



Designation: E1643 – 18a

Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs¹

This standard is issued under the fixed designation E1643; 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 procedures for selecting, designing, installing, and inspecting flexible, prefabricated sheet membranes in contact with earth or granular fill used as vapor retarders under concrete slabs.

1.2 Conditions subject to frost and either heave or hydrostatic pressure, or both, are beyond the scope of this practice. Vapor retarders are not intended to provide a waterproofing function.

1.3 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.

1.4 *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.*

1.5 *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

[E1745 Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs](#)
[E1993/E1993M Specification for Bituminous Water Vapor](#)

¹ This practice is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.21 on Serviceability.

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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.

[Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs](#)

[F710 Practice for Preparing Concrete Floors to Receive Resilient Flooring](#)

2.2 *Other Standard:*³

[ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials](#)

3. Significance and Use

3.1 Vapor retarders provide a method of limiting water vapor transmission and capillary transport of water upward through concrete slabs on grade, which can adversely affect floor finishes and interior humidity levels.

3.2 Adverse impacts include adhesion loss, warping, peeling, and unacceptable appearance of resilient flooring; deterioration of adhesives, ripping or separation of seams, and air bubbles or efflorescence beneath seamed, continuous flooring; damage to flat electrical cable systems, buckling of carpet and carpet tiles, offensive odors, growth of fungi, and undesired increases to interior humidity levels.

4. Manufacturer's Recommendations

4.1 Where inconsistencies occur between this practice and the manufacturer's instructions, conform to the manufacturer's instructions for installation of vapor retarder.

5. Material, Design, and Construction

5.1 See ACI 302.2R-06 for material, design, and construction recommendations.

5.2 See Specifications [E1745](#) and [E1993/E1993M](#) for vapor retarder specifications.

5.3 *Vapor Retarder Material Selection*—The following criteria should be considered when selecting a vapor retarder material.

5.3.1 Local building code and regulatory requirements.

5.3.1.1 Comply with local building code and regulatory requirements as a minimum consideration.

³ Available from American Concrete Institute (ACI), 38800 Country Club Dr., Farmington Hills, MI 48331-3439, <http://www.concrete.org>.

5.3.2 The water-vapor permeance of the vapor retarder material.

5.3.2.1 The water vapor permeance of the vapor retarder material shall be at such a rate so that adverse impacts to floor finishes and coatings do not occur

5.3.2.2 Refer to **X1.6** for discussion on water vapor transmission rate of vapor retarder.

5.3.2.3 The perm rating determined under these criteria shall supersede that in references **5.2** should this value be less than required under references in **5.2**.

5.3.3 The types and amounts of deleterious compounds in the soil on the building site.

5.3.3.1 Review building site soil analyses for deleterious materials and compounds and select a vapor retarder material that will withstand exposure to such deleterious materials or compounds.

5.3.4 The tensile strength and puncture resistance of the vapor retarder material.

5.3.4.1 Select a vapor retarder material capable of withstanding potential construction site damage.

5.3.5 The type of base material on which the vapor retarder is to be installed.

5.3.5.1 Select vapor retarder material capable of withstanding tear or puncture damage due to the type, gradation, and texture of the base material to be installed below the material. Prepare base material to minimize risk of puncture, for example, by rolling or compacting.

5.3.6 The expected exposure of the vapor retarder to ultra-violet rays.

5.3.6.1 Assess expected exposure of the vapor retarder material to ultra violet rays and select a material capable of withstanding such exposure and maintain its capability to perform its intended function.

6. Placement

6.1 Level and compact base material.

6.2 Install vapor retarder material with the longest dimension parallel with the direction of concrete pour.

6.3 Face laps away from the expected direction of the concrete pour whenever possible.

6.4 Extend vapor retarder over footings and seal to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments such as water stops or dowels. Seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter.

6.5 Lap joints minimum 6 in. (150 mm), or as instructed by the manufacturer, and seal laps in accordance with the manufacturer's recommendations.

6.6 Extend vapor retarder over the tops of pile caps and grade beams to a distance acceptable to the structural engineer and terminate as recommended by the manufacturer.

7. Protection

7.1 Take precautions to protect vapor retarder from damage during installation of reinforcing steel, utilities and concrete.

7.2 Use reinforcing bar supports with base sections that minimize the potential for puncture of the vapor retarder.

7.3 Avoid use of stakes driven through the vapor retarder.

7.4 Refer to ACI 302.2R–06 for discussion of aggregate for protection of vapor retarder, including the risks of installing aggregate fill above a vapor retarder that can act as a reservoir for water.

8. Inspection and Repair

8.1 Inspect and mark all areas of damage and insufficient installation of the vapor retarder sufficiently in advance of concrete placement such that deficiencies may be corrected before concrete is placed.

8.2 Repair damaged areas prior to concrete placement with vapor retarder material lapped and sealed minimum of 6 in. (150 mm) beyond damaged area or as instructed by manufacturer.

9. Keywords

9.1 concrete slabs; vapor; vapor retarder

APPENDIX

(Nonmandatory Information)

X1. PRE-DESIGN CONSIDERATIONS

X1.1 *Planning and Organization of Construction*—To avoid ambiguities, redundancies, conflicts, and omissions, plan the organization and coordination of drawings and specifications so that graphic, dimensional, and descriptive information on subgrade, granular base, vapor retarder, and protection course, if any, appears in only one place. Since the relationship of the subgrade (pad) elevation (usually shown on grading plans) to the rest of the building finish floor elevations and finished site grades is a function of the depth of the granular

base and protection course, these dimensions should be shown in only one place. For graphic depictions and dimensions of the granular base and the protection course, the architectural drawings are preferred, but structural drawings are sometimes used. Specifications for sub-base conditions should be in the grading section. Specifications for base, vapor retarder, and protection course should be in the section on concrete, but there are advocates of a separate section in Division 7 for the vapor retarder system. Examination and testing of surface