



Standard Test Method for Measuring Bulk Density Values of Powders and Other Bulk Solids¹

This standard is issued under the fixed designation D 6683; 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 covers an apparatus and procedure for determining a range of bulk densities of powders and other bulk solids as a function of compaction pressure.

1.2 This test method should be performed in the laboratory under controlled conditions of temperature and humidity.

1.3 This test method is similar to those of B 212-89(1995) Test Method for Apparent Density of Free-Flowing Metal Powders, D 29-86(1994) Test Methods for Sampling and Testing Lac Resins, D 2854-89(1993) Test Method for Apparent Density of Activated Carbon.

1.4 The values stated are in SI Units and are to be regarded as the standard.

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:

D 653 Terminology Relating to Soil, Rock, and Contained Fluids²

D 4753 Specification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Testing Soil, Rock, and Related Construction Materials²

3. Terminology

3.1 Definitions of terms used in this test method shall be in accordance with Terminology D 653.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *area of the lid (A_l)*—this is the area of the cover in m².

3.2.2 *incremental height (h_m)*—the height due to the addition of weights in m.

3.2.3 *initial bulk density (ρ)*—the initial density (Kg/m³) when the cup is filled, prior to compressing the material with the weights.

3.2.4 *initial height (H_i)*—the initial height prior to compressing the specimen in m.

3.2.5 *maximum consolidation pressure (P_m)*—the maximum desired pressure at which a bulk density value is to be determined in kPa.

3.2.6 *maximum force (W_m)*—the weight that produces the maximum consolidation pressure (P_m) appropriate for the application: ($W_m = P_m \times A_l$). Units are in kN.

4. Summary of Test Method

4.1 Bulk density values are determined by measuring the volume change of a given mass of bulk solid under increasing compaction pressure conditions.

5. Significance and Use

5.1 The data from this test can be used to estimate the bulk density of materials in bins, hoppers and for material handling applications such as silos.

5.2 The test results can be greatly affected by the sample selected for testing. For meaningful results it is necessary to select a representative sample of the particulate solid with respect to moisture content, particle size distribution and temperature. For the tests an appropriate size sample should be available, and a fresh material should be used for each individual test specimen.

5.3 Initial bulk density may or may not be used as the minimum bulk density. This will depend on the material being tested.

5.4 Bulk density values may be dependent upon the magnitude of the load increments. Traditionally, the load is doubled for each increment resulting in a load-increment ratio of 1. Smaller than standard load increment ratios may be desirable for materials that are highly sensitive to the load increment ratio.

5.5 Bulk density values may be dependent upon the duration of each load increment. Traditionally, the load duration is the same for each increment and equal to 15 s. For some materials, the rate of consolidation is such that complete consolidation (dissipation of excess pore pressure) will require significantly more than 15 s.

6. Apparatus

A schematic of the arrangement of the test apparatus of the

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² *Annual Book of ASTM Standards*, Vol 04.08.