



Designation: D3282 – 24

Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes¹

This standard is issued under the fixed designation D3282; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This practice covers a procedure for classifying mineral and organomineral soils into seven groups based on laboratory determination of particle-size distribution, Liquid Limit, and Plasticity Index. It may be used when a precise classification is required, especially for highway construction purposes. Evaluation of soils within each group is made by means of a *group index*, which is a value calculated from an empirical formula.

NOTE 1—The group classification, including the group index, should be useful in determining the relative quality of the soil material for use in earthwork structures, particularly embankments, subgrades, subbases, and bases. However, for the detailed design of important structures, additional data concerning strength or performance characteristics of the soil under field conditions is required.

1.2 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses are provided for information only and are not considered standard. Reporting of test results in units other than SI shall not be regarded as nonconformance with this standard.

1.2.1 The sieve designations are identified using the “standard” system in accordance with Specification E11, such as 75-mm and 75- μ m, followed by the “alternative” system of 3-in. and No. 200 (presented in parentheses), respectively.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This practice offers a set of instructions for performing one or more specific operations. This practice cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This practice is not intended to represent or replace the standard of care by which*

the adequacy of a given professional service must be judged, nor should this practice be applied without consideration of a project’s many unique aspects. The word “Standard” in the title of this document means only that the document has been approved through the ASTM consensus process.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D1140 Test Methods for Determining the Amount of Material Finer than 75- μ m (No. 200) Sieve in Soils by Washing
- D1452/D1452M Practice for Soil Exploration and Sampling by Auger Borings
- D1586/D1586M Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils
- D1587/D1587M Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes (Withdrawn 2024)³
- 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
- D4700 Guide for Soil Sampling from the Vadose Zone (Withdrawn 2024)³
- D6913/D6913M Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

¹ This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.07 on Identification and Classification of Soils.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 AASHTO Document:⁴

M 145 Specification for Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

M 146 Specification for Terms Relating to Subgrade, Soil-Aggregate, and Fill Materials

3. Terminology

3.1 Definitions:

3.1.1 For definitions of common technical terms used in this standard, refer to Terminology **D653**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 The following terms are frequently used in this practice. These terms differ slightly from those given in Terminology **D653**, but are used here to maintain consistency with common highway usage. The below terminology conforms in part to AASHTO Standards M145 and M146.

3.2.2 *granular materials, n*—soil or soil-aggregate material that passes the 75-mm (3-in.) sieve and contains 35 % or less of particles that will pass a 75- μ m (No. 200) sieve.

3.2.3 *stone, n*—crushed or naturally angular particles of rock that will pass a 75-mm (3-in.) sieve and are retained on a 2-mm (No. 10) sieve.

3.2.4 *gravel, n*—rounded particles of rock that will pass a 75-mm (3-in.) sieve and are retained on a 2-mm (No. 10) sieve.

3.2.5 *coarse sand, n*—particles of rock or soil that will pass a 2-mm (No. 10) sieve and are retained on a 425- μ m (No. 40) sieve.

3.2.6 *fine sand, n*—particles of rock or soil that will pass a 425- μ m (No. 40) sieve and are retained on a 75- μ m (No. 200) sieve.

3.2.7 *silt-clay materials (combined silt and clay), n*—soil or soil-aggregate material that contains more than 35 % of particles that will pass a 75- μ m (No. 200) sieve.

3.2.8 *silty, adj*—containing a minimum of 10 % passing the 75- μ m (No. 200) sieve in which the fraction of total material that passes the 425- μ m (No. 40) sieve has a Plasticity Index of 10 or less.

3.2.9 *clayey, adj*—containing a minimum of 10 % passing the 75- μ m (No. 200) sieve in which the fraction of total material that passes the 425- μ m (No. 40) sieve has a Plasticity Index of 11 or more.

3.2.10 *irreversible mineral colloid, n*—in soils, certain minerals such as feldspars, when weathered, will bind with water to form clay minerals containing interlayer moisture, that when dried above 50°C, permanently lose this structural moisture.

3.2.10.1 *Discussion*—The drying process changes the nature of the mineralogy. This permanent dehydration has been shown to reduce plasticity, increase particle size and may potentially skew the soil classification.

3.2.11 *stone fragment, n*—a small piece of rock that has been mechanically broken from a larger stone.

4. Significance and Use

4.1 The practice described classifies soils from any geographic location into groups (including group indexes) based on the results of prescribed laboratory tests that determine the particle-size characteristics, Liquid Limit, and Plasticity Index.

4.2 The assigning of a group symbol and group index can be used to aid in the evaluation of the significant properties of the soil for highway and airfield purposes.

4.3 The various groupings of this classification system correlate in a general way with the engineering behavior of soils. Also, in a general way, the engineering behavior of a soil varies inversely with its group index. Therefore, this practice provides a useful first step in any field or laboratory investigation for geotechnical engineering purposes.

NOTE 2—The quality of the result produced by this standard 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 **D3740** are generally considered capable of competent and objective testing/sampling/inspection. Reliable results depend on many factors; Practice **D3740** provides a means of evaluation some, but not all, of those factors.

5. Apparatus

5.1 *Apparatus for Preparation of Samples and Particle-Size Analysis*—See Test Methods **D1140** and **D6913/D6913M**.

5.2 *Apparatus for Liquid Limit and Plastic Limit Tests*—See Test Method **D4318**.

6. Sampling

6.1 Conduct field investigations and sampling in accordance with one or more of the following procedures, or other applicable sampling methods under the jurisdiction of Subcommittee D18.02 on Sampling and Related Field Testing for Soil Evaluations:

- 6.1.1 Guide **D4700**,
- 6.1.2 Practice **D1452/D1452M**,
- 6.1.3 Test Method **D1586/D1586M**, and
- 6.1.4 Practice **D1587/D1587M**.

7. Test Samples and Testing Procedures

7.1 Prepare test specimens and perform testing in accordance with the following procedures:

7.1.1 *Test Samples and Testing for Particle-Size Analysis*—Use either Test Methods **D1140** or **D6913/D6913M**.

7.1.2 *Test Samples and Testing for Liquid Limit and Plastic Limit Tests*—Use Test Method **D4318**.

8. Classification Procedure

8.1 Using the test data determined by the methods in Section 7, classify the soil into the appropriate group or subgroup, or both, in accordance with **Table 1**. Use **Fig. 1** to classify silt-clay materials on the basis of the Liquid Limit and Plasticity Index. Classification of materials in the various groups applies only to the fraction passing the 75-mm (3-in.) sieve. Boulders and cobbles shall be excluded from the portion

⁴ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.