Designation: D 2980 – 02

Standard Test Method for Volume Mass, Moisture-Holding Capacity, and Porocity of Saturated Peat Materials[1]

This standard is issued under the fixed designation D 2980; 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 was designed to evaluate the aeration, water penetration, and water retention properties of peat under field conditions of water saturation.

1.2 *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:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils[2]

D 3740 Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Desgin and Construction[2]

D 4753 TSpecification for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil, Rock, and Construction Materials Testing[2]

D 6026 Practice for Using Significant Digits in Geotechnical Data[3]

E 11 Specification for Wire-Cloth Sieves for Testing Purposes[4]

3. Summary of Test Method

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

4. Significance and Use

4.1 This test method measures the air spaces of peat and the moisture-holding capacity on either a mass and/or a volume basis under conditions of saturation. If large 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), whereas water and air-penetration is larger in unhumified peat (larger inter-particulate spaces). The spaces can also be aan indication of the oxygen available to the plant roots.

4.2 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 D 3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D 3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D 3740 provides a means of evaluating some of those factors.

5. Apparatus

5.1 *Dispensing Apparatus*—Two dispensing burets, 250-mL capacity in 1-mL subdivisions, ±2-mL tolerance, pinch-cock type; a one-hole No. 6 rubber stopper; 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;[5] a 4-mesh sieve; a balance; a moisture–proof (air-tight) container; a 5-gal (20-L) bottle equipped with a siphon device; and a 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 scallop the end without the sieve to allow for water drainage, and insert the tube into the dispensing buret with the sieve side up.

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[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 Soil as a Media for Plant Growth.

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[2] *Annual Book of ASTM Standards*, Vol 04.08.

[3] *Annual Book of ASTM Standards*, Vol 04.09.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] A Cenco No. 14782-2 drying tube has been found suitable for this purpose.

6. Sample

6.1 Place a representative field sample on a square rubber sheet, paper, or oil cloth. Reduce the sample to the quantity required by quartering and place in a pre-tared moisture-proof container. Work rapidly to prevent moisture losses.

7. Procedure

7.1 Determine the moisture content on a separate test specimen by Method I or II of Test Methods D 2974.

7.1.1 Weigh 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 20-mL 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 50 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.

7.1.2 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.

7.1.3 Raise the buret and replace the rubber stopper on the delivery end of the buret with a 250-mL dispensing buret filled with water, using the rubber stopper for the connection. Connect the two burets tightly, with no air leaks. Remove the siphon device and open the outlet clamps on both burets to empty. (The suction created is equivalent to about 38 mm (15 in). of water. Check for air leaks to ensure that the standard suction is exerted on the sample. It is important to remove excess water as described.) Measure the height of the wet peat. The height should be 190 to 250 mm (7.5 to 10 in.). Record the volume in millilitres and weigh the buret, the plastic tube with the sieve, and the wet peat to the nearest 1 g. Wet the sample again as above for more than 1 h, drain by suction, record the volume, and mass. Repeat until consistent results are obtained.

8. Calculation

8.1 Calculate the saturated volume mass, *S*, in grams per millilitre as follows:

As-received:

$$S = W_r/V_w \quad (1)$$

Oven-dried:

$$S = W_d/V_w \quad (2)$$

Wet:

$$S = W_w/V_w \quad (3)$$

where:

W_r = mass of test specimen as received, g,
V_w = wet volume, mL,
W_d = mass of dried test specimen, g = $W_r \times (100 - M)/100$,
M = moisture, %, and
W_w = mass of wet test specimen, g.

8.2 Calculate the moisture-holding capacity in percent as follows:

8.2.1 *Mass basis, W*:

As-received:

$$W = [(W_w - W_r) \times 100]/W_r \quad (4)$$

Oven-dried:

$$W = [(W_w - W_d) - W_d) \times 100]/W_d \quad (5)$$

8.2.2 *Volume basis, V*:

$$V = [(W_w - W_d) \times 100]/(V_w \times 1.0) \quad (6)$$

8.3 Calculate the dry peat volume, *P*, in percent as follows:

$$P = (W_d \times 100)/(V_w \times 1.4) \quad (7)$$

8.4 Calculate the porocity, *A*, in percent as follows:

$$A = 100 - (V + P) \quad (8)$$

9. Report

9.1 Report the saturated volume mass to the nearest 0.01 g. Report percentage results to the nearest whole number.

10. Precision and Bias

10.1 *Precision*—Due to the nature of the soil or rock materials tested by this method it is either not feasible or too costly at this time to produce multiple specimens which have uniform physical properties. Any variation observed in the data is just as likely to be due to specimen variation as to operator testing variation. Subcommittee D18.22 welcomes proposals that would allow for development of a valid precision statement.

10.2 *Bias*—There is no accepted reference value for this test method, therefore, bias cannot be determined.

11. Keywords

11.1 moisture; moisture holding capacity; peat; porocity