



Designation: D2462 – 22

Standard Test Method for Moisture in Wool by Distillation With Toluene¹

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1. Scope

1.1 This test method covers the determination of the amount of moisture present in grease wool, scoured wool, carded wool, garnetted wool, wool top and intermediate wool products, and rovings, by distillation with toluene.

1.2 Equations are given for calculating the amount of water present as moisture content (as-received basis) and moisture regain (dry fiber) basis. The term that corresponds to the basis used in the calculation and report must always be stated.

1.3 This test method is not applicable to material known to contain any steam-distillable, water-soluble matter. If it is suspected that such matter is present, the method should be used with caution.

1.4 Xylene or other solvents should not be substituted for toluene as no other solvents have been evaluated for use in this standard.

NOTE 1—The determination of moisture in wool by oven-drying is covered in Test Method D1576 and for textile materials in general in Test Methods D2654. A method for sampling wool for the determination of moisture in wool is covered in Practice D2525.

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.* For specific safety hazard statements, see Section 8.

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.*

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.13 on Wool and Felt.

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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

D1576 Test Method for Moisture in Wool by Oven-Drying

D1776 Practice for Conditioning and Testing Textiles

D2258 Practice for Sampling Yarn for Testing

D2525 Practice for Sampling Wool for Moisture

D2654 Test Methods for Moisture in Textiles

D3333 Practice for Sampling Manufactured Staple Fibers, Sliver, or Tow for Testing

D4845 Terminology Relating to Wool

E123 Specification for Apparatus for Determination of Water by Distillation

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, as defined in the Wool Products Labeling Act as amended in 1980, 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 sample or specimen of wool or material made of wool is weighed, then stabilized in the laboratory atmosphere in which the specimen is prepared, and reweighed. Any resulting change in mass is used to calculate the original moisture content of the sample or specimen from the results observed on the stabilized specimen.

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.

4.2 The specimen is immersed in water-saturated toluene which is then heated, the distilled water vapor and solvent vapor are condensed and collected in a graduated trap, wherein the water separates and settles to the bottom. After cooling in a water bath to achieve a specified temperature, the volume of water collected in the trap is read from the graduated trap and converted to its equivalent weight.

4.3 Results are calculated as percent moisture content or percent moisture regain using the appropriate equation.

5. Significance and Use

5.1 Test Method D2462 for testing for moisture in wool is considered satisfactory for acceptance testing of commercial shipments since current estimates of between-laboratory precision are acceptable.

5.1.1 In case of a dispute arising from differences in reported test results when using Test Method D2462 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative testing to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of the bias. As a minimum, the two parties should take a group of test specimens that are as homogenous as possible and that are from a lot of the type material in question. The test specimens should be 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 acceptance probability level chosen by the two parties before the test 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 light of the known bias.

5.2 This test method is the preferred method for all suitable samples of wool where it is important to obtain a result free from the possible biases, introduced by the conditions discussed in 5.3 and 5.4.

5.3 This test method is free from the interferences caused by different conditions of ambient atmosphere such as might affect the results of oven-drying. A slight amount of residual moisture may be retained in a specimen subjected to oven-drying because of the relative humidity of the ambient air; however, the amount of moisture retained may be estimated from published data.³

5.4 This test method is free from the interference caused by nonaqueous volatile material. Such material, when present, is erroneously measured as moisture by oven-drying methods, the extent of the error depending upon the amount and characteristics of any added oils or finishes.

5.5 This test method is relatively cumbersome, time consuming, and costly compared to oven-drying, and is not recommended for routine process control, in-plant evaluations, or for other purposes where a high degree of accuracy is not necessary. The cost of operation can be reduced somewhat by redistilling the used toluene, which is then suitable for reuse without further treatment.

5.6 Unlike an oven-drying method, any moisture gained or lost by a specimen after its mass has been determined will appear as a direct error in the final result. Since one of the principal uses of the method is to determine the average moisture present in large lots of wool or wool products exposed to variable atmospheric conditions, numerous laboratory samples and test specimens are common. To avoid errors of the type mentioned above, this procedure includes provisions for stabilizing the sample(s) in the laboratory atmosphere so that, during the time necessary for selecting, weighing, and transferring the specimens to flasks, gain or loss of moisture which cannot be accounted for will be minimized. A further advantage of the stabilizing process is realized in cases where the interest is solely in the average moisture content of the sample, and the actual moisture content within the sample is highly variable. By stabilizing the sample before selecting the specimens, equal precision can be achieved with fewer specimens.

6. Apparatus

6.1 *Flask, Erlenmeyer*, wide-mouth, 1000 cm³ (mL) capacity (takes a No. 11 stopper).⁴

6.2 *Distilling Receiver, Dean & Stark*, 10 cm³ (mL) capacity, graduated in 0.1 cm³ (mL).⁵

NOTE 2—The tolerance on the accuracy of the graduations specified in Specification E123 for this apparatus is ± 0.1 cm³. If greater accuracy is required for a test result, the graduated trap(s) used should be calibrated.

NOTE 3—Illustrations of acceptable forms of the glass apparatus required by this method appear in Specification E123.

6.3 *Condenser, Liebig*, sealed, with 500 mm jacket.

6.4 *Balance*, capacity of at least 500 g with a sensitivity of 0.05 g.

6.5 *Heater*, for distillation apparatus, electrical with variable heat control, and arranged so that the surface of the flask above the lowest solution level is not heated by direct radiation.

6.6 *Water Bath*, with thermostatic controls, maintained at a temperature of 21 °C \pm 2 °C.

6.7 *Sample Containers*—Moisture-tight mason jars have been found to be satisfactory where the sample size is not too great (up to 200 g for example). For larger samples, bags of various plastic materials are suitable if the wall thickness is sufficient to provide a good moisture vapor barrier. For example, for polyethylene, a wall thickness of at least 4 mils (approximately 0.1 mm) has been found to be adequate.

7. Reagent

7.1 *Toluene, Water-Saturated*, prepared from toluene having a boiling range such that all distills within a range of 2 °C including 110.6 °C. Prepare a sufficient quantity of water-saturated solution of toluene for the testing program immediately at hand as follows: To each 1000 cm³ (mL) of toluene, add 50 cm³ to 100 cm³ (mL) of distilled water. Shake for about 5 min and allow to settle. Decant the toluene to a flask and

³ Toner, R. K., Bowen, C. F., and Whitwell, J. C., "Equilibrium Moisture Relations for Textile Fibers," *Textile Research Journal*, 17, January 1947, 17–18.

⁴ Corning No. 5100 or equivalent is suitable.

⁵ Corning No. 3600 or equivalent is suitable.