



Standard Test Methods for Determination of Maximum Dry Unit Weight and Water Content Range for Effective Compaction of Granular Soils Using a Vibrating Hammer¹

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1. Scope*

1.1 These test methods cover the determination of the maximum dry unit weight and water content range for effective compaction of granular soils. A vibrating hammer is used to impart a surcharge and compactive effort to the soil specimen.

1.2 These test methods apply to soils with up to 35 %, by dry mass, passing a No. 200 (75- μ m) sieve if the portion passing the No. 40 (425- μ m) sieve is nonplastic.

1.3 These test methods apply to soils with up to 15 %, by dry mass, passing a No. 200 (75- μ m) sieve if the portion passing the No. 40 (425- μ m) sieve exhibits plastic behavior.

1.4 These test methods apply to soils in which 100 %, by dry mass, passes the 2-in. (50-mm) sieve.

1.5 These test methods apply only to soils (materials) that have 30 % or less, by dry mass of their particles retained on the $\frac{3}{4}$ -in. (19.0-mm) sieve.

NOTE 1—For relationships between unit weights and water contents of soils with 30 % or less, by dry mass, of material retained on the $\frac{3}{4}$ -in. (19.0-mm) sieve to unit weights and water contents of the fraction passing the $\frac{3}{4}$ -in. (19.0-mm) sieve, see Practice D4718.

1.6 These test methods will typically produce a higher maximum dry density/unit weight for the soils specified in 1.2 and 1.3 than that obtained by impact compaction in which a well-defined moisture-density relationship is not apparent. However, for some soils containing more than 15 % fines, the use of impact compaction (Test Methods D698 or D1557) may be useful in evaluating what is an appropriate maximum index density/unit weight.

1.7 Two alternative test methods are provided, with the variation being in mold size. The method used shall be as indicated in the specification for the material being tested. If no method is specified, the choice should be based on the maximum particle size of the material.

¹ These test methods are under the jurisdiction of ASTM Committee D18 on Soil and Rock and are the direct responsibility of Subcommittee D18.03 on Texture, Plasticity and Density Characteristics of Soils.

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1.7.1 Method A:

1.7.1.1 *Mold*—6-in. (152.4-mm) diameter.

1.7.1.2 *Material*—Passing $\frac{3}{4}$ -in. (19.0-mm) sieve and consistent with the requirements of 1.2 and 1.3.

1.7.1.3 *Layers*—Three.

1.7.1.4 *Time of Compaction per layer*— 60 ± 5 s.

1.7.2 Method B:

1.7.2.1 *Mold*—11-in. (279.4-mm) diameter.

1.7.2.2 *Material*—Passing 2-in. (50-mm) sieve and consistent with the requirements of 1.2 and 1.3.

1.7.2.3 *Layers*—Three.

1.7.2.4 *Time of Compaction per layer*— 52 ± 5 s at each of 8 locations.

NOTE 2—Method A (with the correction procedure of Practice D4718, if appropriate), has been shown (reference thesis or paper) to provide consistent results with Method B. Therefore, for ease of operations, it is highly recommended to use Method A, unless Method B is required due to soil gradations not meeting Practice D4718.

NOTE 3—Results have been found to vary slightly when a material is tested at the same compaction effort in different size molds.

1.7.3 Either method, A or B, can be performed with the material in an oven-dried or wet/saturated state, whichever provides the maximum dry unit weight.

1.8 If the test specimen contains more than 5 % by mass of oversize fraction (coarse fraction) and the material will not be included in the test, corrections must be made to the unit weight and water content of the test specimen or to the appropriate field in-place density test specimen using Practice D4718.

1.9 This test method causes a minimal amount of degradation (particle breakdown) of the soil. When degradation occurs, typically there is an increase in the maximum unit weight obtained, and comparable test results may not be obtained when different size molds are used to test a given soil. For soils where degradation is suspected, a sieve analysis of the specimen should be performed before and after the compaction test to determine the amount of degradation.

1.10 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents;

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