



Designation: **D4531 – 86 (Reapproved 2008) D4531 – 15**

## Standard Test Methods for Bulk and Dry Density of Peat and Peat Products<sup>1</sup>

This standard is issued under the fixed designation D4531; 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.

### 1. Scope—Scope\*

1.1 These test methods cover the determination of the bulk and dry density of both peat in its natural state and peat products (Note 1). These test methods consist of defining a volume of peat and determining the mass of that specific volume. The difference in the respective methods is in the procedures employed to determine the peat volume.

NOTE 1—Test Method D2978 is used for specifying the volume represented by a quantity of loose processed peat or the volume of a peat bale.

1.2 *Method A*—~~This method, the core method, The core method~~ covers the determination of the bulk density of an undisturbed core of peat taken with a piston sampler or other suitable core sampler (Sections 6 and 7).

1.3 *Method B*—~~This method, the~~ The paraffin wax method, covers the determination of the bulk density of undisturbed clods or irregular pieces of wet peat and compressed peat products (Sections 8 and 9).

1.4 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 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 evaluating some of those factors.

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

1.6.1 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.

1.7 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:*<sup>2</sup>

~~D2974~~D653 [Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils](#) [Terminology Relating to Soil, Rock, and Contained Fluids](#)

D2978 [Test Methods for Volume of Processed Peat Materials](#)

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

D6026 [Practice for Using Significant Digits in Geotechnical Data](#)

<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 D18.22 on Soil as a Medium for Plant Growth.

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<sup>2</sup> 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

### 3. Terminology

3.1 For definitions of common technical terms used in this standard, refer to Terminology [D653](#).

3.2 *Definitions: Definitions of Terms Specific to This Standard:*

3.2.1 *bulk density,  $\rho$* —as used for peat products is the total mass (solids plus water) per unit of total volume of a peat at a given moisture condition.

3.2.2 *dry density,  $\rho_d$* —mass of dry organic and mineral matter per unit of total volume of a peat at a given moisture condition.

NOTE 2—In many peat science applications and publications, the term defined here as “dry density” in accordance with common geotechnical engineering usage is referred to as “bulk density”. Care is necessary to distinguish which definition is being used when such a term is encountered.

### 4. Significance and Use

4.1 These test methods provide uniform procedures for determining the bulk density of in situ peat and processed peat products. The bulk density is of use in the calculation of in situ stresses for engineering analysis and in quantifying the amount of material present when considering peat as a resource. In the latter case, it is necessary to consider the moisture condition for which the bulk density was determined; a more useful parameter to consider may well be the dry density,  $\rho_d$ .

NOTE 3—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 evaluating some of those factors.

### 5. Apparatus

5.1 *Drying Oven*—A thermostatically controlled drying oven maintained at a temperature of  $105 \pm 5^\circ\text{C}$ .

5.2 *Balances*—Balances sensitive to 0.01 g for samplespecimen less than 100 g, sensitive to 0.1 g for samplespecimen between 100 g and 1000 g, or sensitive to 1 g for samplespecimen over 1000 g.

5.3 *Moisture Content Containers*—Suitable containers for laboratory moisture content determinations.

5.4 *Plastic Sample Bags or Sampling Jars*.

5.5 *Sampler*—Piston sampler or other suitable coring device which will give a ~~reasonably undisturbed~~ cylindrical sample.

NOTE 4—Samples taken with the Macaulay type peat sampler are semicylindrical in ~~shape and relatively undisturbed~~ shape. They may also be used in this method of determination.

5.6 *Sharp Knife*—An electric knife or barber’s razor will be best for laboratory work.

5.7 *Paraffin Wax*, maintained at a temperature between 60 and  $70^\circ\text{C}$ , for use in Method B only.

5.8 *Graduated Cylinder*, for use in Method B only.

## METHOD A—CORE METHOD

### 6. Procedure

6.1 Take a representative ~~reasonably undisturbed~~ core of peat with a ~~piston sampler or other coring device~~ sampler.

6.2 With a sharp knife, cut specimens ~~of no less than~~ at least 50 mm in length from the various layers included in the core. Measure and record the specimen length to the nearest millimetre.

6.3 For samplespecimen extruded in the field, place the specimen into a plastic sampling bag or sampling jar and seal to prevent moisture loss.

6.4 Transfer the whole specimen and any free water to a moisture content container in the laboratory and obtain and record the moist mass of peat,  $M$ , to the sensitivity of the balance used.

6.5 Dry the specimen in ~~an~~ a drying oven at ~~105°C~~  $105 \pm 5^\circ\text{C}$  until a constant mass is reached. Record the mass of dry peat,  $M_s$ .

### 7. Calculation

7.1 The bulk density,  $\rho$ , is calculated as follows:

$$\rho = (M/AL) \text{ g/cm}^3 \quad (1)$$

where:

$M$  = mass of the wet peat sample, g,

$L$  = length of sample, cm, and

$A$  = ~~cross-sectional area of sample, as determined from the diameter and form of the sampling device,~~  $\text{cm}^2$ .