Designation: D519 – 04 (Reapproved 2013)

Standard Test Method for Length of Fiber in Wool Top[1]

This standard is issued under the fixed designation D519; 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 measurement of the average length and length distribution of fibers in wool top, on a mass-biased basis. The method is applicable to all types of fibers in sliver formed from long parallelized fibers.

NOTE 1—The determination of fiber length of wool is covered in Test Method D1575, Test Method for Fiber Length of Wool in Scoured Wool and in Card Sliver, the staple length of grease wool is covered in Test Method D1234, Test Method of Sampling and Testing Staple Length of Grease Wool.

NOTE 2—This test method specifically requires length in inches and mass in SI units and is not contrary to ASTM policy. The SI units in parentheses are provided for information only.

1.2 *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

D1234 Test Method of Sampling and Testing Staple Length of Grease Wool

D1575 Test Method for Fiber Length of Wool in Scoured Wool and in Card Sliver

D1776 Practice for Conditioning and Testing Textiles

D4845 Terminology Relating to Wool

3. Terminology

3.1 *Definitions*—For definition of textile terms used in this test method refer to Terminology D4845.

3.1.1 For definitions of other textile terms used in this test method, refer to Terminology D123.

4. Summary of Test Method

4.1 The weight (mass) of fibers, in definite length increments, is determined for each specimen or group of specimens forming one sample. From the data obtained, the weight-biased average fiber length and the weight-biased distribution is calculated. A cumulative weight average length frequency curve may be plotted.

5. Significance and Use

5.1 Knowledge of the average fiber length and the distribution of fibers is of primary importance to users of top in further processing.

5.2 Acceptance specifications for the fiber length and length distribution may be established by the user based on the type of yarn-making equipment employed and the desired end uses.

5.3 Test Method D519 for testing wool top for fiber length is considered satisfactory for acceptance testing of commercial shipments since the method has been used extensively in the trade for acceptance testing and the current estimates of the between-laboratory precisions are acceptable.

5.3.1 In case of a dispute arising from differences in reported test results when using this test method 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 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 then 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 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 supplier must agree to interpret future test results in the light of the known bias.

[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

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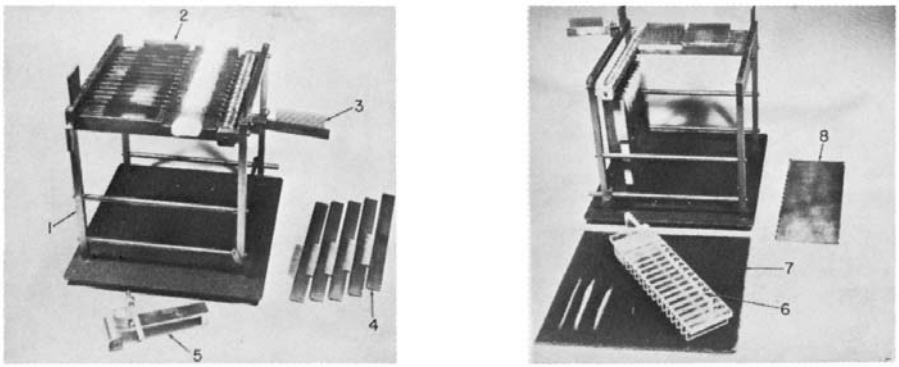

(Front View)
1—Frame.
2—Faller bars.
3—Side comb.
4—Retaining bars.

(Rear View)
5—Drawing clamp.
6—Depressor.
7—Plush board.
8—Faller bar lifting plate.

FIG. 1 Wool Fiber Stapling Apparatus

TABLE 1 Form with Recorded Data Showing the Calculation of the Average Fiber Length of Wool, the Standard Deviation, and Coefficient of Variation

NOTE 1—When using equipment graduated in metric units, use class intervals 10 mm long, and calculate the average and standard deviation to the nearest 0.2 mm.

Class Intervals, in.	Mass, g	Percentages	Cumulative Frequencies	
			First Cumulative, less than	Second Cumulative, less than
6.0 to 6.5	0.014	2.4	100.0	840.1
5.5 to 6.0	0.010	1.7	97.6	740.1
5.0 to 5.5	0.013	2.2	95.9	642.5
4.5 to 5.0	0.018	3.1	93.7	546.6
4.0 to 4.5	0.038	6.5	90.6	452.9
3.5 to 4.0	0.051	8.7	84.1	362.3
3.0 to 3.5	0.062	10.6	75.4	278.2
2.5 to 3.0	0.072	12.3	64.8	202.8
2.0 to 2.5	0.079	13.5	52.5	138.0
1.5 to 2.0	0.080	13.6	39.0	85.5
1.0 to 1.5	0.065	11.0	25.4	46.5
0.5 to 1.0	0.045	7.7	14.4	21.1
0 to 0.5	0.039	6.7	6.7	6.7
Totals	0.586	100.0 = $\sum$	840.1	4363.3
	Divided by $\sum$ percentages		F_1 = 8.40	F_2 = 43.63

B = the largest midpoint value for which a frequency is recorded = 6.25 in.
m = the class interval = 0.5 in.
Percentage of fibers under 2 in. = 39.0 %.
Calculations:

$$\bar{X} = B - m(F_1 - 1) = 6.25 - 0.5(8.40 - 1) = 2.55 \text{ in.}$$

$$s = m\sqrt{2F_2 - F_1 - F_1^2} = 0.5\sqrt{87.26 - 8.40 - 70.56} = 1.44 \text{ in.}$$

v = 100 (σ/X) = 100 × (1.4/2.6) = 56.47 %.

where:

$\bar{X}$ = average fiber length of wool,
s = standard deviation, and
v = coefficient of variation.

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