 5—This method is based on the use of nonylphenoxy poly(ethyleneoxy)ethanol.

7.5.5 Place the specimens in the constant-temperature bath for a period of 24 h at 122°F (50°C), then remove and inspect immediately.

8. Rejection and Retest

8.1 Pipe that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may request a retest.

9. Marking and Labeling

9.1 Pipe in compliance with this specification shall be clearly marked as indicated in 6.6 at intervals of 5 ft (1.50 m) or less as follows:

9.1.1 Manufacturer’s name or trademark,

9.1.2 PE (polyethylene),

9.1.3 Nominal pipe size, and

9.1.4 This designation, “ASTM F810–S” or “F810–HD.”

9.2 The markings shall be applied to the pipe in such a manner that they remain legible (easily read) after installation and inspection have been completed.

10. Installation Procedures

10.1 In order to function properly, pipe produced to this specification should be installed in accordance with Practice F481, when used in waste disposal absorption fields.

10.2 Pipe used for drainage applications should be installed in a gravel envelope in accordance with Practice D2321.

11. Quality Assurance

11.1 When the product is marked with this ASTM designation (F810), 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.

12. Keywords

12.1 drain pipe; fittings; perforated pipe; pipe; polyethylene; under-drain

SUPPLEMENTARY REQUIREMENTS**GOVERNMENT/MILITARY PROCUREMENT**

These supplementary 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 S1.1—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 S2.1—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.

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