



Designation: A674 – 22

Standard Practice for Polyethylene Encasement for Ductile Iron Pipe¹

This standard is issued under the fixed designation A674; 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 practice covers materials and installation procedures for polyethylene encasement to be applied to underground installations of ductile iron pipe. It may also be used for polyethylene encasement of fittings, valves, and other appurtenances to ductile iron pipe systems.

1.2 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.

1.2.1 Important SI values are provided in brackets. Also, certain important SI values appear without brackets or parentheses.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D882 Test Method for Tensile Properties of Thin Plastic Sheeting

D1709 Test Methods for Impact Resistance of Plastic Film

¹ This practice is under the jurisdiction of ASTM Committee A04 on Iron Castings and is the direct responsibility of Subcommittee A04.12 on Pipes and Tubes.

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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.

by the Free-Falling Dart Method

D1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method

D4976 Specification for Polyethylene Plastics Molding and Extrusion Materials

2.2 *ANSI/AWWA Standards:*³

C600 Installation of Ductile Iron Water Mains and Their Appurtenances

C105/A21.5 Polyethylene Encasement for Ductile-Iron Pipe Systems

3. Terminology

3.1 *Definitions:*

3.1.1 *high-density, cross-laminated polyethylene film*—film extruded from virgin high-density polyethylene raw material, which is then molecularly oriented by stretching. The final product is then formed by two single-ply layers of the film that are then laminated together with their orientations at 90° to one another using molten, high-density, virgin resin.

3.1.2 *linear low-density polyethylene film*—film extruded from virgin linear low-density polyethylene raw material.

3.1.3 *polyethylene encasement*—polyethylene material, in tube or sheet form, that is used to encase ductile iron pipe.

3.1.4 *securing overlap*—any one of various methods of holding polyethylene encasement in place at the point of overlap until backfilling operations are completed. This may be accomplished with adhesive tape or plastic tie straps.

4. Requirements

4.1 *Materials:*

4.1.1 *General*—All films shall be manufactured of virgin polyethylene material, as non-virgin polyethylene materials may be susceptible to accelerated environmental degradation.

4.1.1.1 *Requirements*—The sections that follow list the material requirements for linear low-density and high-density, cross-laminated polyethylene film. In each category, the film shall meet all of the listed requirements.

4.1.2 *Linear Low-Density Polyethylene Film*—Linear low-density polyethylene film shall be manufactured of virgin

³ Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, <http://www.awwa.org>.

polyethylene material conforming to the requirements of Specification **D4976** shown in **Table 1**.

4.1.2.1 *Thickness*—Linear low-density polyethylene film shall have a minimum thickness of 0.008 in. [0.20 mm].

4.1.3 *High-Density, Cross-Laminated Polyethylene Film*—High-density, cross-laminated polyethylene film shall be manufactured of virgin polyethylene material conforming to the requirements of Specification **D4976** shown in **Table 2**.

4.1.3.1 *Thickness*—High-density, cross-laminated polyethylene film shall have a minimum thickness of 0.004 in. [0.10 mm].

4.2 *Tube Size*—The tube size for each pipe diameter shall be as listed in **Table 3**.

4.3 *Color*—Polyethylene film may be supplied in its natural color, white, black, or weather-resistant black containing not less than 2 % carbon black with a particle diameter of 90 nm or less. A minimum 2 % of a hindered-amine ultraviolet inhibitor is required for all films other than the weather-resistant black film with carbon black. Where other colors are specified for purposes of identification, the pigmentation shall not contain any regulated substances.

4.4 *Marking Requirements*—Polyethylene film shall be clearly marked at a minimum of every 2 ft [0.6 m] along its length with print that does not contain hazardous material. Marking shall contain the following information:

- (1) Manufacturer's name or registered trademark.
- (2) Year of manufacture.
- (3) ANSI/AWWA C105/A21.5.
- (4) Minimum film thickness and material type (LLDPE or HDCLPE).
- (5) Applicable range of nominal pipe diameter size(s).
- (6) Warning—Corrosion Protection—Repair Any Damage.

4.4.1 *Marking Height*—Letters and numerals used for marking items (1) through (5) in 4.4 shall not be less than 1 in. [25.4 mm] in height. Item (6) in 4.4 shall be not less than 1½ in. [38.10 mm] in height.

5. Installation

5.1 General:

TABLE 1 Linear Low-Density Polyethylene Characteristics

Raw Material Used to Manufacture Polyethylene Encasement Material	
Group, density, and dielectric strength in accordance with the latest revision of Specification D4976	
Group	2 (Linear)
Density	0.910 to 0.935 g/cm ³
Dielectric strength, volume resistivity	10 ¹⁵ ohm-cm, min
Polyethylene Encasement Material	
Tensile strength	3600 psi (24.83 MPa), for an 8 mil (200µm) minimum thickness, or 28.8 lbf/in. width (50.4 N/cm width), minimum in machine and transverse direction (Test Method D882)
Elongation	700 %, min in the machine and transverse direction (Test Method D882)
Dielectric strength	800 V/mil (31.5 V/µm) thickness, min (Test Method D149)
Impact resistance	600 g, min (Test Methods D1709 Method B)
Propagation tear resistance	2550 gf, min in machine and transverse direction (Test Method D1922)

TABLE 2 High-Density Cross-Laminated Polyethylene Characteristics

Raw Material Used to Manufacture Polyethylene Encasement Material	
Group, density, and dielectric strength in accordance with the latest revision of Specification D4976	
Group	2 (Linear)
Density	0.940 to 0.960 g/cm ³
Dielectric strength, volume resistivity	10 ¹⁵ ohm-cm, min
High-Density Cross-Laminated Polyethylene Encasement Material	
Tensile strength	6300 psi (43.47 MPa), for a 4 mil (100 µm) minimum thickness, or 25.2 lbf/in. width (44.1 N/cm width), minimum in machine and transverse direction (Test Method D882)
Elongation	100 %, min in machine and transverse direction (Test Method D882)
Dielectric strength	800 V/mil (31.5 V/µm) thickness, min (Test Method D149)
Impact resistance	800 g, min. (Test Methods D1709 Method B)
Propagation tear resistance	250 gf, min. in machine and transverse direction (Test Method D1922)

TABLE 3 Polyethylene Tube Sizes for Push-On Joint Pipe^A

Nominal Pipe Diameter, in.	Recommended Polyethylene Flat Tube Width, in. [cm] ^B
3	14 [36]
4	14 [36]
6	16 [41]
8	20 [51]
10	24 [61]
12	27 [69]
14	30 [76]
16	34 [86]
18	37 [94]
20	41 [104]
24	54 [137]
30	67 [170]
36	81 [206]
42	81 [206]
48	95 [241]
54	108 [274]
60	108 [274]
64	121 [307]

^A These wrap sizes should work with most push-on joint pipe and fitting bell sizes. Lay flat tube widths are minimums for each size of pipe. Tube widths used may be as much as two sizes wider than shown. Where bell circumferences are larger than the sheet sizes shown, the bell areas should be carefully wrapped with cut film sections, effectively lapping and securing cut edges as necessary; or, alternatively, sufficiently large tube or sheet film to effectively cover these joints should be ordered.

^B For flat-sheet polyethylene, see 5.4.5.

5.1.1 The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely airtight or watertight enclosure. All lumps of clay, mud, cinders, etc. which may be on the pipe surface shall be removed prior to installation of the polyethylene encasement. During installation, care shall be exercised to prevent soil or embedment material from becoming entrapped between the pipe and the polyethylene.

5.1.2 The polyethylene film shall be fitted to the contour of the pipe to effect a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching