



Designation: D8296 – 19

Standard Test Method for Consolidated Undrained Cyclic Direct Simple Shear Test under Constant Volume with Load Control or Displacement Control¹

This standard is issued under the fixed designation D8296; 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 defines equipment specifications and testing procedures for the measurement of cyclic strength, number of cycles to liquefaction or cyclic properties (Modulus and Damping) of soils, after one-dimensional consolidation using a cyclic mode of loading.

1.2 The cyclic shearing can be applied using load control or displacement control. It shall be the responsibility of the agency requesting this test to specify the magnitude and frequency of the cyclic loading. Other loading histories may be used if required by the agency requesting the testing.

1.3 This test method is written specifically for devices that test cylindrical specimens enclosed in a wire-reinforced membrane or a soft membrane within a stack of rigid rings (this test method applies to Teflon coated rigid rings as well). Other types of shear devices are beyond the scope of this test method.

1.4 This test method can be used for testing cohesionless free draining soils or fine grained soils. However, this test method may be followed when testing most soil types if care is taken to ensure that any special considerations required for such soils are accounted for.

1.5 The shearing phase of this test is conducted under constant volume conditions. Since the lateral confinement system prevents radial specimen strains, the constant volume condition is accomplished by preventing specimen height change during shear. Shearing under constant volume can be performed on dry or saturated specimens. The constant volume condition is equivalent to the undrained condition for fully saturated specimens. Cyclic direct simple shear testing with truly undrained conditions (restricting pore water flow from

and into the specimen) can be performed using some simple shear devices, but is beyond the scope of this standard.²

1.6 The cyclic strength of a soil is determined based on the number of cycles required to reach a limiting double amplitude shear strain or a single amplitude shear strain, while liquefaction is more commonly defined as 100 % change in vertical stress ratio (change in effective vertical stress during shearing divided by effective vertical stress at end of primary consolidation). The change in vertical stress ratio in constant volume shearing is equivalent to the excess pore pressure ratio (excess pore pressure during shearing divided by effective vertical stress at end of primary consolidation) under undrained conditions. The strain criterion is only applicable when performing load controlled tests; 100 % change in vertical stress ratio can be used for both, load and displacement control. For displacement control testing, the criterion to stop the test could be a specified number of cycles.

1.7 This test method is applicable to testing intact, reconstituted, or compacted specimens; however, it does not include specific guidance for preparing, reconstituting or compacting test specimens.

1.8 It shall be the responsibility of the agency requesting this test to specify the magnitude of the consolidation stress prior to shear and, if assigned, an unloading consolidation stage may be required for over-consolidating the specimen.

1.9 All recorded and calculated values shall conform to the guide for significant digits and rounding established in Practice D6026.

1.9.1 The procedures used to specify how data are collected/recorded and calculated in this test method are regarded as the industry standard. In addition, they are representative of the significant digits that shall 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; it is common practice to increase or reduce significant digits of reported data to be

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.09 on Cyclic and Dynamic Properties of Soils.

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² Tests sheared under truly undrained conditions should be performed exclusively on saturated specimens. Therefore, backpressure saturation is required to ensure complete saturation of test specimen.