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.

Designation: D4491/D4491M – 22

# Standard Test Methods for Water Permeability of Geotextiles by Permittivity[1]

This standard is issued under the fixed designation D4491/D4491M; 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.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope

1.1 These test methods cover procedures for determining the hydraulic conductivity (water permeability) of geotextiles in terms of permittivity under standard testing conditions, in the uncompressed state. Included are three procedures: the constant head and falling head methods using a water flow apparatus, and the air flow method using an air flow apparatus.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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]

D123 Terminology Relating to Textiles

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D4439 Terminology for Geosynthetics

D5199 Test Method for Measuring the Nominal Thickness of Geosynthetics

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 *ASTM Adjuncts:*[3]

Detailed Drawings and Materials List for Construction, 10 Drawings

## 3. Terminology

3.1 *Definitions:*

3.1.1 *geotextile, n*—a permeable geosynthetic comprised solely of textiles.

3.1.2 *permeability, n*—the rate of flow of a liquid under a differential pressure through a material.

3.1.2.1 *Discussion*—The nominal thickness is used as it is difficult to evaluate the pressure on the geotextile during the test, thereby making it difficult to determine the thickness of the fabric under these test conditions.

3.1.3 *permeability, n—of geotextiles*, hydraulic conductivity.

3.1.4 *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.

3.1.5 For the definitions of other terms relating to geotextiles, refer to Terminology D4439. For the definitions of textile terms, refer to Terminology D123. For the definition of coefficient of permeability, refer to Terminology D653.

## 4. Summary of Test Method

4.1 *Water Flow Test Methods*—These test methods describe procedures for determining the permittivity of geotextiles using constant head or falling head test procedures with a water flow apparatus:

4.1.1 *Method A – Constant Head Test*—A head of 50 mm of water is maintained on the geotextile throughout the test. The quantity of flow is measured versus time. The constant head test is used when the flow rate of water through the geotextile is so large that it is difficult to obtain readings of head change

[1] These test methods are under the jurisdiction of ASTM Committee D35 on Geosynthetics and are the direct responsibility of Subcommittee D35.03 on Permeability and Filtration.

Current edition approved May 1, 2022. Published June 2022. Originally approved in 1985. Last previous edition approved in 2021 as D4491/D4491M – 21. DOI: 10.1520/D4491_D4491M-22.

[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] Detailed drawings and a materials list for construction are available from ASTM International Headquarters. Order Adjunct No. ADJD4491.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States