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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D2654 Test Method for Moisture in Textiles (Withdrawn 1998)[3]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 *Definitions:*~~

~~3.1.1 *grease wool, n*—wool taken from the living sheep and which has not been commercially scoured.~~

~~3.1.2 *moisture content, n*—the amount of moisture in a material determined under prescribed conditions and expressed as a percentage of the mass of the moist material, that is, the original mass comprising the oven-dried substance plus any moisture present.~~

[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] 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.

~~3.1.2.1 *Discussion*—~~

~~The term "mass" is the correct designation for the property commonly designated as "weight."~~

~~A slight amount of residual moisture may not be removed from a specimen subjected to oven drying because of the relative humidity of the ambient air. The amount of moisture retained by a specimen may be estimated from published data.[4]~~

There may also be a slight additional loss in mass caused by the evaporation of volatile material other than water, the amount depending on the characteristics of any added oils or emulsions.

3.1.3 *moisture-free, adj*—the condition of a material that has been exposed in an atmosphere of desiccated air until there is no further significant change in its mass (see 3.1.2).

3.1.3.1 *Discussion*—

Heating the material and the desiccated air to temperatures as high as 110°C increases the rate of moisture loss but does not change the final equilibrium mass of the moisture-free material.

3.1.4 *moisture regain, n*—the amount of moisture in a material determined under prescribed conditions and expressed as a percentage of the mass of the moisture-free material (see moisture content).

3.1.4.1 *Discussion*—

In this test method, the material is considered to be oven-dried after drying as described in Section 10.

3.1.5 *oven-dried, adj*—the condition of a material that has been heated under prescribed conditions of temperature and humidity until there is no further significant change in its mass (see 3.1.2).

3.1.5.1 *Discussion*—

An oven-dried material will retain a small amount of moisture which is dependent on the temperature and relative humidity of the atmosphere in contact with the material during the drying process. An oven-dried material will only be moisture-free when the air supplied to the drying oven has been previously desiccated.

3.1.6 *pulled wool, n*—wool taken from the pelt of a slaughtered sheep and which has not been commercially scoured. (syn. *slipe wool*,*skin wool*).

3.1.7 *raw wool, n*—wool or hair of the sheep in the grease, pulled, or scoured state. (See also *scoured wool*.)

3.1.8 *recycled wool, n—as defined in the Wool Products Labeling Act as amended in 1980*, "the resulting fiber when wool has been woven or felted into a wool product which, without ever having been utilized in any way by the ultimate consumer, subsequently has been made into a fibrous state, or the resulting fiber when wool or reprocessed wool has been spun, woven, knitted, or felted into a wool product which, after having been used in any way by the ultimate consumer, subsequently has been made into a fibrous state."

3.1.8.1 *Discussion*—

In the amended Act of 1980, the term" recycled wool" replaced the terms "reprocessed wool" and" reused wool."

3.1.9 *scoured wool, n*—wool from which the bulk of impurities has been removed by an aqueous or solvent washing process.

3.1.9.1 *Discussion*—

Although it is no longer in its original raw state, scoured wool is generally accepted as raw wool.

3.1.10 *virgin wool, n— as defined in the Wool Products Labeling Act*, "the terms 'virgin' or 'new' as descriptive of a wool product, or any fiber or part thereof, shall not be used when the product or part so described is not composed wholly of new or virgin fiber which has never been reclaimed from any spun, woven, knitted, felted, braided, bonded, or otherwise manufactured or used product".

3.1.11 *wool, n*—the fibrous covering of the sheep, *Ovis* species.

3.1.11.1 *Discussion*—

For the purposes of this method, the word *wool* is used in the generic sense, and includes both *wool* as defined in the Wool Products Labeling Act of 1939 as well as recycled wool as defined in the amended Act of 1980.

3.1.12 *wool, n—as defined in the Wool Products Labeling Act of 1939*, "the fiber from the fleece of the sheep or lamb, or hair of the Angora goat or Cashmere goat (and may include the so called specialty fibers from the hair of the camel, alpaca, llama, and vicuna) which has never been reclaimed from any woven or felted wool product".

3.1.13 For the definition of other textile terms used in this method, refer to Terminology D123.

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 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.