



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

This standard is issued under the fixed designation D 5920; 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 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 D 4043 and Test Method D 4050.

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:

D 653 Terminology Relating to Soil, Rock, and Contained Fluids²

D 4043 Guide for Selection of Aquifer-Test Method in Determining Hydraulic Properties by Well Techniques²

D 4050 Test Method (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems²

D 4105 Test Method (Analytical Procedure) for Determining Transmissivity and Storage Coefficient of Nonleaky Confined Aquifers by the Modified Theis Nonequilibrium Method²

D 4106 Test Method (Analytical Procedure) for Determining Transmissivity and Storage Coefficient of Nonleaky

Confined Aquifers by the Theis Nonequilibrium Method²
D 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well²

3. Terminology

3.1 Definitions:

3.1.1 *aquifer, confined*—an aquifer bounded above and below by confining beds and in which the static head is above the top of the aquifer.

3.1.2 *aquifer, unconfined*—an aquifer that has a water table.

3.1.3 *control well*—a well by which the head and flow in the aquifer is changed by pumping, injecting, or imposing a constant change of head.

3.1.4 *drawdown*—the vertical distance the static head is lowered due to removal of water.

3.1.5 *head, static*—the height above a standard datum the surface of a column of water can be supported by the static pressure at a point.

3.1.6 *hydraulic conductivity—field aquifer test*, the volume of water at the existing kinematic viscosity that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

3.1.7 *observation well*—a well open to all or part of an aquifer.

3.1.8 *piezometer*—a device used to measure static head at a point in the subsurface.

3.1.9 *storage coefficient*—the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

3.1.10 *transmissivity*—the volume of water of the prevailing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit width of the aquifer.

3.1.11 For definitions of other terms used in this test method, see Terminology D 653.

3.2 Symbols: 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.

¹ This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

Current edition approved Feb. 10, 1996. Published June 1996.

² Annual Book of ASTM Standards, Vol 04.08.