



Designation: D 4511 – 92 (Reapproved 1996)

Standard Test Method for Hydraulic Conductivity of Essentially Saturated Peat (Constant Head)¹

This standard is issued under the fixed designation D 4511; 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 hydraulic conductivity (permeability) of essentially saturated, intact cylindrical specimens of peat when the hydraulic conductivity is greater than 1×10^{-5} cm/s. During the test, the specimens are contained in the core holder, or in right, regular cylindrical sections cut from the sampling tube in which they were originally obtained in the field.

1.2 Hydraulic conductivity is calculated on the basis of the measured constant flow rate through the specimen under constant head.² For verification, flow rate determinations may be made at two or more values of constant head with corresponding calculations of hydraulic conductivity.

1.3 The values stated in SI units are to be regarded as the 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 653 Terminology Relating to Soil, Rock, and Contained Fluids³

D 1587 Practice for Thin-Walled Tube Sampling of Soils³

D 2434 Test Method for Permeability of Granular Soils (Constant Head)³

D 2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils³

D 4220 Practices for Preserving and Transporting Soil Samples³

2.2 NRC Document:

Peat Testing Manual⁴

3. Terminology

3.1 *Definitions*—The definitions used in this test method shall be in accordance with Terminology D 653.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *deaerated (de-aired) water*—water in which the amount of dissolved gas (air) has been reduced.

3.2.2 *flow rate*—the quantity of water flowing through the test specimen in a given period of time, when subjected to a certain constant head differential.

3.2.3 *soaking*—placement of a specimen in water for the purpose of removing gas contained in the pore space, through buoyancy, and replacement with water to cause saturation of the specimen. This method of saturation does not effectively remove all the gas contained in the specimen and does not prevent the continuous slow formation of gas from decomposition under anaerobic conditions.

4. Significance and Use

4.1 Values of hydraulic conductivity determined by this test method may be useful in making rough preliminary estimates of the initial rates of drainage and compression of peat deposits when the only effective stress increase on the deposit is that resulting from a moderate, gradual lowering of the water table.

4.2 Even under light, sustained loads, peat will undergo dramatic volume changes which will influence (decrease) the hydraulic conductivity of the deposit by several orders of magnitude. This test method does not offer provisions for the determination of the relationship between hydraulic conductivity and the void ratios corresponding to increasing stress levels. Therefore, this test method is not suitable for applications involving grade increases, such as embankment construction or placement of access berms alongside drainage ditches.

5. Interferences

5.1 Due to the generally fibrous texture and extremely high compressibility of peat, present sampling technologies may not be able to obtain samples truly representative of the in situ conditions. It should therefore be recognized that disturbance caused during sampling and subsequent specimen preparation, together with natural variations in material composition, may result in differences in the measured hydraulic conductivity of the specimens by several orders of magnitude.

¹ This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.04 on Hydrologic Properties of Soil and Rock.

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² For further information, see "Methods for Measurement of Saturated Hydraulic Conductivity," *Peat Testing Manual*, Technical Memorandum No. 125, NRC Canada, pp. 80–84.

³ *Annual Book of ASTM Standards*, Vol 04.08.

⁴ Available from National Research Council of Canada, Publications Section, Building R-88, Ottawa, Ontario, Canada K1A 0R6.