ASTM Designation: D 2816 – 95

Standard Test Method for
Cashmere Coarse-Hair Content in Cashmere[1]

This standard is issued under the fixed designation D 2816; 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 a sequential procedure for determining whether or not the cashmere coarse-hair content of a sample exceeds a specified value.

NOTE 1—For the maximum allowable cashmere coarse-hair content in cashmere, refer to Specification D 2817.

NOTE 2—For the quantitative analysis of cashmere hair and blends of cashmere hair and other fibers, refer to Test Methods D 629.

1.2 This test method is applicable only to cashmere hair in the form of roving, yarn, or fabric, and to the cashmere hair content of blends with other fibers, where the expected cashmere coarse-hair content is not more than five mass percent (see Footnote C of Table 1). For greater expected mass percentages of cashmere coarse-hair, see Test Methods D 629.

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:*
D 123 Terminology Relating to Textile Materials[2]
D 629 Test Methods for Quantitative Analysis of Textiles[2]
D 2130 Test Method for Diameter of Wool and Other Animal Fibers by Microprojection[2]
D 2817 Specification for Maximum Cashmere Coarse-Hair Content in Cashmere[2]

3. Terminology

3.1 *Definitions*—For definitions of textile terms used in this test method, refer to Terminology D 123.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cashmere, n—in roving, yarn, or fabrics,* cashmere hair or products made therewith having a cashmere coarse-hair content not exceeding a specified maximum percentage by length.

3.2.2 *cashmere coarse-hair, n*—those coarse fibers in cashmere hair having widths greater than 30 µm.

3.2.2.1 *Discussion*—For the purpose of this test method, width shall be determined as directed in Test Method D 2130.

3.2.3 *cashmere coarse-hair content, n*—the total length of the cashmere coarse-hair fibers that are present, expressed as a percentage of the total length of all the cashmere hair fibers; that is, the percentage by length of cashmere coarse-hair in cashmere hair.

3.2.4 *cashmere down, n*—those fibers in cashmere hair having widths of 30 µm or less.

3.2.4.1 *Discussion*—For the purpose of this test method, width shall be determined as directed in Test Method D 2130.

3.2.5 *cashmere hair, n*—the fibers produced by a form of goat (*Capra hircus*) indigenous to Asia and known as the cashmere goat.

3.2.5.1 *Discussion*—Characteristically, cashmere hair consists of fine down (undercoat) fibers and coarse (outer-coat) fibers.

4. Summary of Test Method

4.1 One thousand (or more) individual fibers of cashmere hair are examined microscopically and classified either as cashmere down or cashmere coarse-hair on the basis of fiber width.

4.2 The procedure (6.1 and 6.2) for classifying a fiber as cashmere coarse-hair or cashmere requires microscopic examination of fiber segments of fixed length. The number of fiber segments of each width category is proportional to the total length of the fibers in each category. Hence, the percentage by length of cashmere coarse-hair in cashmere hair is equal to the percentage by number of cashmere coarse-hair segments as determined by this procedure.

4.3 The observed number of cashmere coarse-hair fibers is compared with the numbers in Table 1 and a decision is made (*1*) to accept the lot as conforming, (*2*) to reject the lot as nonconforming, or (*3*) to continue testing. The counting, classification, and comparison process is continued until a decision can be made as to whether the lot does or does not conform to the specification. Table 1 is based on stated levels of confidence.

5. Significance and Use

5.1 This test method may be used for determining compliance with a specification for maximum cashmere coarse-hair content and is required to be used for determining compliance with Specification D 2817.

TABLE 1 Sequential Accept-Reject Numbers for Selected Specifications[A]

Number of Fibers Counted	Specification, Length %[B]																	
	0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9		1.0	
	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R	A	R
1 000	...[C]	17	...	18	...	19	...	20	...	21	...	22	...	23	...	24	...	25
2 000	...	19	...	21	...	23	...	25	...	27	...	29	1	31	3	33	5	35
3 000	...	21	...	24	...	27	0	30	3	33	6	36	9	39	12	42	15	45
4 000	...	23	...	27	1	31	5	35	9	39	13	43	17	47	21	51	25	55
5 000	...	25	0	30	5	35	10	40	15	45	20	50	25	55	30	60	35	65
6 000	...	27	3	33	9	39	15	45	21	51	27	57	33	63	39	69	45	75
7 000	...	29	6	36	13	43	20	50	27	57	34	64	41	71	48	77	55	85
8 000	1	31	9	39	17	47	25	55	33	63	41	71	49	79	57	86	65	95
9 000	3	33	12	42	21	51	30	60	39	69	48	78	57	87	66	95	75	105
10 000	5	35	15	45	25	55	35	65	45	75	55	85	65	95	75	104	85	115

[A] These accept-reject numbers are based on the following conditions:

(1) The probability of accepting a lot that exceeds the specifications by 10 % or more of the specification percent is 0.05.

(2) The probability of rejecting a lot that is 10 % or more of the specification percent below the specification is also 0.05.

[B] Extensive interlaboratory tests have shown that, for the concentration of cashmere coarse-hair covered in Table 1, the relationship between "Specification, Length Percent" and mass percent of cashmere coarse-hair is approximately linear, as shown in (Eq 1):

$$M = 3S + 0.9 \tag{1}$$

where:

M = mass percent of cashmere coarse-hair, and
S = specified maximum coarse-hair content in length percent ($0.2 \leq S \leq 1.0$).

The data from these studies are on file with the Secretary of Subcommittee D13.13, Committee D-13 of ASTM.

[C] Blanks correspond to a theoretical number less than zero. No decision to accept can be made until a number of fibers corresponding to the first nonblank entry has been classified.

5.1.1 In case of a dispute arising from differences in reported test results when using Test Method D 2816 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 that are as homogeneous as possible and that 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 the 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 When the product being tested has a cashmere coarse-hair content that departs significantly either way from the specified amount, the sequential test procedure described herein will result in a substantial reduction in the number of observations required for a decision at the stated level of confidence. On the other hand, when the product being tested has a cashmere coarse-hair content that approaches the specified amount, the sequential procedure ensures that the necessary increased number of observations shall be made to secure a correct decision at the stated level of confidence.

6. Apparatus

6.1 Apparatus is as specified in Test Method D 2130.

7. Procedure

7.1 Proceed as directed in Test Method D 2130 with respect to apparatus and materials, sampling and selection of speci-mens, test specimen, calibration of microprojector, and prepa-ration of slides, positioning and traversing the slide, focusing, and selecting the fibers to be observed and, if necessary, measured.

7.2 Examine 1000 fibers and record the number of fibers the width of which exceeds 30 μm (classified as cashmere coarse-hair). Measure fibers having widths close to 30 μm with particular care so as to assure correct classification.

7.3 In Table 1, refer to the appropriate column for the agreed upon specification. In the row labeled 1000, two numbers are given. The number of cashmere coarse-hair fibers counted in 7.2 is either (*1*) equal to or greater than the larger number, (*2*) equal to or smaller than the smaller number, or (*3*) lies between the two numbers.

7.3.1 If the observed number is equal to or greater than the larger number, terminate the test and report that the sample exceeds the specification for cashmere coarse-hair content.

7.3.2 If the observed number is equal to or smaller than the smaller number, terminate the test and report that all the sample conforms to the specification for cashmere coarse-hair content.

7.3.3 If the observed number lies between the two numbers in the table, examine an additional 1000 fibers as in 7.2 and record the number of fibers classified as cashmere coarse-hair.

7.4 Compare the number of cashmere coarse-hair fibers observed in 2000 observations with the second row of the table, labeled 2000, in the column for the applicable specifi-cation. Use the table as directed in 7.3, and continue the examination of the fibers in groups of 1000 as long as necessary to reach a decision with respect to conformance or nonconformance to the prescribed specification.

7.5 If, after 10 000 fibers have been examined, the total number of cashmere coarse-hair fibers found remains between the limiting numbers, terminate the test. Calculate the percent-age of cashmere coarse-hair fibers and report that the sample

conforms or does not conform to the prescribed cashmere coarse-hair content specification according to whether this calculated percentage is, respectively, less than or more than the prescribed cashmere coarse-hair specification.

NOTE 3—A decision based on a test terminated as directed in 7.5 has a lower level of confidence than that corresponding to the level of confidence on which the calculations of Table 1 are based.

8. Report

8.1 State that the samples (or specimens) were tested as directed in Test Method D 2816. Describe the material or product sampled and the method of sampling used.

8.2 Report the following information:

8.2.1 Number of fibers examined,

8.2.2 Number of cashmere coarse-hair fibers observed,

8.2.3 Maximum cashmere coarse-hair content specified, and

8.2.4 Whether the lot conforms or does not conform to the cashmere coarse-hair content specification.

9. Precision and Bias

9.1 The critical values in Table 1 (Note 4) are based on a probability of 0.05 of accepting a lot having a cashmere coarse-hair content exceeding the specification by 10 % or more and a probability of 0.05 of rejecting a lot having a cashmere coarse-hair content 10 % or more below the specification. That is, the total probability of making either a Type I error or a Type II error is 0.10.

NOTE 4—The table entries were calculated by the procedure given by Mood, A. F., *Introduction to the Theory of Statistics,* McGraw-Hill Book Co., New York, 1950, pp. 366–369, with $P_0 = 0.9$ P, $P_1 = 1.1$ P, $\alpha = \beta = 0.05$, P = specification for which the table is calculated.

9.2 *Bias*—Test Method D 2816 for testing the cashmere coarse-hair content in cashmere has no known bias and is accepted as a referee method.

10. Keywords

10.1 animal fibers (except wool); content