



Standard Test Method for Measurement of Pneumatic Permeability of Partially Saturated Porous Materials by Flowing Air¹

This standard is issued under the fixed designation D 6539; 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 laboratory determination of the coefficient of permeability for the flow of air (pneumatic permeability) through partially saturated porous materials.

1.2 This test method may be used with undisturbed or compacted coarse grained soils, silts, or lean cohesive soils that have a low degree of saturation and that have pneumatic permeability between 0.001 square micrometre (1.01 millidarcy) and 100 square micrometre (101 darcy).

1.3 The values stated in SI units are to be regarded as the standard, unless other units are specifically given. By tradition in U.S. practice, the pneumatic permeability of porous media is reported in units of darcy, although the SI unit for pneumatic permeability is square metre.

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 698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft·lbf/ft³ (605 kN·m/m³))²
- D 854 Test Method for Specific Gravity of Soils²
- D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft·lbf/ft³ (2,750 kN·m/m³))²
- D 1587 Practice for Thin-Walled Tube Geotechnical Sampling of Soils²
- D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass²
- D 3550 Practice for Ring-Lined Barrel Sampling of Soils²
- D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction²

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.04 on Hydrologic Properties of Soil and Rocks.

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² *Annual Book of ASTM Standards*, Vol 04.08.

TABLE 1 Viscosity of Air, μ , as a Function of Temperature

Temperature, °C	Viscosity, Pa·s
12	1.778×10^{-5}
14	1.788×10^{-5}
16	1.798×10^{-5}
18	1.808×10^{-5}
20	1.818×10^{-5}
22	1.828×10^{-5}
24	1.837×10^{-5}
26	1.847×10^{-5}
28	1.857×10^{-5}

D 4220 Practices for Preserving and Transporting Soil Samples²

D 4525 Test Method for Permeability of Rocks by Flowing Air²

D 4564 Test Method for Density of Soil in Place by the Sleeve Method²

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Testing Soil, Rock, and Related Construction Materials²

D 4767 Test Method for Consolidated-Undrained Triaxial Compression Test on Cohesive Soils²

D 5084 Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter³

D 5856 Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter³

E 1 Specification for ASTM Thermometers⁴

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens⁵

2.2 *American Petroleum Institute Document:*

RP-27 Recommended Practice for Determining Permeability of Porous Media⁶

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *darcy*—a porous medium has a permeability of one darcy when a single-phase fluid of 1-MPa·s (1-cP) viscosity

³ *Annual Book of ASTM Standards*, Vol 04.09.

⁴ *Annual Book of ASTM Standards*, Vol 14.03.

⁵ *Annual Book of ASTM Standards*, Vol 14.04.

⁶ Available from American Petroleum Institute, 1220 L St. NW, Washington, DC 20005.