Standard Method of Test for

Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression

AASHTO Designation: T 296-10 (2020)

Technical Subcommittee: 1a, Soil and Unbound Recycled Materials

Release: Group 3 (July)

AASHTO

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1. SCOPE

1.1. This test method covers the determination of unconsolidated strength and stress–strain relationships for a cylindrical specimen of either an undisturbed or remolded cohesive soil sheared undrained in compression at a constant rate of axial deformation (strain controlled). T 208 is a related test method to this standard, although not as controlled.

1.2. The test method provides for the calculation of total stresses on, and axial compression of, the test specimen by measurement of axial load and axial deformation.

1.3. The test provides data useful in determining strength and deformation properties of cohesive soils much as Mohr strength envelopes and Young's modulus.

1.4. The determination of strength envelopes and the development of relationships to aid in interpreting and evaluating test results are left to the engineer or office requesting the test.

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 purport to address all of 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 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 208, Unconfined Compressive Strength of Cohesive Soil

2.2. *ASTM Standards*:

- D422, Standard Test Method for Particle-Size Analysis of Soils (withdrawn 2016)
- D653, Standard Terminology Relating to Soil, Rock, and Contained Fluids
- D2216, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- D4220/D4220M, Standard Practices for Preserving and Transporting Soil Samples

3. TERMINOLOGY

3.1. *Definitions*—The definitions of terms used in this test method shall be in accordance with ASTM D653 or D2487.

3.2. *Description of Terms Specific to This Standard*:

3.2.1. *failure*—the stress condition at failure for a test specimen. Failure is often taken to correspond to the maximum principal stress difference (maximum deviator stress) attained or the principal stress difference (deviator stress) at 15 percent axial strain, whichever is obtained first during the performance of a test. Depending on soil behavior and field application, other suitable failure criteria may be defined, such as the principal stress difference (deviator stress) at a selected axial strain other than 15 percent.

3.2.2. *principal stress difference (deviator stress)*—the difference in magnitude between the major principal stress and minor principal stress; in a triaxial compression test, the stress due to the axial load that is applied in excess of the confining pressure.

3.2.3. *total stress,* σ—the total force per unit area acting within a soil mass. It is the sum of neutral and effective stresses ($\sigma' + \mu$).

4. SIGNIFICANCE AND USE

4.1. The strength in this test is measured under undrained conditions and is applicable to field conditions where soils are subjected to a change in stress without time for consolidation to take place (unconsolidated condition), and the field stress conditions are similar to those in the tests.

4.2. The shear strength determined from the test expressed in terms of total stresses or effective stresses is commonly used in embankment stability analyses, earth pressure calculations, and foundation design.

5. APPARATUS

5.1. The requirements for equipment needed to perform satisfactory tests are given in the following sections.

5.2. *Axial Loading Device*—The axial compression device may be a screw jack driven by an electric motor through a geared transmission, a hydraulic or pneumatic loading device, or any other compression device with sufficient capacity and control to provide the rate of axial strain (loading) described in Section 8.1.4. The rate of advance of the loading device should not deviate by more than ±1 percent from the selected value. Vibration due to the operation of the loading device shall