



Standard Test Method for Laboratory Miniature Vane Shear Test for Saturated Fine-Grained Clayey Soil¹

This standard is issued under the fixed designation D 4648; 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 the miniature vane test in very soft to stiff saturated fine-grained clayey soils ($\phi = 0$). Knowledge of the nature of the soil in which each vane test is to be made is necessary for assessment of the applicability and interpretation of the test results.

NOTE 1—It is recommended that the miniature vane test be conducted in fine-grained, predominately clay soils with an undrained shear strength less than 1.0 tsf (100 kPa) which are defined as stiff according to Practice D 2488. Vane failure conditions in higher strength clay and predominantly silty soils may deviate from the assumed cylindrical failure surface, thereby causing error in the measured strength.

1.2 This test method includes the use of both conventional calibrated torque spring units (Method A) and electrical torque transducer units (Method B) with a motorized miniature vane shear device.

1.3 Laboratory vane is an ideal tool to investigate strength anisotropy in the vertical and horizontal directions, if suitable samples (specimens) are available.

1.4 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *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 1587 Practice for Thin-Walled Tube Sampling of Soils²
- D 2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)²
- D 2573 Method for Field Vane Shear Test In Cohesive Soil²
- 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 Construction³

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.13 on Marine Geotechnics.

Current edition approved Feb. 10, 2000. Published April 2000. Originally published as D 4648 – 87. Last previous edition D 4648 – 94.

² Annual Book of ASTM Standards, Vol 04.08.

³ Annual Book of ASTM Standards, Vol 04.09.

D 4220 Practices for Preserving and Transporting Soil Samples²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *torque*—the product of the magnitude of a force and the perpendicular distance of the line of action of the force from a specified axis of rotation.

3.1.2 *torque spring*—an elastic spring that can be calibrated to provide a measure of torque that is proportional to the rotation (about a central longitudinal axis) of one end of the spring relative to a fixed condition at the opposite end of the spring.

3.1.3 *torque transducer*—an electronic measuring device that can be calibrated to provide a measure of torque.

4. Summary of Test Method

4.1 The miniature vane shear test consists of inserting a four-bladed vane in the end of an undisturbed tube sample or remolded sample and rotating it at a constant rate to determine the torque required to cause a cylindrical surface to be sheared by the vane. This torque is then converted to a unit shearing resistance of the cylindrical surface area. The torque is measured by a calibrated torque spring or torque transducer that is attached directly to the vane.

5. Significance and Use

5.1 The miniature vane shear test may be used to obtain estimates of the undrained shear strength of fine-grained soils. The test provides a rapid determination of the shear strength on undisturbed, or remolded or reconstituted soils.

NOTE 2—Notwithstanding the statements on precision and bias contained in this test method: The precision of this test method is dependent on the competence of the personnel performing it and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D 3740 are generally considered capable of competent and objective testing. Users of this test method are cautioned that compliance with Practice D 3740 does not in itself ensure reliable testing. Reliable testing depends on several factors; Practice D 3740 provides a means for evaluating some of those factors.

6. Interferences

6.1 *Vane Disturbance*—The remolded zone around a vane blade resulting from insertion is generally assumed to be small and have little or no effect on the stress-strain properties of the

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

