



Designation: E 1745 – 97

## Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs<sup>1</sup>

This standard is issued under the fixed designation E 1745; 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 flexible, preformed sheet membrane materials to be used as vapor retarders in contact with soil or granular fill under concrete slabs.

1.1.1 A task group in Subcommittee E06.21 is working on a specification for bituminous vapor retarders.

1.2 The specified tests are conducted on new materials and materials that have been conditioned or exposed to simulate potential service conditions.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 168 Terminology Relating to Thermal Insulating Materials<sup>2</sup>

D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus<sup>3</sup>

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting<sup>4</sup>

D 1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method<sup>4</sup>

E 96 Test Methods for Water Vapor Transmission of Materials<sup>2</sup>

E 154 Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover<sup>5</sup>

E 631 Terminology of Building Constructions<sup>5</sup>

F 1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, see Terminologies C 168 and E 631.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and is the direct responsibility of Subcommittee E06.21 on Serviceability.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.06.

<sup>3</sup> Annual Book of ASTM Standards, Vol 15.09.

<sup>4</sup> Annual Book of ASTM Standards, Vol 08.01.

<sup>5</sup> Annual Book of ASTM Standards, Vol 04.11.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *perm, n*—the time rate of water vapor migration through a material or a construction of one grain per hour, square foot, inch of mercury pressure difference.

3.2.1.1 *Discussion*—If a specification states that a one perm limit is required, the same flow rate will be obtained from the following relationships:

$$\begin{aligned} 1 \text{ perm} &= 1 \text{ grain/h} \cdot \text{ft}^2 \text{ in.} \cdot \text{Hg (inch-pound)} \\ &= 57.2 \cdot 10^{-12} \text{ kg}/(\text{Pa} \cdot \text{s} \cdot \text{m}^2) \text{ (SI fundamental units)} \\ &= 57.2 \text{ ng}/(\text{Pa} \cdot \text{s} \cdot \text{m}^2) \text{ (SI frequently used)} \\ &= 0.66 \text{ g}/24 \text{ h} \cdot \text{m}^2 \cdot \text{mm Hg (SI has been used but is now obsolete)} \end{aligned}$$

3.2.2 *vapor retarder, n*—(formerly vapor barrier) a material or construction that impedes the transmission of water vapor under specified conditions.

3.2.3 *water vapor permeability, n*—a property of material which is water vapor permeance through unit thickness. Since materials that provide resistance to vapor flow are never used in unit thickness, the preferred evaluation of both materials and constructions is the permeance.

3.2.4 *water-vapor permeance, n*—the time rate of water vapor flow through unit area of the known thickness of a flat material or a construction normal to two specific parallel surfaces induced by unit vapor pressure difference between the two surfaces under specific temperature and humidity conditions. See *perm*.

### 4. Classification

4.1 Materials shall be specified to conform to one of these three classes: A, B, or C, or specific requirements shall be specified in one or more of the properties listed in Table 1.

### 5. Specifying Information

5.1 Specifications for materials shall include the following:

5.1.1 This specification number.

5.1.2 Class A, B, or C, or alternatively, specific performance requirements for each of the properties listed in Table 1.

5.1.3 Performance requirements, if any, for special conditions (see 7.3).

**TABLE 1 Properties for Specified Performance Classes**

	Class A		Class B		Class C	
	US Units	SI Units	US Units	SI Units	US Units	SI Units
Water vapor permeance	0.3 perms		0.3 perms		0.3 perms	
(E 154, Section 7 or F 1249), max	(0.3 gr/[h-ft <sup>2</sup> -in.-Hg])	(17 ng/[s-m <sup>2</sup> -Pa])	(0.3 gr/[h-ft <sup>2</sup> -in.-Hg])	(17 ng/[s-m <sup>2</sup> -Pa])	(0.3 gr/[h-ft <sup>2</sup> -in.-Hg])	(17 ng/[s-m <sup>2</sup> -Pa])
Tensile strength (E 154, Section 9), <sup>A</sup> min	45.0 lbf/in.	7.9 kN/m	30.0 lbf/in.	5.3 kN/m	13.6 lbf/in.	2.4 kN/m
Puncture resistance (D 1709, Method B), min	no inch-pound equivalent used	2200 g	no inch-pound equivalent used	1700 g	no inch-pound equivalent used	475 g

<sup>A</sup> Tensile strength per unit width for the total sample thickness is used instead of tensile strength per unit area because vapor retarder materials are never used in unit thickness.

## 6. Lap Sealing

6.1 The producer shall provide instructions for lap sealing, including minimum width of lap, method of sealing, and either supply or specify suitable products for lap sealing.

## 7. Properties

7.1 *Permeance*—Material shall conform to the requirements listed in Table 1 under the following conditions: when tested in accordance with Test Methods E 154, Section 7 (based on Test Methods E 96) or Test Method F 1249, test temperature shall be 73.4°F (23°C) and test humidity shall be 50 ± 2 %.

7.1.1 *Permeance of New Material*—No conditioning.

7.1.2 *Permeance after Wetting, Drying, and Soaking*—Refer to Test Methods E 154, Section 8.

7.1.3 *Permeance after Heat Conditioning*—Refer to Test Methods E 154, Section 11.

7.1.4 *Permeance after Low Temperature Conditioning*—Refer to Test Methods E 154, Section 12.

7.1.5 *Permeance after Soil Organism Exposure*—Refer to Test Methods E 154, Section 13.

7.2 *Tensile Strength of New Material*—Refer to Test Methods E 154, Section 9. (The apparatus shall be that described in either Test Method D 828 or Test Methods D 882.)

7.3 *Resistance to Puncture of New Material*—Refer to Test Methods D 1709, Method B.

7.4 *Special Conditions*—When specifically required by the buyer, due to special conditions which dictate properties of fire resistivity, prolonged exposure to sunlight, or resistance to deterioration from hydrocarbons, the material shall conform to the following:

7.4.1 *Flame Spread*<sup>6</sup>—Refer to Test Methods E 154, Section 16, as follows:

Class A	0–25
Class B	26–75
Class C	76–200

7.4.2 *Permeance after Soil Poison Petroleum Vehicle Exposure*—Refer to Test Methods E 154, Section 14 (based on Test Methods E 96). Conform to permeance requirements in Table 1.

7.4.3 *Permeance after Exposure to Ultraviolet Light*—Refer to Test Methods E 154, Section 15. Conform to permeance requirements in Table 1.

## 8. Certification

8.1 When specified in the purchase order or contract, the purchaser shall be furnished with certification that samples representing each lot have been either tested or inspected as directed in this specification and that requirements have been met.

8.2 Upon the request of the purchaser in the contract or order, the certification of an independent third party (testing laboratory) indicating conformance to the requirements of this specification may be considered.

8.3 When specified in the purchase order or contract, the producer or supplier shall furnish a summary of the test procedures listed in Table 1, providing for each test the laboratory that performed or witnessed the test, the date of the most recent test, and the test results.

8.4 When specified in the purchase order or contract, the producer or supplier shall furnish copies of the laboratory reports for each of the tests listed in Table 1.

## 9. Keywords

9.1 concrete slab; floor; concrete; plastic; vapor retarder

<sup>6</sup> The classes and values shown are distinct from the performance classes listed in Table 1.

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