



Standard Test Method for Identification and Classification of Dispersive Clay Soils by the Pinhole Test¹

This standard is issued under the fixed designation D 4647; 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 (€) indicates an editorial change since the last revision or reapproval.

€¹ NOTE—Keywords were added editorially December 1998

1. Scope

1.1 This test method presents a direct, qualitative measurement of the dispersibility and consequent colloidal erodibility of clay soils by causing water to flow through a small hole punched in a specimen. This test method is complemented by Test Method D 4221.

1.2 This test method and the criteria for evaluating test data are based upon results of several hundred tests on samples collected from embankments, channels, and other areas where clay soils have eroded or resisted erosion in nature **(1)**.²

1.3 Three alternative procedures for classifying the dispersibility of clay soils are provided as follows:

1.3.1 Method A and Method C, adapted from Ref **(1)**, classify soils into six categories of dispersiveness as: dispersibility (D1, D2), slight to moderately dispersive (ND4, ND3), and nondispersive (ND2, ND1).

1.3.2 Method B classifies soils into three categories of dispersiveness as: dispersibility (D), slightly dispersive (SD), and nondispersive (ND).

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided 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 422 Method for Particle Size Analysis of Soils³

D 698 Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 5.5-lb (2.49-kg) Rammer and a 12-in. (305-mm) Drop³

¹ This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.06 on Physico-Chemical Properties of Soils and Rock.

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² The boldface numbers in parentheses refer to the list of references at the end of this test method.

³ *Annual Book of ASTM Standards*, Vol 04.08.

D 2216 Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures³

D 2487 Test Method for Classification of Soils for Engineering Purposes³

D 2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)³

D 3740 Practice for the Evaluation of Agencies in the Testing and/or Inspection of Soil and Rock as Used In Engineering Design and Construction³

D 4221 Test Method for Dispersive Characteristics of Clay Soil By Double Hydrometer³

D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils³

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil, Rock and Construction Materials Testing³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *dispersive clays*—clays that diaggregate easily and rapidly in water of low-salt concentration, and without significant mechanical assistance. Such clays usually have a high proportion of their adsorptive capacity saturated with sodium cations.

3.1.1.1 *Discussion*—Such clays generally have a high shrink-swell potential, have low resistance to erosion, and have low permeability in an intact state.

4. Summary of Test Method

4.1 The test method is started with distilled water flowing horizontally under a hydraulic head of 50 mm (2 in.) through a 1.0-mm (0.04-in.) diameter hole punched in the soil specimen. The nature of the solution emerging from the specimen under the initial 50-mm (2-in.) head provides the principle differentiation between dispersive and nondispersive clays. Flow from dispersive clays will be distinctly dark and the hole through the specimen will enlarge rapidly, with a resultant increase in the flow rate. Flow from slightly to moderately dispersive clays will be slightly dark with a constant hole size and flow rate. Flow from nondispersive clays will be completely clear with no measurable increase in the hole size.