



Standard Test Method (Analytical Procedure) for Determining the Efficiency of a Production Well in a Confined Aquifer from a Constant Rate Pumping Test¹

This standard is issued under the fixed designation D 6034; 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 describes an analytical procedure for determining the hydraulic efficiency of a production well in a confined aquifer. It involves comparing the actual drawdown in the well to the theoretical minimum drawdown achievable and is based upon data and aquifer coefficients obtained from a constant rate pumping test.

1.2 This analytical procedure is used in conjunction with the field procedure, Test Method D 4050.

1.3 *Limitations*—The limitations of the technique for determination of well efficiency are related primarily to the correspondence between the field situation and the simplifying assumption of this test method.

1.4 *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
- D 5521 Guide for Development of Ground-Water Monitor-

ing Wells in Granular Aquifers³

D 5850 Test Method (Analytical Procedure) for Determining Transmissivity, Storage Coefficient, and Anisotropy Ratio from a Network of Partially Penetrating Wells Using Distance-Drawdown Data and Iterative Procedure³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology D 653.

3.2 Definitions of Terms Specific to This Standard:

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

3.2.2 *confining bed, n*—a hydrogeologic unit of less permeable material bounding one or more aquifers.

3.2.3 *control well, n*—a well by which the head and flow in the aquifer is changed, for example, by pumping, injection, or imposing a constant change of head.

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

3.2.5 *hydraulic conductivity, n*—(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 flow.

3.2.6 *observation well, n*—a well open to all or part of an aquifer.

3.2.7 *piezometer, n*—a device so constructed and sealed as to measure hydraulic head at a point in the subsurface.

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

3.2.9 *transmissivity, n*—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.

3.2.10 *well efficiency, n*—the ratio, usually expressed as a percentage, of the measured drawdown inside the control well divided into the theoretical drawdown which would occur in the aquifer just outside the borehole if there were no drilling damage, that is, no reduction in the natural permeability of the sediments in the vicinity of the borehole.

3.3 Symbols: Symbols and Dimensions:

3.3.1 *K*—hydraulic conductivity [LT⁻¹].

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 Investigation.

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² Annual Book of ASTM Standards, Vol 04.08.

³ Annual Book of ASTM Standards, Vol 04.09.