Standard Method of Test for

One-Dimensional Consolidation Properties of Soils

AASHTO Designation: T 216-07 (2020)

Technical Subcommittee: 1a, Soil and Unbound Recycled Materials

Release: Group 3 (July)

ASTM Designation: D2435-04

AASHTO
American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004

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1. SCOPE

1.1. This test method covers procedures for determining the magnitude and rate of consolidation of soil when it is restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading. Two alternative procedures are provided as follows:

1.1.1. *Test Method A*—This test method is performed with constant load increment duration of 24 h, or multiples thereof. Time-deformation readings are required on a minimum of two-load increments.

1.1.2. *Test Method B*—Time-deformation readings are required on all load increments. Successive load increments are applied after 100 percent primary consolidation is reached, or at constant time increments as described in Test Method A.

Note 1—The determination of the rate and magnitude of consolidation of soil when it is subjected to controlled-strain loading is covered by ASTM D4186/D4186M.

1.2. This test method is most commonly performed on undisturbed samples of fine grained soils naturally sedimented in water; however, the basic test procedure is applicable as well to specimens of compacted soils and undisturbed samples of soils formed by other processes such as weathering or chemical alteration. Evaluation techniques specified in this test method are generally applicable to soils naturally sedimented in water. Tests performed on other soils, such as compacted and residual (weathered or chemically altered) soils, may require special evaluation techniques.

1.3. It shall be the responsibility of the agency requesting this test to specify the magnitude and sequence of each load increment, including the location of a rebound cycle, if required, and, for Test Method A, the load increments for which time-deformation readings are desired.

Note 2—Time-deformation readings are required to determine the time for completion of primary consolidation and for evaluating the coefficient of consolidation, c_v. Since c_v varies with stress level and load increment (loading or unloading), the load increments with timed readings must be selected with specific reference to the individual project. Alternatively, the requesting agency may specify Test Method B wherein the time-deformation readings are taken on all load increments.

1.4. The values stated in SI units are to be regarded as the standard. The values stated in inch-pound units are approximate and given for guidance only. Reporting of test results in units other than SI shall not be regarded as nonconformance with this test method.

1.4.1. In the engineering profession, it is customary practice to use, interchangeably, units representing both mass and force, unless dynamic calculations ($F = Ma$) are involved. This implicitly combines two separate systems of units; that is, the absolute system and the gravimetric system. It is scientifically undesirable to combine two separate systems within a single standard. This test method has been written using SI units; however, inch-pound conversions are given in the gravimetric system, where the pound (lbf) represents a unit of force (weight). The use of balances or scales recording pounds of mass (lbm), or the recording of density in lb/ft^3, should not be regarded as nonconformance with this test method.

1.5. *This standard does not purport to address the safety concerns 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. *AASHTO Standards*:

- T 88, Particle Size Analysis of Soils
- T 89, Determining the Liquid Limit of Soils
- T 90, Determining the Plastic Limit and Plasticity Index of Soils
- T 100, Specific Gravity of Soils
- T 207, Thin-Walled Tube Sampling of Soils
- T 265, Laboratory Determination of Moisture Content of Soils

2.2. *ASTM Standards*:

- D653, Standard Terminology Relating to Soil, Rock, and Contained Fluids
- D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
- D3550/D3550M, Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils
- D4186/D4186M, Standard Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading
- D4220/D4220M, Standard Practices for Preserving and Transporting Soil Samples
- D4452, Standard Practice for X-Ray Radiography of Soil Samples
- D4546, Standard Test Methods for One-Dimensional Swell or Collapse of Soils
- D6026, Standard Practice for Using Significant Digits in Geotechnical Data

3. TERMINOLOGY

3.1. *Definitions*—The definitions of terms used in this test method shall be in accordance with ASTM D653.

4. SUMMARY OF TEST METHOD

4.1. In this test method, a soil specimen is restrained laterally and loaded axially with total stress increments. Each stress increment is maintained until excess pore water pressures are completely dissipated. During the consolidation process, measurements are made of change in the specimen height and these data are used to determine the relationship between the effective stress