Designation: D7367/D7367M – 22

Standard Test Method for Determining Water Holding Capacity of Fiber Mulches for Hydraulic Planting[1]

This standard is issued under the fixed designation D7367/D7367M; 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 quantitative test method determines the water holding capacity of fiber mulches, including wood, paper, and agriculturally derived and blended fiber mulches that are used for hydraulic seeding and planting. Results from this testing can be used as a quality assurance and/or quality control data for manufacturing processes.

1.2 There are no known limitations to this test method.

1.3 *Units*—The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard. Reporting of test results in units other than inch-pound shall not be regarded as nonconformance with this standard. The amount of test water is presented in mL and no other unit of measurement is given.

1.3.1 The gravitational system of inch-pound units is used when dealing with inch-pound units. In the system, the pound (lbf) represents a unit of force (weight), while the units for mass is slugs. The slug unit is not given, unless dynamic (F = ma) calculations are involved. This standard includes the gravitational system of inch-pound units and does not use/present the slug unit of mass.

1.3.2 The slug unit of mass is typically not used in commercial practice; that is, density, balances, and so on. Therefore, the standard unit for mass in this standard is either kilogram (kg) or gram (g), or both.

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

1.4.1 The procedures used to specify how data are collected/recorded or calculated in the 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 data.

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

1.6 *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

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

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 and Data Records in Geotechnical Data

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 *Definitions*—For definitions of common technical terms used in this standard, refer to Terminology D653.

[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.25 on Erosion and Sediment Control Technology.

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[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.

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

4. Summary of Test Method

4.1 A representative sample of a fiber mulch is taken from a packaged bale or bag. The representative sample is thoroughly mixed to obtain 3 test specimens. The test specimens are allowed to condition for 24 h. Then, the mass of each test specimen is determined as is the mass of a sieve and a sieve pan. Test water is then added to the test specimen and mixed. The test water and fiber is then poured over a sieve and evenly distributed. The sieve is then placed in bowl to allow the fiber mulch to saturate. After saturation, the sieve is allowed to drain and the sieve and pan are dried off before the mass of the sieve plus sieve pan plus saturated fiber mulch is determined. This process is repeated for the other 2 test specimens. The water holding capacity is expressed as a percentage of increased mass after saturation.

5. Significance and Use

5.1 The meaning of the test is related to the manufacturing quality assurance and quality control and end use of the material, to determine characteristics of products. The water holding capacity of hydraulically applied mulches for hydraulic planting correlates directly with enhanced slurry and spray patterns by providing better soil/slurry binding ability, mixing ability in a tank, and rate of seed germination.

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.

6. Apparatus

6.1 *Sieves*—A No. 8 [2.36 mm] full height (2 in. [50 mm]) sieve and full height pan both having a diameter of 8 in. [203 mm] and conforming to Specification E11.

6.2 *Thermometric Device*—A thermometric device capable of measuring the temperature range within which the test is being performed readable to 1°F/°C or better and having an accuracy of at least ±0.5°F/°C.

6.3 *Mixing Bowl*—A large metal or glass mixing bowl having a capacity of 6 ± 1 qt [5.5 L ± 0.5 L] for use with the mixer.

6.4 *Balance*—Balances shall conform to the requirements of Guide D4753. The balance shall have readability without estimation of 0.01 g. The capacity of this balance will need to exceed the mass of the sieve plus sieve pan and saturated fiber. In general, a balance with a minimum capacity of 1,500 g is sufficient.

6.5 *Pan/Tray*—An 11 by 18 in. [460 mm by 280 mm] or larger baking pan or tray.

6.6 *Mixer*—A device capable of producing a speed between 60 and 90 rpm and having a dough kneader attachment. A stand mixer with a low setting typically meets this requirement.

6.7 *Hygrometer*—A device capable of measuring the humidity within which the test is being performed readable to 1 % or better.

6.8 *Miscellaneous*—Items such as a large bowl, spoons, spatulas, paper towels, and a squirt/water bottle may be useful.

7. Reagents

7.1 *Test Water*—Distilled or demineralized water is the only permissible test fluid. The use of tap water is not permitted.

8. Sampling and Testing Specimens

8.1 Obtain the sample from an undamaged packaged bale or bag that has no visible signs of tears or openings in the packaging. If the packaging of the bale or bag is torn, do not use the bale for testing.

8.2 Cut open the bale or bag and select 30 g from each the top, middle, and bottom ⅓ of the bale for a total of 90 g. Heterogeneous blends should be mixed at the same ratio by mass per manufacturer's specifications to equal 30 g. Place the fibers in a large mixing bowl and gently break the compressed fibers apart with your thumb and fingers. Mix thoroughly to make sure the sample is representative.

8.3 Allow the fibers to condition at a temperature of 75 ± 4°F [24°C ± 2°C] with a relative humidity of 50 % ± 10 % RH for at least 24 h. At the same time, allow the test water to equilibrate to this same temperature.

8.4 Determine and record the humidity to the nearest 1 % and the temperature of the fibers and test water to the nearest 1°F/°C. After conditioning, obtain 3 representative test specimens each having a mass of 15.0 ± 0.1 g.

9. Procedure

9.1 Determine and record the mass of one of the test specimens, M_{ts}, to the nearest 0.01 g. Place the test specimen in the large mixing bowl and add 300 mL of test water. Attach the dough kneader to the mixer and make sure the mixer is set on the low setting (60 to 90 rpm) to reduce damage to the fibers. Using the mixer, blend the fiber and test water for 5 min.

9.2 Assemble the sieve stack by placing the sieve on top of the sieve pan. Determine and record the mass of the sieve plus sieve pan, Y, to the nearest 0.01 g.

9.3 Detach dough kneader attachment and rinse over mixing bowl using up to 100 mL of test water.

9.4 Pour the contents of the mixing bowl over the sieve stack.

9.5 Rinse the mixing bowl using up to 300 mL of test water to remove any remaining fibers

9.6 Using a spoon, distribute fibers evenly across the sieve screen surface.

9.7 Carefully separate the sieve and the sieve pan. Place the sieve in a large bowl containing enough test water to saturate the specimen without overflowing the sieve. Pour the fiber and water mixture that collected in the sieve pan onto the sieve.

9.8 Soak the specimen for 30 min to saturate the specimen.

9.9 Dry the sieve pan with a paper towel, making sure the inside is dry. Place the dry sieve pan inside a baking pan/tray.

9.10 After soaking, slowly remove the sieve of saturated fiber from the bowl keeping the sieve level so as to not break the surface tension.

9.11 Place the edge of the sieve on the outside edge of the sieve pan to create a 45° angle that does not allow test water to go into the pan, but does break the surface tension and allows the test water to drain from the sieve into the baking pan/tray. Drain the sieve for 3 min.

9.12 Using a paper towel(s), dry the sieve and sieve pan. Remove any excess test water from the outside of both the sieve and sieve pan, the bottom of the sieve pan, and the skirt of the sieve. Once dried off, put the sieve on top of the sieve pan and determine and record the mass of the sieve plus sieve pan and saturated fiber, *K*, to the nearest 0.01 g.

9.13 Repeat the steps in 9.1 through 9.12 for the 2 other test specimens.

10. Calculations

10.1 Calculate the mass of the sieve plus sieve pan and conditioned fiber, *X*, for each of the test specimens using the following equation:

$$X = Y + M_{ts} \quad (1)$$

where:

X = mass of sieve plus sieve pan and conditioned fiber, nearest 0.01 g,
Y = mass of sieve plus sieve pan, and
M_{ts} = mass of test specimen.

10.2 Calculate the water holding capacity, *WHC*, for each of the test specimens using the following equation:

$$WHC = \frac{(K - X)}{(X - Y)} \times 100 \quad (2)$$

where:

WHC = water holding capacity, nearest 1 %
K = mass of sieve plus sieve pan and saturated fiber.

10.3 Calculate the average *WHC* of the three specimens to the nearest 1 % and the standard deviation to two significant digits.

11. Report: Test Data Sheet(s)/Form(s)

11.1 The methodology used to specify how data are recorded on the test data sheet(s)/form(s), as given below, is covered in 1.4 and in Practice D6026.

11.2 Record as a minimum the following general information (data):

11.2.1 Identification of the fiber mulch being evaluated, such as project identification, type of mulch, and mulch manufacturer.

11.2.2 Name(s) or initials of person(s) performing the test and date(s).

11.2.3 Any problems or issues encountered during testing.

11.3 Record as a minimum the following test specimen data:

11.3.1 The temperature of the fibers and test water and the humidity.

11.3.2 The masses of the test specimens, M_{ts}.

11.3.3 The mixing, soaking, and draining times to the nearest 0.5 min.

11.3.4 Values of masses for *X*, *Y*, and *K*.

11.3.5 The water holding capacity, *WHC*, for each test specimen, the average WHC, and standard deviation.

12. Precision and Bias

12.1 *Precision*—The precision of the procedure of this test method is being evaluated.

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

13. Keywords

13.1 fiber mulch; hydraulic planting; water holding capacity

SUMMARY OF CHANGES

Committee D18 has identified the location of selected changes to this standard since the last issue (D7367–19$^{\varepsilon 2}$) that may impact the use of this standard. (June 1, 2022)

(1) Changed to dual units and updated values throughout to be consistent with this change.