



Standard Test Method for Determining Specific Capacity and Estimating Transmissivity at the Control Well¹

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^{ε1} NOTE—Section 10.2.1 was corrected editorially in August 1999.

1. Scope

1.1 This test describes a procedure for conducting a specific capacity test, computing the specific capacity of a control well, and estimating the transmissivity in the vicinity of the control well. Specific capacity is the well yield per unit drawdown at an identified time after pumping started.

1.2 This test method is used in conjunction with Test Method D 4050 for conducting withdrawal and injection well tests.

1.3 The method of determining transmissivity from specific capacity is a variation of the nonequilibrium method of Theis (1) for determining transmissivity and storage coefficient of an aquifer. The Theis nonequilibrium method is given in Test Method D 4106.

1.4 *Limitations*—The limitations of the technique for determining transmissivity are primarily related to the correspondence between the field situation and the simplifying assumptions of the Theis method.

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

1.6 This standard may involve hazardous materials, operations, and equipment. This standard does not address safety problems 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 4050 Test Method (Field Procedure) for Withdrawal and Injection Well Tests for Determining Hydraulic Properties of Aquifer Systems²
- D 4106 Test Method for Analytical Procedure for Determining Transmissivity and Storativity of Nonleaky Confined Aquifers by the Theis Nonequilibrium Method²

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.

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² Annual Book of ASTM Standards, Vol 04.08.

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

3.1.5 *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.

3.1.6 *observation well*—a well open to all or part of an aquifer, and used to make measurements.

3.1.7 *specific capacity*—well yield per unit drawdown at an identified time after pumping started.

3.1.8 *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.

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

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

3.2 Symbols: Symbols and Dimensions:

3.2.1 *K*—hydraulic conductivity [$L T^{-1}$]

3.2.2 *m*—saturated thickness [L]

3.2.3 *Q*—discharge [$L^3 T^{-1}$]

3.2.4 *Q/s*—specific capacity [$(L^3 T^{-1}) L^{-1}$]

3.2.5 *r*—well radius [L]

3.2.6 *s*—drawdown [L]

3.2.7 *S*—storage coefficient [dimensionless]

3.2.8 *T*—transmissivity [$L^2 T^{-1}$]

3.2.9 *T'*—provisional value of transmissivity [$L^2 T^{-1}$]

3.2.10 *t*—elapsed time of pumping [T]