



# Standard Specification for Smoothwall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields<sup>1</sup>

This standard is issued under the fixed designation F 810; 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.

## 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 pipe. Methods of marking are also included.

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

1.3 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.

1.4 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:

- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing<sup>2</sup>
- D 1600 Terminology for Abbreviated Terms Relating to Plastics<sup>2</sup>
- D 1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics<sup>3</sup>
- D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings<sup>4</sup>
- D 2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading<sup>4</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.65 on Land Drainage.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 08.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 08.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 08.04.

- D 2444 Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)<sup>4</sup>
- D 2729 Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings<sup>4</sup>
- D 2751 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings<sup>4</sup>
- D 2852 Specification for Styrene-Rubber (SR) Plastic Drain Pipe and Fittings<sup>4</sup>
- D 3033 Specification for Type PSP Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings<sup>4</sup>
- D 3034 Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings<sup>4</sup>
- D 3350 Specification for Polyethylene Plastics Pipe and Fittings<sup>3</sup>
- F 412 Terminology Relating to Plastic Piping Systems<sup>4</sup>
- F 481 Practice for Installation of Thermoplastic Pipe and Corrugated Tubing in Septic Tank Leach Fields<sup>4</sup>
- 2.2 *Federal Standard:*
  - Fed. Std. No. 123 Marking for Shipments (Civil Agencies)<sup>5</sup>
- 2.3 *Military Standard:*
  - MIL-STD-129 Marking for Shipment and Storage<sup>5</sup>

## 3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600, 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.

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,

<sup>5</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

PVC, or styrene fittings may be used provided they conform to Specifications D 2729, D 2751, D 3033, D 3034, or D 2852.

5. Materials

5.1 *General*—Those PE compounds used in the manufacture of PE smoothwall pipe shall conform with the requirements of Grade P14, Grade P23, Grade P24, Grade P33, or Grade P34 as defined and described in Specification D 3350. The compound ingredients may consist of lubricants, stabilizers, nonpoly(ethylene) resin modifiers, and pigments essential for processing, property control, and coloring. Compounds that have different grades, but because one or more properties are superior to those of the specific compounds, are also acceptable.

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 D 2444, 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.

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 D 2122.

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

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

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)

pipe is to be measured in accordance with Test Method D 2122.

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 D 2122 on socket depth.

6.5 *Pipe Stiffness*—The pipe stiffness at 5 % deflection (F/Δy) shall not be less than the values given in Table 3 when tested in accordance with Test Method D 2412.

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 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.

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

TABLE 3 Minimum Pipe Stiffness, F/Δy, at 5 % Deflection Minimum Pipe Stiffness, psi (kPa)

Nominal Pipe Size, in. (mm)	psi	kPa
3 (75)	19	131
4 (100)	11	76
6 (150)	8	55