



Standard Test Method for Permittivity of Geotextiles Under Load¹

This standard is issued under the fixed designation D 5493; 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 test method covers the determination of the water permittivity behavior of geotextiles in a direction normal to the plane of the geotextile when subjected to specific normal compressive loads.

1.2 Use of this test method is limited to geotextiles. This test method is not intended for application with geotextile-related products such as geogrids, geonets, geomembranes, and other geocomposites.

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

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:²

- D 123 Terminology Relating to Textile Materials
- D 653 Terminology Relating to Soil, Rock, and Contained Fluids
- D 4354 Practice for Sampling of Geosynthetics for Testing
- D 4439 Terminology for Geosynthetics
- D 4491 Test Method for Water Permeability of Geotextiles by Permittivity
- D 4716 Test Method for Determining the (in-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of ASTM Committee D-35 on Geosynthetics and is the direct responsibility of Subcommittee D35.03 on Permeability and Filtration.

Current edition approved Nov. 15, 1993. Published January 1994. Originally approved in 1993. Last previous edition approved in 1998 as D5493-93(1998).

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.

3.1.1 *geotextile, n*—any permeable textile material used with foundation, soil, rock, earth, or any other geotechnical engineering related material as an integral part of a manmade project, structure, or system (see Terminology D 4439).

3.1.2 *hydraulic gradient, i, n*—the loss of hydraulic head per unit distance of flow, dh/dL (see Test Method D 4716).

3.1.3 *permittivity, (ψ), (T^{-1}), n*—of geotextiles, the volumetric flow rate of water per unit cross-sectional area per unit head under laminar flow conditions, in the normal direction through a geotextile (see Terminology D 4439).

3.1.4 *For the definitions of other terms relating to geotextiles, refer to Terminology D 4439. For the definitions of textile terms, refer to Terminology D 123. For the definitions of coefficient of permeability, refer to Terminology D 653.*

4. Summary of Test Method

4.1 This test method provides a procedure for measuring the water flow, in the normal direction through a known cross section of a single layer of a geotextile at predetermined constant hydraulic heads over a range of applied normal compressive stresses.

4.2 The permittivity of a geotextile, ψ , can be determined by measuring the flow rate of water, in the normal direction, through a known cross section of a geotextile at predetermined constant water heads.

4.3 Water flow through geotextiles can be laminar, transient, or turbulent, and therefore permittivity cannot be taken as a constant.

5. Significance and Use

5.1 The thickness of a geotextile decreases with increase in the normal compressive stress. This decrease in thickness may result in the partial closing or the opening of the voids of geotextile depending on its initial structure and the boundary conditions.

5.2 This test method measures the permittivity due to a change of void structure of a geotextile as a result of an applied compressive stress.

6. Apparatus

6.1 The apparatus used for the normal permeability under load test is shown in Fig. 1. The apparatus shall conform to one of the following arrangements: