Designation: ~~D2974 – 14~~ D2974 – 20

Standard Test Methods for ~~Moisture, Ash, and Organic Matter~~Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils[1]

This standard is issued under the fixed designation D2974; 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 These test methods cover the measurement of water (moisture) content, ash content, and organic material in peats and other organic soils, such as organic clays, silts, and mucks. Test Method D2216 provides for determining the water (moisture) content in mineral soils and rock.

1.2 This standard has two different ways to determine the water content of the specimen prior to determining the ash content based on the application for which the peat or organic soil is being used. For general classification of peat/organic soils not being used for fuel, the water content is determined using oven drying. For peat/organic soils being used as a fuel, the water content is determined first by air drying followed by oven drying.

1.3 ~~These test methods cover the measurement of moisture~~ There are two Methods, A and B, for determining the ash content and organic material of peat or organic soils. For general classification purposes, Method A is used to determine the water content, ash content, and organic ~~matter in peats and other organic soils, such as organic clays, silts, and mucks. Test~~ material. When the peat is being used as a fuel, Method ~~D2216 provides an alternative method for determining moisture content in mineral soils and rock.~~B is used to determine the water content, ash content and organic material.

~~1.1.1 *Test Method A*—Moisture is determined by drying peat or organic sample at 110 ± 5°C.~~

~~1.1.2 *Test Method B*—Alternative moisture method which removes the total moisture in two steps: (*1*) evaporation of moisture at room temperature, (*2*) subsequent oven drying of air dried sample at 110 ± 5°C. This method is used when the peat is to be used as fuel.~~

1.3.1 ~~*Test Method C—A*—Ash content of a~~ The ash content and organic material of peat or organic ~~soil sample, for general purposes,~~ soils is determined by igniting ~~oven dried sample from moisture~~ the oven-dried specimen as obtained from the water content determination in a furnace at 440 ± 40°C. This method is used for general purposes and should not be used when the peat or organic soils are being used or evaluated for use as a fuel.

1.3.2 ~~*Test Method D—B*—Ash content of a~~ The ash content and organic material of peat or organic ~~soil sample, for materials used for fuel,~~ soils is determined by igniting ~~oven dried sample from moisture~~ the air-dried then oven-dried specimen obtained from the water content determination in a furnace at 750 ± 38°C. This method is used when the peat or organic soil is being used as or evaluated for use as a fuel.

~~1.2 Test Method A should be used for general classification, except for use of the peat as a fuel. Test Method B should be used when peats are being evaluated for use as a fuel~~

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

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

1.5.1 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 ~~beyone~~beyond the scope of this standard to consider significant digits used in analysis methods for engineering design.

[1] 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~~ Media for Plant Growth.

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

1.6 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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

D2216 Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

~~D2944 Practice of Sampling 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

D4427 Classification of Peat Samples by Laboratory Testing

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

~~E145 Specification for Gravity-Convection and Forced-Ventilation Ovens~~

3. Terminology

3.1 *Definitions:*

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

4. Summary of Test Methods

~~4.1 *Test Method A*—Moisture is determined by drying a peat or organic soil sample at 110 ± 5°C. The moisture content is expressed as a percent of the oven dry mass.~~

4.1 ~~*Test Method B*—~~*A*—~~This is an alternative moisture method which removes the total moisture in two steps: (~~A peat or organic soil sample is reduced by quartering to obtain a 50.00 ±10 g test specimen. A water content determination is made by drying the test specimen in a 110°C ±~~1) evaporation of moisture in air at room temperature (air-drying), and (~~ 5°C oven. The loss of mass due to drying is considered to be water. After oven drying, the test specimen is placed in a furnace that is then gradually brought up to a temperature of 440 ± 10°C. The specimen remains in the furnace until it is completely ashed. Then it is removed and placed in a desiccator to cool to room temperature before determining its~~2) the subsequent oven drying of the air-dried sample at 110 ± 5°C.~~ mass. The substance remaining after ignition is the ash. The water content, ash content and amount of organic material is then calculated. This method is used ~~when the peat is to be used as fuel. The moisture content is expressed as both a percent of the oven dry mass and of the as received mass.~~for general purposes/classification of peats and organic soils and must not be used for peat or organic soil being used or evaluated for use as a fuel.

4.2 ~~*Test Methods C and D*—~~*Method B*—~~Ash content of a~~ A peat or organic soil sample is ~~determined by igniting the oven-dried sample from the moisture content determination in a furnace at 440 ± 40°C (Test Method C) or 750 ± 38°C (Test Method D). The~~ reduced by quartering to obtain a 100.0 to 300.00 g test specimen. A water content determination is made by first air drying the test specimen, then taking 50.00 ± 10 g of air-dried peat/organic soil and then oven drying it in a 110°C ± 5°C oven. After oven drying, the test specimen is placed in a furnace that is then gradually brought up to a temperature of 750°C ± 38°C. The specimen remains in the furnace until it is completely ashed. Then it is removed and placed in a desiccator to cool to room temperature before determining its mass. The substance remaining after ignition is the ash. The water content, ash content ~~is expressed as a percentage of the mass of the oven-dried sample.~~and amount of organic material is then calculated. This method is used when the peat or organic soil is to be used as fuel.

~~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.~~standard is used in various industries including, but not limited to, agriculture, forestry, energy, horticulture, and geotechnical. Over the years, the use of peat as a fuel has been on the decline for numerous reasons, however it is still being used as a fuel in some parts of the world. Peat typically has high a water content, thus when being used as a fuel, the peat must first be air dried in order to reduce

[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.

the water content. When the peat it too wet, it doesn't burn well and much heat is wasted in unnecessary conversion of water to steam and more smoke/soot is created, which can coat a chimney and pose a danger to the end user.

5.2 The ash content and percent organic ~~matter is~~material are important in the following: (*1*) classifying peat or other organic soil, (*2*) geotechnical and general classification purposes, and (*3*) when peats are being evaluated as a fuel. The ash content is one of several parameters used to classify peat as detailed in Classification D4427.

~~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.~~

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6. Apparatus

~~6.1 *Oven,* meeting the requirements of E145 and capable of being regulated to a constant temperature of 110 ± 5°C.~~

6.1 *Drying Oven*—~~The~~ Vented, thermostatically controlled oven capable of maintaining a uniform temperature of 110 ± 5°C ~~is quite critical for organic soils. The oven~~ throughout the drying chamber. The oven shall not have any "hot spots" that could ignite the specimen. The uniformity of the oven's temperature shall be verified annually and the temperature should be checked ~~for "hot spots" to avoid possible ignition of~~or monitored as detailed in Test Method D2216 ~~the specimen.~~(Note 2).

NOTE 2—The temperature of the drying oven is very important for organic soils. Hot spots in the oven could ignite the specimen. Care should be taken when monitoring the oven's temperature and placement of the specimens within the oven to avoid possible ignition.

6.2 *Thermometric Device*—A thermometric device(s) capable of measuring the temperature of the drying oven and the furnace readable to 1°C or better and having an accuracy of at least ±1°C.

6.3 ~~*Furnace,*~~ *Furnace*—An ignition oven or furnace capable of producing constant temperatures of 440 ± 40°C and 750 ± 38°C.

6.4 *Balance or Scale,* ~~a balance or scale for determining the mass of the soil having a minimum capacity of 500 g and meeting the~~ Balances/Scales shall conform to the requirements of Guide D4753 ~~for a balance or scale of 0.01 g readability.~~. The balance/scale must have a minimum capacity of 500 g and have a readability without estimation of of 0.01 g.

6.5 ~~*Rubber Sheet, Oil Cloth,*~~ *Non-Absorbent Surface*—A rubber sheet, oil cloth, or other similar non-absorbent ~~material.~~material/surface.

6.6 ~~*Evaporating Dishes,*~~ *Container*—~~ of high silica or porcelain of not less than 100-mL capacity.~~A porcelain or high-silica crucible, container, or dish having a capacity of 100 mL or more is acceptable provided its mass does not change under the ignition condition. The container must have a cover. A lid is recommended, however heavy duty aluminum foil is acceptable for use as a cover.

6.7 ~~*Aluminum Foil,*~~ *Large Pan*—~~ heavy-duty.~~A 330 by 230 mm or larger flat pan or tray.

6.8 ~~*Porcelain Pan, Spoons,*~~ *Desiccator*—~~ and equipment of the like.~~A desiccant containing device of suitable size used to prevent moisture gain during cooling of the oven-dried specimen.

6.9 ~~*Desiccator.*~~ *Miscellaneous Items*—Items such as, water-proof containers, spoons, spatulas are useful.

7. Sampling and Test Specimens

7.1 These test methods do not address, in any detail, procurement of the sample. It is assumed the sample is obtained using appropriate methods and is representative of the peat or organic soil under evaluation.

7.2 ~~Place a representative field~~ Work rapidly to prevent changes in water content or perform the sample and specimen preparation in an environment where the humidity is high (>50 %). Place the sample on a ~~rubber sheet, oil cloth, or equivalent material~~non-absorbent surface, such as a rubber sheet or oil cloth and mix thoroughly. Use quartering to obtain a representative sample that will yield 300 g or more. Put any unused sample in a tightly-sealed, labeled, waterproof container.

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

7.3 ~~Place the test specimen and the remaining~~ Reduce the representative sample to obtain the test specimen by quartering. The mass of the test specimen for Method A is 50.00 ± 10 g and for Method B is 100.00 to 300.00 g. Then immediately, place the test specimen and the unused representative sample in separate tightly-sealed, labeled, 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:*~~ *Method A (General Classification):*