



Standard Test Method for Determining Unsaturated and Saturated Hydraulic Conductivity in Porous Media by Steady-State Centrifugation¹

This standard is issued under the fixed designation D6527; 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, or the permeability relative to water, of any porous medium in the laboratory, in particular, the hydraulic conductivity for water in subsurface materials, for example, soil, sediment, rock, concrete, and ceramic, either natural or artificial, especially in relatively impermeable materials or materials under highly unsaturated conditions. This test method covers determination of these properties using any form of steady-state centrifugation (SSC) in which fluid can be applied to a specimen with a constant flux or steady flow during centrifugation of the specimen. This test method only measures advective flow on core specimens in the laboratory.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard may involve hazardous materials, operations, and equipment. 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

D420 Guide to Site Characterization for Engineering Design and Construction Purposes (Withdrawn 2011)³

D653 Terminology Relating to Soil, Rock, and Contained Fluids

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 Sept. 15, 2008. Published November 2008. Originally approved in 2000. Last previous edition approved in 2000 as D6527 – 2000. DOI: 10.1520/D6527-00R08.

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 The last approved version of this historical standard is referenced on www.astm.org.

D2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing

D5084 Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

D5730 Guide for Site Characterization for Environmental Purposes With Emphasis on Soil, Rock, the Vadose Zone and Groundwater (Withdrawn 2013)³

D6026 Practice for Using Significant Digits in Geotechnical Data

3. Terminology

3.1 *Definitions:* For common definitions of terms in this guide, such as porosity, permeability, hydraulic conductivity, water content, and matric potential (matric suction, water suction, or water potential), refer to Terminology **D653**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *hydraulic steady state*—the condition in which the water flux density remains constant along the conducting system. This is diagnosed as the point at which both the mass and volumetric water contents of the material are no longer changing.

3.2.2 *SSCM or SSC-UFA*—Apparatus to achieve steady-state centrifugation. The SSCM (steady-state centrifugation method) uses a self-contained flow delivery-specimen system **(1)**.⁴ The SSC-UFA (unsaturated flow apparatus) uses an external pump to deliver flow to the rotating specimen **(2)**. This test method will describe the SSC-UFA application, but other applications are possible. Specific parts for the SSC-UFA are described in Section 6 as an example of a SSC system.

3.2.3 *steady-state centrifugation*—controlled flow of water or other fluid through a specimen while it is rotating in a

⁴ The boldface numbers in parentheses refer to the list of references at the end of this standard.