



Standard Test Method (Analytical Procedure) for Tests of Anisotropic Unconfined Aquifers by Neuman Method¹

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1. Scope*

1.1 This test method covers an analytical procedure for determining the transmissivity, storage coefficient, specific yield, and horizontal-to-vertical hydraulic conductivity ratio of an unconfined aquifer. It is used to analyze the drawdown of water levels in piezometers and partially or fully penetrating observation wells during pumping from a control well at a constant rate.

1.2 The analytical procedure given in this test method is used in conjunction with Guide D4043 and Test Method D4050.

1.3 The valid use of the Neuman method is limited to determination of transmissivities for aquifers in hydrogeologic settings with reasonable correspondence to the assumptions of the theory.

1.4 The values stated in SI units are to be regarded as standard.

1.5 *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

D653 Terminology Relating to Soil, Rock, and Contained Fluids

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

D4043 Guide for Selection of Aquifer Test Method in

Determining Hydraulic Properties by Well Techniques

D4050 Test Method for (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems

D4105 Test Method for (Analytical Procedure) for Determining Transmissivity and Storage Coefficient of Non-leaky Confined Aquifers by the Modified Theis Nonequilibrium Method

D4106 Test Method for (Analytical Procedure) for Determining Transmissivity and Storage Coefficient of Non-leaky Confined Aquifers by the Theis Nonequilibrium Method

D6026 Practice for Using Significant Digits in Geotechnical Data

3. Terminology

3.1 *Definitions*—For definitions of general technical terms used within this guide, refer to Terminology D653.

3.2 Symbols and Dimensions:

3.2.1 b [L]—initial saturated thickness of the aquifer.

3.2.2 d [L]—vertical distance between top of screen in pumping well and initial position of the water table.

3.2.3 d_D [nd]—dimensionless d , equal to d/b .

3.2.4 $J_0(x)$ —zero-order Bessel function of the first kind.

3.2.5 K_r [LT^{-1}]—hydraulic conductivity in the plane of the aquifer, radially from the control well.

3.2.6 K_z [LT^{-1}]—hydraulic conductivity normal to the plane of the aquifer.

3.2.6.1 *Discussion*—The use of the symbol K for the hydraulic conductivity is the predominant usage in groundwater literature by hydrogeologists, whereas, the symbol k is commonly used for this term in soil and rock mechanics and soil science.

3.2.7 l [L]—vertical distance between bottom of screen in control well and initial position of water table.

3.2.8 l_D [nd]—dimensionless l , equal to l/b .

3.2.9 Q [L^3T^{-1}]—discharge rate.

3.2.10 r [L]—radial distance from control well.

3.2.11 s [L]—drawdown.

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

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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.