



Designation: D5195 – 21

Standard Test Method for Density of Soil and Rock In-Place at Depths Below Surface by Nuclear Methods¹

This standard is issued under the fixed designation D5195; 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 the calculation of the wet density of soil and rock by the attenuation of gamma radiation, where the gamma source and the gamma detector are placed at the desired depth in a bored hole, typically lined by an access tube.

1.1.1 For limitations see Section 6, “Interference.”

1.2 The wet density, in mass per unit volume of the material under test, is calculated by comparing the detected rate of gamma radiation with previously established calibration data (see [Annex A1](#)).

1.3 *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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined. Within the text of this standard, SI units appear first followed by the inch-pound (or other non-SI) units in brackets.

1.3.1 Reporting the test results in units other than SI shall not be regarded as nonconformance with this standard.

1.4 All observed and calculated values shall conform to the guide for significant digits and rounding established in Practice [D6026](#).

1.4.1 The procedures used to specify how data are collected, recorded, and calculated in this standard are regarded as the industry standard. In addition, they are representative of the significant digits that should generally 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 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 8, “Hazards.”

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D1452/D1452M Practice for Soil Exploration and Sampling by Auger Borings](#)³

[D1587/D1587M Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes](#)

[D2113 Practice for Rock Core Drilling and Sampling of Rock for Site Exploration](#)

[D2216 Test Methods for Laboratory Determination of Water \(Moisture\) Content of Soil and Rock by Mass](#)

[D2937 Test Method for Density of Soil in Place by the Drive-Cylinder Method](#)

[D3441 Test Method for Mechanical Cone Penetration Testing of Soils](#)

[D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)

[D4428/D4428M Test Methods for Crosshole Seismic Testing](#)

[D5220/D5220M Test Method for Water Mass per Unit](#)

¹ This test method is under the jurisdiction of ASTM Committee [D18](#) on Soil and Rock and is the direct responsibility of Subcommittee [D18.08](#) on Special and Construction Control Tests.

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² 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.

³ Replace with continuous flight and hollowstream methods when available.

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