Designation: D2980 – 17ε1

Standard Test Method for Saturated Density, Moisture-Holding Capacity, and Porosity of Saturated Peat Materials[1]

This standard is issued under the fixed designation D2980; 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.

ε[1] NOTE—Editorially updated units of measurement statement in April 2018.

1. Scope*

1.1 This test method was designed to evaluate the aeration, water penetration, and water retention properties of peat under field conditions of water saturation by measurement of the saturated density, the moisture holding capacity, and the porosity.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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

1.3.1 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

1.4 *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.*

1.5 *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

D2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic 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

D4753 Guide for Evaluating, Selecting, and Specifying Balances and Standard Masses for Use in Soil, Rock, and Construction Materials Testing

D6026 Practice for Using Significant Digits in Geotechnical Data

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 *Definitions:*

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

4. Summary of Test Method

4.1 The test method sets up standardized conditions for measuring the volume and mass of saturated peat. From these data, saturated volume, mass, moisture-holding capacity (on a mass and volume basis), dry peat volumes, and porosity can be determined.

5. Significance and Use

5.1 This test method measures the air-filled spaces (porosity) and the moisture-holding capacity of peat on both a mass and a volume basis under conditions of saturation. If large

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.22 on Media for Plant Growth.

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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.

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

spaces are present, water and air can penetrate easily. If spaces are smaller, the water holding capacity is increased. Water holding capacity is larger in humified peat materials (small inter-particulate spaces) (sapric soil), whereas water and air-penetration is larger in unhumified peat (larger inter-particulate spaces) (fibric soil). The spaces can also be an indication of the oxygen available to the plant roots. As such, the interplay of the properties of moisture holding capacity and porosity dictate the best use of the harvested organic soil material as well as the best management practices for organic soils. The moisture retention relationships of these soils are critical to decisions involving irrigation, drainage, and bearing capacity of these soil.

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

5.2 Water retention values are particularly important in the management of organic soils. There is much confusion in the literature about the moisture retention values being expressed in various bases; as a percent by volume; as a percent of oven dry mass; or as the percent of the wet mass. In some management decisions, it is necessary to express the water contents of organic soils on a volume basis because of their varied bulk densities, but because of the volume reduction occurring on drying, the water contents must also be expressed on a wet volume basis as collected in the field. Whereas, in other management decisions, moisture retention values are best expressed on a dry mass basis. For example, the difference in mass between the wet and oven dry sample is the moisture held. These values are best expressed on a dry mass basis. Water holding capacities show a marked difference due to the degree of decomposition in an organic soil. The mass of water in fibric soil may be as much as 20 times the mass of the solid particles, whereas that held in a sapric soil contains less than twice the mass. If the water holding capacity is expressed on a volume basis these differences are much less apparent.

6. Apparatus

6.1 *Dispensing Apparatus:*

6.1.1 Two dispensing burets, 250-cm^3 capacity in 1-cm^3 subdivisions, ±2-cm^3 tolerance, pinch-cock type;

6.1.2 A one-hole No. 6 rubber stopper;

6.1.3 Straight polyethylene drying tube with serrated rubber tubing fittings, 150 mm long, 19 mm (¾ in.) in outside diameter, 16 mm (⅝ in.) in inside diameter;

6.2 A 4-mesh sieve conforming to Specification E11;

6.3 *Balance or Scale,* a balance or scale for determining the mass of the soil having a minimum capacity of 500 g and meeting the requirements of Guide D4753 for a balance or scale of 0.01 g readability;

6.4 A pre-tared moisture-proof (air-tight) container;

6.5 A 5-gal (20-L) bottle equipped with a siphon device;

6.6 Stainless steel sieve circle about 16 mesh and 28.7 mm in diameter to be attached to one end of the drying tube and sealed. (A soldering iron is useful.) Adjust the length of the tube to match conveniently the graduation of the buret; then cut the end without the sieve to allow for water drainage, and insert the tube into the dispensing buret with the sieve side up.

6.7 A square piece of rubber sheet, paper, or oil cloth to aid in mixing sample.

7. Preparation of Sampling and Test Specimens Sampling, Test Specimens, and Test Units

7.1 *Sample:*

7.1.1 Obtain a sample as outlined in Section 7 of Test Methods D2974.

7.1.2 Air-dry the sample in accordance with Method B, 8.1.3.2 of Test Methods D2974 (air dried portion only). Determine and Record the moisture removed during air-drying as a percentage of the as-received mass to the nearest 0.1 %.

7.2 *Test Specimen:*

7.2.1 Place a representative field sample about 300 g on a square rubber sheet, paper, or oil cloth.

7.2.2 Reduce the sample to the quantity required for a specimen by quartering and place in a pre-tared moisture-proof container. Work rapidly to prevent moisture losses.

8. Procedure

8.1 Determine the moisture content on a separate test specimen by Method I or II of Test Methods D2974.

8.1.1 Determine the mass of the buret fitted with the plastic tube and screen. Working rapidly to prevent moisture losses, mix the sample thoroughly, place on top of a 4-mesh sieve, and shake until sieving is complete. Use only the portion that has passed through the sieve for the determination. Firmly pack the buret with 250 mm (10 in.) of the material passing the 4-mesh sieve as follows: Attach the rubber stopper to the delivery end of the buret. Add approximately 20-cm^3 portions of the sample, firmly tapping on the rubber stopper 3 times vertically from a height of 150 mm (6 in.) for a final height of 250 mm (10 in.) (This will ensure that the height of the final wet volume is 190 to 250 mm. (7.5 to 10 in.)). Remove the stopper and weigh the buret to nearest 1 g.

8.1.2 Position the buret to use a sink as the drain. Place a 20-L (5-gal) bottle equipped with a siphon device above the level of the buret. Connect the clamped rubber tubing of the siphon device to the buret by inserting glass tubing about 125 mm (5 in.) and constricted at one end into the one-hole rubber stopper fitted tightly into the top of the buret. Attach the rubber tubing with the pinch clamp to the delivery end of the buret. Open both clamps and pass water through the sample for more than 24 h, maintaining a water reservoir over the sample at all times. (Moss-type samples may float but gradually settle as the sample becomes wet.) After initial soaking, regulate the water flow through the column by adjusting the screw clamp at the delivery end of the buret. (The in-flow of water should be about equal to the out-flow; a flow of about 1 drop/s is suitable.) When the sample is saturated, close both clamps and let the sample settle in water for about 5 min. The top surface of the sample should be as level as possible.