Designation: D 6391 – 99 (Reapproved 2004)

Standard Test Method for Field Measurement of Hydraulic Conductivity Limits of Porous Materials Using Two Stages of Infiltration from a Borehole[1]

This standard is issued under the fixed designation D 6391; 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 field measurement of limiting values for vertical and horizontal hydraulic conductivities (also referred to as *coefficients of permeability*) of porous materials using the two-stage, cased borehole technique. These limiting hydraulic conductivity values are the maximum possible for the vertical direction and minimum possible for the horizontal direction. Determination of actual hydraulic conductivity values requires further analysis by qualified personnel.

1.2 This test method may be utilized for compacted fills or natural deposits, above or below the water table, that have a mean hydraulic conductivity less than or equal to 1×10^{-5} m/s (1×10^{-3} cm/s).

1.3 Hydraulic conductivity greater than 1×10^{-5} m/s may be determined by ordinary borehole tests, for example, U.S. Bureau of Reclamation 7310 **(1)**[2]; however, the resulting value is an apparent conductivity.

1.4 For this test method, a distinction must be made between "saturated" (K_s) and "field-saturated" (K_{fs}) hydraulic conductivity. True saturated conditions seldom occur in the vadose zone except where impermeable layers result in the presence of perched water tables. During infiltration events or in the event of a leak from a lined pond, a "field-saturated" condition develops. True saturation does not occur due to entrapped air **(2)**. The entrapped air prevents water from moving in air-filled pores that, in turn, may reduce the hydraulic conductivity measured in the field by as much as a factor of two compared with conditions when trapped air is not present **(3)**. This test method simulates the "field-saturated" condition.

1.5 Experience with this test method has been predominantly in materials having a degree of saturation of 70 % or more, and where the stratification or plane of compaction is relatively horizontal. Its use in other situations should be considered experimental.

1.6 As in the case of all tests for hydraulic conductivity, the results of this test pertain only to the volume of soil permeated. Extending the results to the surrounding area requires both multiple tests and the judgment of qualified personnel. The number of tests required depends on among other things: the size of the area, the uniformity of the material in that area, and the variation in data from multiple tests.

1.7 The values stated in SI units are to be regarded as the standard unless other units specifically are given. By tradition in U.S. practice, hydraulic conductivity is reported in cm/s although the common SI units for hydraulic conductivity are m/s.

1.8 *This standard does not purport to address 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.* This test method does not purport to address environmental protection problems, as well.

2. Referenced Documents

2.1 *ASTM Standards:* [3]

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

D 1452 Practice for Soil Investigation and Sampling by Auger Borings

D 1587 Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes

D 2937 Test Method for Density of Soil in Place by the Drive-Cylinder Method

D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D 5084 Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

D 5092 Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.04 on Hydrologic Properties and Hydraulic Barriers.

Current edition approved May 1, 2004. Published June 2004. Originally approved in 1999. Last previous edition approved in 1999 as D 6391 - 99.

[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] 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.

This document is now PUBLIC

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