Designation: D 5918 – 96 (Reapproved 2001)

Standard Test Methods for Frost Heave and Thaw Weakening Susceptibility of Soils[1]

This standard is issued under the fixed designation D 5918; 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 These laboratory test methods cover the frost heave and thaw weakening susceptibilities of soil that is tested in the laboratory by comparing the heave rate and thawed bearing ratio[2] with values in an established classification system. This test was developed to classify the frost susceptibility of soils used in pavements. It should be used for soils where frost-susceptibility considerations, based on particle size such as the limit of 3 % finer than 20 mm in Specification D 2940, are uncertain. This is most important for frost-susceptibility criteria such as those used by the Corps of Engineers,[3] that require a freezing test for aggregates of inconclusive frost classification. The frost heave susceptibility is determined from the heave rate during freezing. The thaw weakening susceptibility is determined with the bearing ratio test (see Test Method D 1883).

1.2 This is an index test for estimating the relative degree of frost-susceptibility of soils used in pavement systems. It cannot be used to predict the amount of frost heave nor the strength after thawing, nor can it be used for long-term freezing of permafrost or for foundations of refrigerated structures.

1.3 The test methods described are for one sample and uses manual temperature control. It is suggested that four samples be tested simultaneously and that the temperature control and data taking be automated using a computer.

1.4 The values stated in SI units are to be regarded as the standard. The inch-pound units 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:*

C 702 Methods for Reducing Samples of Aggregate to Testing Size[4]

D 75 Practice for Sampling Aggregates[5]

D 420 Guide to Site Characterization for Engineering Design and Construction Purposes[6]

D 653 Terminology Relating to Soil, Rock, and Contaminated Fluids[6]

D 698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort [12 400 ft-lbf/ft ^{3} (600 kN-m/m^3)][6]

D 1587 Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes[6]

D 1883 Test Method for CBR California Bearing Ratio of Laboratory-Compacted Soils[6]

D 2216 Method for Laboratory Determination of Water (Moisture) Content Soil and Rock by Mass[6]

D 2940 Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports[6]

D 3550 Practice for Dummy Text Value[6]

D 4083 Practice for Description of Frozen Soils (Visual-Manual Procedure)[6]

E 105 Practice for Probability Sampling of Materials[4]

E 122 Practice for Calculating Sample Size to Estimate with a Specified Tolerable Error, the Average for a Characteristic of a Lot or Process[4]

2.2 *Military Standards:*

Army TM 5-818-2 Pavement Design for Frost Conditions, January 1985[7]

MIL-STD-619 Unified Soil Classification System for Roads, Airfields, Embankments and Foundations[7]

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions of the soil components of a freezing and thawing soil system shall be in accordance with the terminology in Terminology D 653.

3.1.2 Definitions of the components of freezing and thawing

[1] These test methods are under the jurisdiction of ASTM Committee D18 on Soil and Rock and are the direct responsibility of Subcommittee D18.19 on Frozen Soils and Rock.

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[2] Sometimes called California Bearing Ratio (CBR).

[3] The Army Corps of Engineers uses a frost susceptibility classification procedure (TM 5-818-2) based on particle size criteria and the Unified Soil Classification System (MIL-STD-619) field. Furthermore, this test should only be used for seasonal freezing and thawing conditions and not for long-term freezing of permafrost or of foundations of refrigerated structures.

[4] *Annual Book of ASTM Standards*, Vol 04.02.

[5] *Annual Book of ASTM Standards*, Vols 04.02, 04.03, and 04.08.

[6] *Annual Book of ASTM Standards*, Vol 04.08.

[7] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

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