

ASTM D 2974-87

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

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These test methods are under the jurisdiction of ASTM Committee D-18 on Soil and Rock and are the direct responsibility of Subcommittee D18.18 on Peats and Related Materials.

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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.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. Summary of Methods

2.1 *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.

2.2 *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.

2.3 *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.

2.4 Organic matter is determined by subtracting percent ash content from 100.

3. Apparatus

3.1 *Oven*, capable of being regulated to a constant temperature of $105 \pm 5^\circ\text{C}$.

NOTE — 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.

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

3.3 *Evaporating Dishes*, of high silica or porcelain of not less than 100 mL capacity.

3.4 *Blender*, high-speed.

3.5 *Aluminum Foil*, heavy-duty.

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

3.7 *Desiccator*.

4. Preparation of Sample

4.1 Place a representative field sample on a square rubber sheet, oil cloth, or equivalent material. Reduce the sample to the quantity required by quartering and place in a moisture-proof container. Work rapidly to prevent moisture loss or perform the operation in a room with a high humidity.

Moisture Content

5. Method A

5.1 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.

5.2 Mix thoroughly the representative sample and place a test specimen of at least 50 g in the container described in 5.1. Crush soft lumps with a spoon or spatula. The thickness of peat in the container should not exceed 3 cm.

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

5.4 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.

6. Method A Calculation

6.1 Calculate the moisture content as follows:

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

where:

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

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

6.1.1 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.

6.2 An alternative calculation is as follows:

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

where:

A = as-received test specimen, g, and

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

6.2.1 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.

6.3 Take care to indicate the calculation method used.

7. Method B

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

7.2 Mix the sample thoroughly and select a 100 to 300 g representative sample. Determine the mass of this sample and spread 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.

7.3 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.

7.4 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:

Equivalent Sample Mass, g = $50.0 \cdot [(50 \times M)/100]$

where:

M = moisture removed in air drying, %.

7.5 Place the sample in a container as described in 5.1 and proceed as in Method A.

8. Method B Calculation

8.1 Calculate the moisture content as follows:

Moisture Content, % = $(50 - B) \times 2$

where:

B = oven-dried sample, g.

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

8.2 An alternative calculation is as follows:

Moisture Content, % = $[(50 - B) \times 100]/B$

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

Ash Content

9. Method C

9.1 Determine the mass of a covered high-silica or porcelain dish.



A muffle furnace, used for organic matter analysis.

9.2 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.

9.3 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).

9.4 Cover with the retained aluminum foil cover, cool in a desiccator, and determine the mass.

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

10. Method D

10.1 Determine the mass of a covered high-silica or porcelain dish.

10.2 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.

10.3 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).

10.4 Cover with the retained aluminum foil cover, cool in a desiccator, and determine the mass.

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

11. Calculation for Methods C and D

11.1 Calculate the ash content as follows:

Ash Content, % = $(C \times 100)/B$

where:

C = ash, g, and

B = oven-dried test specimen, g.

Organic Matter

12. Calculation

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

Organic matter, % = $100.0 - D$

where:

D = ash content, %.

13. Report

13.1 Report the following information:

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

13.1.2 Furnace temperature used for ash content determinations.

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

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

13.1.3.2 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%.

14. Precision and Bias

14.1 The precision and bias of these test methods have not been determined. Data are being sought for use in developing a precision and bias statement.

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ASTM C-88-90

Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

ASTM C-131-89

Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM procedures C-88-90 and C-131-89 are special situation tests that rarely will be required, and have not been published here. They are available from the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.