



Designation: D4221 – 99 (Reapproved 2005)

Standard Test Method for Dispersive Characteristics of Clay Soil by Double Hydrometer¹

This standard is issued under the fixed designation D4221; 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, when used in conjunction with a test performed by Test Method [D422](#) on a duplicate soil sample, provides an indication of the natural dispersive characteristics of clay soils (1).²

1.2 This test method is applicable only to soils with a plasticity index greater than 4 as determined in accordance with Test Method [D4318](#) and more than 12 % of the soil fraction finer than 5- μm as determined in accordance with Test Method [D422](#) (2).

1.3 This test method is similar to Test Method [D422](#), except that this method covers the determination of percent of soil particles smaller than 5- μm in diameter in a soil-water suspension without mechanical agitation and to which no dispersing agent has been added.

1.4 The amount of particles smaller than 5- μm determined by this method compared with the total amount of particles smaller than 5- μm determined by Test Method [D422](#) is a measure of the dispersive characteristics of the soil.

1.5 This test method may not identify all dispersive clay soils. Pinholes (Test Method [D4647](#) and crumb tests, or both, (3-5) or the analysis of pore water extract (4-7) may be performed to help verify dispersion.

1.6 *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*:³

[D422](#) Test Method for Particle-Size Analysis of Soils

¹ This test method is under the jurisdiction of ASTM Committee [D18](#) on Soil and Rock and is the direct responsibility of Subcommittee [D18.06](#) on Physico-Chemical Properties of Soils and Rocks.

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² The boldface numbers in parentheses refer to the list of references appended to this standard.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[D653](#) Terminology Relating to Soil, Rock, and Contained Fluids

[D2216](#) Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

[D3740](#) Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

[D4318](#) Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

[D4647](#) Test Method for Identification and Classification of Dispersive Clay Soils by the Pinhole Test

[D4753](#) Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing

[E1](#) Specification for ASTM Liquid-in-Glass Thermometers

[E11](#) Specification for Woven Wire Test Sieve Cloth and Test Sieves

[E100](#) Specification for ASTM Hydrometers

[E145](#) Specification for Gravity-Convection and Forced-Ventilation Ovens

3. Terminology

3.1 *Definitions*:

3.1.1 *dispersive clays*—soils that disperse (deflocculate) easily and rapidly without significant mechanical assistance in water of low-salt concentration.

3.1.1.1 Such soils usually have a high proportion of their adsorptive capacity saturated with sodium cation although adsorbed lithium and magnesium may also play a role (6). Such soils also generally have a high shrink-swell potential, have low resistance to erosion, and have low permeability in an intact state.

3.2 For other definitions relating to this standard, refer to Terminology [D653](#).

4. Summary of Test Method

4.1 The percent passing the 5- μm size is determined using test procedures in Test Method [D422](#).

4.2 The percent passing the 5- μm size is determined using the test procedures in this test method. This test method differs from Test Method [D422](#) primarily in that no mechanical agitation nor chemical dispersants are used.