



Standard Test Method for Determination of Water (Moisture) Content of Soil by the Time-Domain Reflectometry (TDR) Method¹

This standard is issued under the fixed designation D 6565; 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 determination of water content (or moisture content) in soil by the use of the electromagnetic technique called Time-Domain Reflectometry (TDR).

1.2 This test method was written to detail the procedure for conventional TDR measurements of soil. Other TDR applications exist for the purpose of quantifying water content in soil and are not covered here, such as flat probe technologies and wetting front advance methods.

1.3 Commercial TDR applications exist which automate the TDR methodology and are not detailed in this test method. It is likely that overlap exists in the automated commercial systems versus this applied method, and the user is encouraged to adhere to this test method when applicable.

1.4 This test method is one of a series on vadose zone characterization methods. Other standards have been prepared on vadose zone characterization techniques.

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:²

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

D 1452 Practice for Soil Investigations and Sampling by Auger Borings

D 2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

D 4643 Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method

D 4700 Guide for Soil Sampling from the Vadose Zone

D 4944 Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester Method

D 5220 Test Method for Water Content of Soil and Rock In-Place by the Neutron Depth Probe Method

3. Terminology

3.1 Definitions:

3.1.1 *time domain reflectometry (TDR)*—an electromagnetic method used in the determination of water content of soil.

3.1.2 Definitions of other terminology used in this guide may be found in Terminology D 653.

4. Summary of Test Method

4.1 A specially constructed, multi-wave-guide TDR probe is inserted into the soil. The electronic cable tester (or automated commercial TDR electronics) is used to send a pulsed waveform to the probe. The cable tester then receives a return signal which was influenced by the dielectric constant of the soil, which in turn is a function of water content. An analysis of the waveform trace supplies the necessary information to calculate the water content of the soil.

5. Significance and Use

5.1 The determination of the water-content, or moisture content, of soil is one of the fundamental needs in the soil physics and hydrology disciplines. The need arises from requirements for defining the optimal time for irrigation, the infiltration rate, the soil-moisture flux, contaminant transport rates, and evaluating the potential for leakage from a waste site or a surface or subsurface barrier.

5.2 The TDR application covered in this test method is that used for point measurements of moisture content in soil. The application is either through manual insertion into the soil or by burying a probe in the subsurface to acquire moisture content

¹ This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21.02 on Vadose Zone Monitoring.

Current edition approved Nov. 1, 2005. Published December 2005. Originally approved in 2000. Last previous edition approved in 2000 as D 6565 – 00.

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.