



Designation: D698 - 12 (Reapproved 2021)

## Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))<sup>1</sup>

This standard is issued under the fixed designation D698; 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 ( $\epsilon$ ) 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 These test methods cover laboratory compaction methods used to determine the relationship between molding water content and dry unit weight of soils (compaction curve) compacted in a 4 or 6-in. (101.6 or 152.4-mm) diameter mold with a 5.50-lbf (24.5-N) rammer dropped from a height of 12.0 in. (305 mm) producing a compactive effort of 12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).

**Note 1**—The equipment and procedures are similar as those proposed by R. R. Proctor (*Engineering News-Record*—September 7, 1933) with this one major exception: his rammer blows were applied as “12 inch firm strokes” instead of free fall, producing variable compactive effort depending on the operator, but probably in the range 15 000 to 25 000 ft-lbf/ft<sup>3</sup> (700 to 1200 kN-m/m<sup>3</sup>). The standard effort test (see 3.1.4) is sometimes referred to as the Proctor Test.

1.1.1 Soils and soil-aggregate mixtures are to be regarded as natural occurring fine- or coarse-grained soils, or composites or mixtures of natural soils, or mixtures of natural and processed soils or aggregates such as gravel or crushed rock. Hereafter referred to as either soil or material.

1.2 These test methods apply only to soils (materials) that have 30 % or less by mass of particles retained on the 3/4-in. (19.0-mm) sieve and have not been previously compacted in the laboratory; that is, do not reuse compacted soil.

1.2.1 For relationships between unit weights and molding water contents of soils with 30 % or less by mass of material retained on the 3/4-in. (19.0-mm) sieve to unit weights and molding water contents of the fraction passing 3/4-in. (19.0-mm) sieve, see Practice [D4718/D4718M](#).

1.3 Three alternative methods are provided. 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 material gradation.

#### 1.3.1 Method A:

1.3.1.1 *Mold*—4-in. (101.6-mm) diameter.

1.3.1.2 *Material*—Passing No. 4 (4.75-mm) sieve.

1.3.1.3 *Layers*—Three.

1.3.1.4 *Blows per Layer*—25.

1.3.1.5 *Usage*—May be used if 25 % or less (see 1.4) by mass of the material is retained on the No. 4 (4.75-mm) sieve.

1.3.1.6 *Other Usage*—If this gradation requirement cannot be met, then Method C may be used.

#### 1.3.2 Method B:

1.3.2.1 *Mold*—4-in. (101.6-mm) diameter.

1.3.2.2 *Material*—Passing 3/4-in. (9.5-mm) sieve.

1.3.2.3 *Layers*—Three.

1.3.2.4 *Blows per Layer*—25.

1.3.2.5 *Usage*—May be used if 25 % or less (see 1.4) by mass of the material is retained on the 3/4-in. (9.5-mm) sieve.

1.3.2.6 *Other Usage*—If this gradation requirement cannot be met, then Method C may be used.

#### 1.3.3 Method C:

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

1.3.3.2 *Material*—Passing 3/4-in. (19.0-mm) sieve.

1.3.3.3 *Layers*—Three.

1.3.3.4 *Blows per Layer*—56.

1.3.3.5 *Usage*—May be used if 30 % or less (see 1.4) by mass of the material is retained on the 3/4-in. (19.0-mm) sieve.

1.3.4 The 6-in. (152.4-mm) diameter mold shall not be used with Method A or B.

**Note 2**—Results have been found to vary slightly when a material is tested at the same compactive effort in different size molds, with the smaller mold size typically yielding larger values of density/unit weight (1, pp. 21+).

1.4 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 mass and molding water content of the specimen or to the appropriate field-in-place density test specimen using Practice [D4718/D4718M](#).

1.5 This test method will generally produce a well-defined maximum dry unit weight for non-free draining soils. If this

<sup>1</sup> 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.

Current edition approved July 1, 2021. Published July 2021. Originally approved in 1942. Last previous edition approved in 2012 as D698 - 12<sup>ε</sup>. DOI: 10.1520/D0698-12R21.

<sup>ε</sup> The boldface numbers in parentheses refer to the list of referencers at the end of this standard.

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

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## **Table of Contents Astm D 698**

1. Understanding the eBook Astm D 698
  - The Rise of Digital Reading Astm D 698
  - Advantages of eBooks Over Traditional Books
2. Identifying Astm D 698
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Astm D 698
  - User-Friendly Interface
4. Exploring eBook Recommendations from Astm D 698
  - Personalized Recommendations
  - Astm D 698 User Reviews and Ratings
  - Astm D 698 and Bestseller Lists
5. Accessing Astm D 698 Free and Paid eBooks
  - Astm D 698 Public Domain eBooks
  - Astm D 698 eBook Subscription Services
  - Astm D 698 Budget-Friendly Options

- 
6. Navigating Astm D 698 eBook Formats
    - ePub, PDF, MOBI, and More
    - Astm D 698 Compatibility with Devices
    - Astm D 698 Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Astm D 698
    - Highlighting and Note-Taking Astm D 698
    - Interactive Elements Astm D 698
  8. Staying Engaged with Astm D 698
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Astm D 698
  9. Balancing eBooks and Physical Books Astm D 698
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Astm D 698
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Astm D 698
    - Setting Reading Goals Astm D 698
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Astm D 698
    - Fact-Checking eBook Content of Astm D 698
    - Distinguishing Credible Sources
  13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development
    - Exploring Educational eBooks
  14. Embracing eBook Trends
    - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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