



Designation: D 5886 – 95

Standard Guide for Selection of Test Methods to Determine Rate of Fluid Permeation Through Geomembranes for Specific Applications¹

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1. Scope

1.1 This guide covers selecting one or more appropriate test methods to assess the permeability of all candidate geomembranes for a proposed specific application to various permeants. The widely different uses of geomembranes as barriers to the transport and migration of different gases, vapors, and liquids under different service conditions require determinations of permeability by test methods that relate to and simulate the service. Geomembranes are nonporous homogeneous materials that are permeable in varying degrees to gases, vapors, and liquids on a molecular scale in a three-step process (1) by dissolution in or absorption by the geomembrane on the upstream side, (2) diffusion through the geomembrane, and (3) desorption on the downstream side of the barrier.

1.2 The rate of transmission of a given chemical species, whether as a single permeant or in mixtures, is driven by its chemical potential or in practical terms by its concentration gradient across the geomembrane. Various methods to assess the permeability of geomembranes to single component permeants, such as individual gases, vapors, and liquids are referenced and briefly described.

1.3 Various test methods for the measurement of permeation and transmission through geomembranes of individual species in complex mixtures such as waste liquids are discussed.

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

2. Referenced Documents

2.1 ASTM Standards:

D 471 Test Method for Rubber Property—Effect of Liquids²

D 814 Test Method for Rubber Property—Vapor Transmission of Volatile Liquids²

D 815 Method for Testing Coated Fabrics—Hydrogen Permeability³

D 1434 Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheet to Gases⁴

D 1653 Test Methods for Water Vapor Permeability of Organic Coating Films⁵

D 4439 Terminology for Geosynthetics⁶

D 4491 Test Methods for Water Permeability of Geotextiles by Permittivity⁶

E 96 Test Methods for Water Vapor Transmission of Materials⁷

F 372 Test Method for Water Vapor Transmission Rate of Flexible Barrier Materials Using an Infrared Detection Technique⁴

F 739 Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids or Gases Under Conditions of Continuous Contact⁸

3. Terminology

3.1 Definitions:

3.1.1 *downstream, n*—the space adjacent to the geomembrane through which the permeant is flowing.

3.1.2 *geomembrane, n*—an essentially impermeable geosynthetic composed of one or more synthetic sheets. (See Terminology D 4439.)

3.1.2.1 *Discussion*—In geotechnical engineering, essentially impermeable means that no measurable liquid flows through a geosynthetic when tested in accordance with Terminology D 4491.

3.1.3 *geosynthetic, n*—a planar product manufactured from polymeric material used with soil, rock, earth, or other geotechnical engineering-related material as an integral part of a man-made project, structure, or system. (See Terminology D 4439.)

3.1.4 *permeability, n*—the rate of flow under a differential pressure, temperature, or concentration of a gas, liquid, or

¹ This guide is under the jurisdiction of ASTM Committee D-35 on Geosynthetics and is the direct responsibility of Subcommittee D35.10 on Geomembranes.

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² *Annual Book of ASTM Standards*, Vol 09.01.

³ Discontinued; see 1988 *Annual Book of ASTM Standards*, Vol 09.02.

⁴ *Annual Book of ASTM Standards*, Vol 15.09.

⁵ *Annual Book of ASTM Standards*, Vol 06.01.

⁶ *Annual Book of ASTM Standards*, Vol 04.09.

⁷ *Annual Book of ASTM Standards*, Vol 04.06.

⁸ *Annual Book of ASTM Standards*, Vol 11.03.