



Standard Test Method for Bulk Solids Characterization by Carr Indices¹

This standard is issued under the fixed designation D6393; 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 procedures for measuring properties of bulk solids, henceforth referred to as Carr Indices.²

1.2 This test method is suitable for free flowing and moderately cohesive powders and granular materials up to 2.0 mm in size. Materials must be able to pour through a 6.0 to 8.0-mm diameter funnel outlet when in an aerated state.

1.3 This method consists of eight measurements and two calculations for Carr Indices as follows. Each measurement, or calculation, or combination of them, can be used to characterize the properties of bulk solids.

- 1.3.1 Measurement of Carr Angle of Repose
- 1.3.2 Measurement of Carr Angle of Fall
- 1.3.3 Calculation of Carr Angle of Difference
- 1.3.4 Measurement of Carr Loose Bulk Density
- 1.3.5 Measurement of Carr Packed Bulk Density
- 1.3.6 Calculation of Carr Compressibility
- 1.3.7 Measurement of Carr Cohesion
- 1.3.8 Measurement of Carr Uniformity
- 1.3.9 Measurement of Carr Angle of Spatula
- 1.3.10 Measurement of Carr Dispersibility

1.4 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026.

1.4.1 The procedures used to specify how data are collected/recorded or calculated in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope

of this standard to consider significant digits used in analysis methods for engineering design.

1.5 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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:³

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D6026 Practice for Using Significant Digits in Geotechnical Data

3. Terminology

3.1 Definitions of Terms:

3.1.1 For common definitions of terms in this test method, refer to Terminology D653.

4. Summary of Test Method

4.1 Carr Angle of Repose is determined by dropping the powder specimen through a vibrating sieve and funnel above a horizontal circular platform and measuring the angle of powder cone in relation to the edge of the circular platform.

4.2 Carr Angle of Fall is determined by measuring the angle of powder cone in relation to the edge of a circular platform after applying shock impacts to the powder cone. The measurement is performed after completing the measurement of Carr Angle of Repose.

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.24 on Characterization and Handling of Powders and Bulk Solids.

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² Carr, R.L., "Evaluating Flow Properties of Solids," *Chemical Engineering*, January 18, 1965, pp. 163–168.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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