



Designation: D7382 – 20

Standard Test Methods for Determination of Maximum Dry Unit Weight 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 of granular soils. A vibrating hammer is used to impart a surcharge and compactive effort to the soil specimen. Further, an optional calculation is presented to determine the approximate water content range for effective compaction of granular soils based on the measured maximum dry density and specific gravity.

1.2 These test methods apply to primarily granular, free-draining soils for which impact compaction does not yield a clear optimum water content. Specifically, these test methods apply to soils:

1.2.1 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;

1.2.2 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.

1.3 Further, due to limitations of the testing equipment, and the available oversize correction procedures these test methods apply to soils in which:

1.3.1 less than 30 %, by dry mass, is retained on the $\frac{3}{4}$ -in. (19.0-mm) sieve, or in which

1.3.2 100 %, by dry mass, passes the 2-in. (50-mm) sieve.

1.4 These test methods will typically produce a higher maximum dry unit weight for the soils specified in 1.2.1 and 1.2.2 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 unit weight.

1.5 Four alternative test methods are provided, with the variation being in saturated versus dry specimens and 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.

1.5.1 *Method 1A*—Using saturated material and a 6-in. (152.4-mm) diameter mold; applicable for materials with maximum particle size of $\frac{3}{4}$ -in. (19-mm) or less, or with 30 % or less, by dry mass, retained on the $\frac{3}{4}$ -in. (19-mm) sieve.

1.5.2 *Method 1B*—Using saturated material and an 11-in. (279.4-mm) diameter mold; applicable for materials with maximum particle size of 2-in. (50-mm) or less

1.5.3 *Method 2A*—Using oven-dry material and a 6-in. (152.4-mm) diameter mold; applicable for materials with maximum particle size of $\frac{3}{4}$ -in. (19-mm) or less, or with 30 % or less, by dry mass, retained on the $\frac{3}{4}$ -in. (19-mm) sieve.

1.5.4 *Method 2B*—Using oven-dry material and an 11-in. (279.4-mm) diameter mold; applicable for materials with maximum particle size of 2-in. (50-mm) or less.

1.5.5 It is recommended that both the saturated and dry methods (Methods 1A and 2A, or 1B and 2B) be performed when beginning a new job or encountering a change in soil type, as one method or the other may result in a higher value for the maximum dry unit weight. While the dry method is often preferred for convenience and because results can be obtained more quickly, as a general rule, the saturated method should be used if it proves to produce a significantly higher value for maximum dry unit weight.

NOTE 1—Results have been found to vary slightly when a material is tested at the same compaction effort in different size molds.

1.6 If the test specimen contains more than 5 % by mass of oversize material (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.

NOTE 2—Methods 1A and 2A (with the correction procedure of Practice D4718, if appropriate), have been shown to provide consistent results with Methods 1B and 2B for materials with 30 % or less, by dry mass retained on the $\frac{3}{4}$ -in. (19-mm) sieve. Therefore, for ease of operations, it is recommended to use Method 1A or 2A, unless Method 1B or 2B is required due to soil gradations having in excess of 30 %, by dry mass, retained on the $\frac{3}{4}$ -in. (19-mm) sieve.

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