



Standard Test Method for Determining Transmissivity and Storage Coefficient of Bounded, Nonleaky, Confined Aquifers¹

This standard is issued under the fixed designation D 5270; 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, and possible location of boundaries for a confined aquifer with a linear boundary. This test method is used to analyze water-level or head data from one or more observation wells or piezometers during the pumping of water from a control well at a constant rate. This test method also applies to flowing artesian wells discharging at a constant rate. With appropriate changes in sign, this test method also can be used to analyze the effects of injecting water into a control well at a constant rate.

1.2 The analytical procedure in this test method is used in conjunction with the field procedure in Test Method D 4050.

1.3 *Limitations*—The valid use of this test method is limited to determination of transmissivities and storage coefficients for aquifers in hydrogeologic settings with reasonable correspondence to the assumptions of the Theis nonequilibrium method (see Test Method D 4106) (see 5.1), except that the aquifer is limited in areal extent by a linear boundary that fully penetrates the aquifer. The boundary is assumed to be either a constant-head boundary (equivalent to a stream or lake that hydraulically fully penetrates the aquifer) or a no-flow (impermeable) boundary (equivalent to a contact with a significantly less permeable rock unit). The Theis nonequilibrium method is described in Test Methods D 4105 and D 4106.

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 Well (Observation Well)²

3. Terminology

3.1 Definitions:

3.1.1 *constant-head boundary*—the conceptual representation of a natural feature such as a lake or river that effectively fully penetrates the aquifer and prevents water-level change in the aquifer at that location.

3.1.2 *equipotential line*—a line connecting points of equal hydraulic head. A set of such lines provides a contour map of a potentiometric surface.

3.1.3 *image well*—an imaginary well located opposite a control well such that a boundary is the perpendicular bisector of a straight line connecting the control and image wells; used to simulate the effect of a boundary on water-level changes.

3.1.4 *impermeable boundary*—the conceptual representation of a natural feature such as a fault or depositional contact that places a boundary of significantly less-permeable material laterally adjacent to an aquifer.

3.1.5 See Terminology D 653 for other terms.

3.2 Symbols and Dimensions:

3.2.1 K_i [nd]—constant of proportionality, r_i/r_r .

3.2.2 Q [L^3T^{-1}]—discharge.

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

3.2.4 r_i [L]—distance from observation well to image well.

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 Ground Water and Vadose Zone Investigations.

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² Annual Book of ASTM Standards, Vol 04.08.