This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D4186/D4186M – 20$^{\varepsilon 1}$

Standard Test Method for One-Dimensional Consolidation Properties of Saturated Cohesive Soils Using Controlled-Strain Loading[1]

This standard is issued under the fixed designation D4186/D4186M; 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.

ε[1] NOTE—Section references in 10.1 were editorially corrected in April 2021.

1. Scope*

1.1 This test method is for the determination of the magnitude and rate-of-consolidation of saturated cohesive soils using continuous controlled-strain axial compression. The specimen is restrained laterally and drained axially to one surface. The axial force and base excess pressure are measured during the deformation process. Controlled strain compression is typically referred to as constant rate-of-strain (CRS) testing.

1.2 This test method provides for the calculation of total and effective axial stresses, and axial strain from the measurement of axial force, axial deformation, chamber pressure, and base excess pressure. The effective stress is computed using steady state equations.

1.3 This test method provides for the calculation of the coefficient of consolidation and the hydraulic conductivity throughout the loading process. These values are also based on steady state equations.

1.4 This test method makes use of steady state equations resulting from a theory formulated under particular assumptions. Subsection 5.5 presents these assumptions.

1.5 The behavior of cohesive soils is strain rate dependent and hence the results of a CRS test are sensitive to the imposed rate of strain. This test method imposes limits on the strain rate to provide comparable results to the incremental consolidation test (Test Method D2435).

1.6 The determination of the rate and magnitude of consolidation of soil when it is subjected to incremental loading is covered by Test Method D2435.

1.7 This test method applies to intact (Group C and Group D of Practice D4220), remolded, or laboratory reconstituted samples.

1.8 This test method is most often used for materials of relatively low hydraulic conductivity that generate measurable excess base pressures. It may be used to measure the compression behavior of essentially free draining soils but will not provide a measure of the hydraulic conductivity or coefficient of consolidation.

1.9 All recorded and calculated values shall conform to the guide for significant digits and rounding established in Practice D6026, unless superseded by this test method. The significant digits specified throughout this standard are based on the assumption that data will be collected over an axial stress range from 1% of the maximum stress to the maximum stress value.

1.9.1 The procedures used to specify how data are collected/recorded and calculated in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that should generally be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.

1.9.2 Measurements made to more significant digits or better sensitivity than specified in this standard shall not be regarded a non-conformance with this standard.

1.10 *Units*—The values stated in either SI units or inch-pound units [given in brackets] are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. Reporting of test results in units other than SI shall not be regarded as nonconformance with this standard.

1.10.1 The gravitational system is used when working with inch-pound units. In this system, the pound (lbf) represents a unit of force (weight), while the unit for mass is slugs. The rationalized slug unit is not given, unless dynamic (F = ma) calculations are involved.

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.05 on Strength and Compressibility of Soils.

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*A Summary of Changes section appears at the end of this standard

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