



# Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils<sup>1</sup>

This standard is issued under the fixed designation D 2974; 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

1.1 These test methods cover the measurement of moisture content, ash content, and organic matter in peats and other organic soils, such as organic clays, silts, and mucks.

1.2 The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.3 *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 Rock, Soil, and Contained Fluids<sup>2</sup>

D 3740 Practice for the Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction<sup>2</sup>

D 4753 Standard Specifications for Evaluating, Selecting, and Specifying Balances and Scales for Use in Soil and Rock Testing<sup>2</sup>

E 145 Specification for Gravity Convection and Forced Ventilation Ovens<sup>3</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 For common definitions of terms in this standard, refer to Terminology D 653.

## 4. Summary of Test Methods

4.1 *Test Method A*—Moisture is determined by drying a peat or organic soil sample at 105°C. The moisture content is expressed either as a percent of the oven dry mass or of the as-received mass.

4.2 *Test Method B*—This is an alternative moisture method

which removes the total moisture in two steps: (1) evaporation of moisture in air at room temperature (air-drying), and (2) the subsequent oven drying of the air-dried sample at 105°C. This method provides a more stable sample, the air-dried sample, when tests for nitrogen, pH, cation exchange, and the like are to be made.

4.3 *Test Methods C and D*—Ash content of a peat or organic soil sample is determined by igniting the oven-dried sample from the moisture content determination in a muffle furnace at 440°C (Method C) or 750°C (Method D). The substance remaining after ignition is the ash. The ash content is expressed as a percentage of the mass of the oven-dried sample.

4.4 Organic matter is determined by subtracting percent ash content from one hundred.

## 5. Significance and Use

5.1 This test method can be used to determine the moisture content, ash content, and percent organic matter in soil.

5.2 The percent organic matter is important in classifying a peat or other organic 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 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.

## 6. Apparatus

6.1 *Oven*, meeting the requirements of E 145 and capable of being regulated to a constant temperature of 105 ± 5°C.

NOTE 2—The temperature of 105°C is quite critical for organic soils. The oven should be checked for “hot spots” to avoid possible ignition of the specimen.

6.2 *Muffle Furnace*, capable of producing constant temperatures of 440°C and 750°C.

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 Standard D 4753 for a balance or scale of 0.01 g readability.

6.4 *Rubber Sheet, Oil Cloth*, or other non-absorbent material.

6.5 *Evaporating Dishes*, of high silica or porcelain of not

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.08.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.06.

less than 100-mL capacity.

6.6 *Blender*, high-speed.

6.7 *Aluminum Foil*, heavy-duty.

6.8 *Porcelain Pan, Spoons*, and equipment of the like.

6.9 *Desiccator*.

## 7. Sampling and Test Specimens

7.1 Place a representative field sample on a square rubber sheet, oil cloth, or equivalent material and mix thoroughly.

7.2 Reduce the sample to the quantity required for a test specimen by quartering.

7.3 Place the test specimen and the remaining sample in separate waterproof containers.

7.4 Work rapidly to prevent moisture loss or perform the operation in a room with a high humidity.

## 8. Procedure

### 8.1 Moisture Content Determination

#### 8.1.1 Test Method A

8.1.1.1 Record to the nearest 0.01 g the mass of a high silica or porcelain evaporating dish fitted with a heavy-duty aluminum foil cover. The dish shall have a capacity of not less than 100 mL.

8.1.1.2 Following the instruction in section 4.1 above, place a test specimen of at least 50 g in the container described in 8.1.1.1. Crush soft lumps with a spoon or spatula. The thickness of peat in the container should not exceed 3 cm.

8.1.1.3 Cover immediately with the aluminum foil cover and record the mass to the nearest 0.01 g.

8.1.1.4 Dry uncovered for at least 16 h at 105°C or until there is no change in mass of the sample after further drying periods in excess of 1 h. Remove from the oven, cover tightly, cool in a desiccator, and record the mass to the nearest 0.01 g.

#### 8.1.2 Calculations for Test Method A

8.1.2.1 Calculate the moisture content as follows:

$$\text{Moisture Content, \%} = [(A - B) \times 100]/A \quad (1)$$

where:

$A$  = mass of the as-received test specimen, g, and

$B$  = mass of the oven-dried specimen, g.

8.1.2.1.1 This calculation is used primarily for agriculture, forestry, energy, and horticultural purposes and the result should be referred to as the moisture content as a percentage of as-received or total mass.

8.1.2.2 An alternative calculation is as follows:

$$\text{Moisture Content, \%} = [(A - B) \times 100]/B \quad (2)$$

where:

$A$  = as-received test specimen, g, and

$B$  = mass of the oven-dried specimen, g.

8.1.2.2.1 This calculation is used primarily for geotechnical purposes and the result should be referred to as the moisture content as a percentage of oven-dried mass.

8.1.2.3 Take care to indicate the calculation method used.

#### 8.1.3 Test Method B

8.1.3.1 This test method should be used if pH, nitrogen content, cation exchange capacity, and the like are to be tested.

8.1.3.2 Following the instructions in section 4.1 above, select a 100 to 300 g representative test specimen. Determine

the mass of this test specimen to the nearest 0.01 g and spread it evenly on a large flat pan. Crush soft lumps with a spoon or spatula and let the sample come to moisture equilibrium with room air. This will require at least 24 h. Stir occasionally to maintain maximum air exposure of the entire sample. When the mass of the sample reaches a constant value, calculate the moisture removed during air drying as a percentage of the as-received mass.

8.1.3.3 Grind a representative portion of the air-dried sample for 1 to 2 min in a high-speed blender. Use the ground portion for moisture, ash, nitrogen, cation exchange capacity tests, and the like.

8.1.3.4 Thoroughly mix the air-dried, ground sample. Weigh to the nearest 0.01 g the equivalent of 50 g of test specimen on an as-received basis. Determine the amount, in grams, of air-dried sample equivalent to 50 g of as-received sample, as follows:

$$\text{Equivalent Sample Mass, g} = 50.0 - [(50 \times M)/100] \quad (3)$$

where:

$M$  = moisture removed in air drying, %.

8.1.3.5 Place the sample in a container as described in 8.1.1 and proceed as in Method A.

#### 8.1.4 Calculations for Test Method B

8.1.4.1 Calculate the moisture content as follows:

$$\text{Moisture Content, \%} = (50 - B) \times 2 \quad (4)$$

where:

$B$  = oven-dried sample, g.

8.1.4.1.1 This calculation gives moisture content as a percentage of as-received mass.

8.1.4.2 An alternative calculation is as follows:

$$\text{Moisture Content, \%} = [(50 - B) \times 100]/B \quad (5)$$

8.1.4.2.1 This calculation gives moisture content as a percentage of oven-dried mass.

## 8.2 Ash Content Determination

### 8.2.1 Test Method C

8.2.1.1 Determine the mass of a covered high-silica or porcelain dish to the nearest 0.01 g.

8.2.1.2 Place a part of or all of the oven-dried test specimen from a moisture determination in the dish and determine the mass of the dish and specimen.

8.2.1.3 Remove the cover and place the dish in a muffle furnace. Gradually bring the temperature in the furnace to 440°C and hold until the specimen is completely ashed (no change of mass occurs after a further period of heating).

8.2.1.4 Cover with the retained aluminum foil cover, cool in a desiccator, and determine the mass to the nearest 0.01 g.

8.2.1.5 This test method should be used for all geotechnical and general classification purposes.

### 8.2.2 Test Method D

8.2.2.1 Determine the mass of a covered high-silica or porcelain dish to the nearest 0.01 g.

8.2.2.2 Place a part of or all of the oven-dried test specimen from a moisture determination in the dish and determine the mass of the dish and specimen to the nearest 0.01 g.

8.2.2.3 Remove the cover and place the dish in a muffle furnace. Gradually bring the temperature in the furnace to

750°C and hold until the specimen is completely ashed (no change of mass occurs after a further period of heating).

8.2.2.4 Cover with the retained aluminum foil cover, cool in a desiccator, and determine the mass to the nearest 0.01 g.

8.2.2.5 This test method should be used when peats are being evaluated for use as a fuel.

### 8.2.3 Calculation for Test Methods C and D

8.2.3.1 Calculate the ash content as follows:

$$\text{Ash Content, \%} = (C \times 100) / B \quad (6)$$

where:

$C$  = ash, g, and

$B$  = oven-dried test specimen, g.

### 8.3 Organic Matter Determination

#### 8.3.1 Calculation

8.3.1.1 Determine the amount of organic matter by difference, as follows:

$$\text{Organic matter, \%} = 100.0 - D \quad (7)$$

where:

$D$  = ash content, %.

## 9. Report

9.1 Report the following information:

9.1.1 Results for organic matter and ash content, to the nearest 0.1 %.

9.1.2 Furnace temperature used for ash content determinations.

9.1.3 Whether moisture contents are by proportion of as-received mass or oven-dried mass.

9.1.3.1 Express results for moisture content as a percentage of as-received mass to the nearest 0.1 %.

9.1.3.2 Express results for moisture content as a percentage of oven-dried mass as follows:

(a) Below 100 % to the nearest 1 %.

(b) Between 100 % and 500 % to the nearest 5 %.

(c) Between 500 % and 1000 % to the nearest 10 %.

(d) Above 1000 % to the nearest 20 %.

## 10. Precision and Bias

10.1 *Precision*—Test data on precision is not presented due to the nature of the soil materials tested by this test method. It is either not feasible or too costly at this time to have ten or more laboratories participate in a round-robin testing program.

10.1.1 The Subcommittee D 18.06 is seeking any data from the users of this test method that might be used to make a limited statement on precision.

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

## 11. Keywords

11.1 ash content; moisture content; organic soil; peat; % organic matter

## SUMMARY OF CHANGES

In accordance with Committee D18 policy, this section identifies the location of changes to this standard since the last edition (95) that may impact the use of the standard.

(1) Section 1.2—Added second sentence to update SI statement.

(2) Inserted new Section 2 on Referenced Documents and new Section 3 on Terminology. Renumbered subsequent sections as needed.

(3) Inserted new Section 5 on Significance and Use and renumbered subsequent sections as needed.

(4) Renumbered Section 5—Inserted standard Note 1 referencing D 3740 and renumbered following notes as needed.

(5) Inserted new footnotes 2 and 3 for referenced ASTM documents.

(6) Section 6.1—Inserted reference to E 145.

(7) Section 6 Apparatus—Inserted a balance or scale as 6.3 and a rubber sheet, etc. as 6.4.

(8) Changed heading of Section 7 from Preparation of Sample

to Sampling and Test Specimens.

(9) Renumbered section 7.1—Clarified procedures for mixing, subsampling and storing material.

(10) Added Section 8 Procedure and renumbered sections on moisture content, ash content and organic matter to fall under procedure.

(11) Renumbered sections 8.1.1.2 and 8.1.3.2—Deleted “Mix the sample thoroughly and” with “Following the instructions in section 4.1 above.”

(12) Renumbered sections 8.1.1.4, 8.1.3.2, 8.2.1.1, 8.2.1.4, 8.2.2.1, and 8.2.2.3—specified determining the mass to the nearest 0.01 g.

(13) Renumbered section 8.1.3.2—Changed “sample” to “test specimen.”

(14) Updated Precision and Bias statement.

(15) Added Keywords section.

(16) Added Summary of Changes section.

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