Designation: D1576 – 13

Standard Test Method for Moisture in Wool by Oven-Drying[1]

This standard is issued under the fixed designation D1576; 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 test method covers the determination of the amount of moisture present in ordinary commercial and industrial samples of wool in all forms except grease wool, using the oven-drying technique.

1.2 Formulas for calculating the moisture content (as-received basis) and moisture regain (oven-dried basis) are given. It is always important to use the correct term which corresponds to the basis used in the calculation (see 12.2.1).

NOTE 1—The determination of moisture content for textile materials in general is covered in Test Methods D2654, and an optimal method for determining the moisture in wool by distillation with toluene is covered in Test Method D2462. A method for sampling wool for the determination of moisture in wool is covered in Practice D2525. The oven-drying method has been adapted for cotton in Test Method D2495.

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:*[2]

D123 Terminology Relating to Textiles
D1060 Practice for Core Sampling of Raw Wool in Packages for Determination of Percentage of Clean Wool Fiber Present
D1776 Practice for Conditioning and Testing Textiles
D2258 Practice for Sampling Yarn for Testing
D2462 Test Method for Moisture in Wool by Distillation With Toluene
D2495 Test Method for Moisture in Cotton by Oven-Drying
D2525 Practice for Sampling Wool for Moisture
D2654 Test Method for Moisture in Textiles (Withdrawn 1998)[3]
D3333 Practice for Sampling Manufactured Staple Fibers, Sliver, or Tow for Testing
D4845 Terminology Relating to Wool

3. Terminology

3.1 For all terminology related to D13.13, Wool and Felt, see Terminology D4845.

3.1.1 The following terms are relevant to this standard: grease wool, moisture content, moisture-free, moisture regain, oven-dried, pulled wool, raw wool, recycled wool, scoured wool, virgin wool, wool, wool, *as defined in the Wool Products Labeling Act of 1939*.

3.2 For definitions of all other textile terms see Terminology D123.

4. Summary of Test Method

4.1 A specimen of wool material is weighed and then dried to constant mass at 105 ± 2°C in an oven supplied with ambient air. The loss in mass is considered moisture and reported as either moisture content or moisture regain. Directions are given for the adjustment of the observed results for any change in the moisture content after sampling and before drying.

5. Significance and Use

5.1 Test Method D2462 for the determination of the moisture in wool by distillation with toluene is the preferred method for testing wool for moisture for the acceptance testing of commercial shipments. If, however, the purchaser and the supplier agree, Test Method D1576 for the determination of the moisture in wool by oven drying may be used instead. Comparative tests as directed in 5.1.1, may be advisable.

5.1.1 In case of a dispute arising from differences in reported test results when using Test Method D1576 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of

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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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

bias. As a minimum, the two parties should take a group of test specimens which are as homogeneous as possible and which are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in the light of the known bias.

5.2 This test method is a simple and convenient method for routine process control, in-plant evaluation, estimation of moisture content of a lot of wool, or any other purpose for which a high degree of reproducibility is not necessary (see Section 13).

6. Apparatus

6.1 *Oven,* ventilated and thermostatically controlled in the temperature range of 105 ± 2°C throughout the enclosure. The oven may be of either the forced draft or the convection type.

6.2 *Weighing Containers,* of perforated metal if weighing is to be performed in the drying enclosure; or containers that can be hermetically sealed (such as glass weighing bottles) if the specimen is to be cooled in a desiccator before weighing in the ambient atmosphere.

6.3 *Sampling Containers,* capable of being sealed. Mason jars have been found to be satisfactory where the sample size is not too great. For larger samples, bags of various plastic materials may be suitable if the wall thickness is sufficient to provide a good moisture vapor barrier (at least 4 mil (approximately 0.1 mm) for polyethylene, for example).

6.4 *Balance,* having a capacity adequate for weighing specimens and containers, and a sensitivity of 0.005 g.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping containers directed in applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D2525 for bales of fiber and containers of top or sliver or to use Practice D2258 for beams or cases of yarn. Consider shipping containers to be the primary sampling unit.

NOTE 2—An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between shipping containers, between laboratory sampling units within a shipping container, and test specimens within a laboratory sampling unit to produce a sample plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.2 Use extreme care to prevent gain or loss of moisture during the sampling operation and the transfer of material to the sampling container. Weigh each portion of the sample and its container immediately after sampling. Subtract the tare mass of the container to obtain the net mass at time of sampling, M.

7.3 *Laboratory Sample*—As a laboratory sample for acceptance testing, proceed as follows:

7.3.1 For wool fiber, take laboratory samples as directed in Practice D1060 for cored samples or Practice D3333 for hand samples.

7.3.2 For wool sliver or top, from each shipping container in the lot sample, take one ball of top. From this ball of top, take approximately 2 m from the inside and 4 m from the outside of the ball.

7.3.3 Take laboratory sampling units which weigh a minimum of 50 g. Follow the instructions in Practice D2525 for reduction of the laboratory samples to specimens.

NOTE 3—Condition the laboratory samples as directed in Section 9 before preparing the specimens from them.

8. Number of Specimens

8.1 Take a number of specimens per laboratory sampling unit that the user can expect at the 95 % probability level that the test result for a laboratory sampling unit will be no more than 0.5 percentage points above or below the true average for the laboratory sampling unit. Determine the number of specimens per laboratory sampling unit as follows:

8.1.1 *Reliable estimate of s*—when there is a reliable estimate of *s* based upon extensive past records in the user's laboratory as directed in the test method, calculate the required number of specimens per laboratory sampling unit using Eq 1:

$$n = (ts/E)2 \quad (1)$$

where:

n = number of specimens per laboratory sampling unit (rounded upward to a whole number),
s = reliable estimate of the standard deviation of individual observations on similar materials in the user's laboratory under conditions of single operator precision,
t = the value of Student's t for two-sided limits, a 95 % probability level, and the degrees of freedom associated with the estimate of v, and
E = 0.5 percentage points, the allowable variation.

8.1.2 *No Reliable Estimate of s*—When there is no reliable estimate of *s* for the user's laboratory, do not use Eq 1 directly. Instead, specify the fixed number of six specimens per laboratory sampling unit. This number of specimens per laboratory sampling unit is calculated using $s = 0.60$ percentage points which is a somewhat larger value of *s* than is usually found in practice. When a reliable estimate of *s* for the user's laboratory becomes available, Eq 1 will usually require fewer than six specimens per laboratory sampling unit.

9. Conditioning

9.1 Condition the lot sample (or laboratory sample(s)) by exposure to moving air in the laboratory atmosphere in which the testing is to be done, until equilibrium for testing is achieved.

NOTE 4—Preconditioning and conditioning as directed in Practice D1776 is acceptable but not necessary, since the object of the conditioning for the purpose of this test is merely to stabilize the sample, that is, to bring all parts of the sample to moisture equilibrium with the prevailing atmosphere in order that changes in moisture level will not occur while the specimens are being prepared and weighed.