Designation: D3991 – 94 (Reapproved 2012)ε1

Standard Specifications for Fineness of Wool or Mohair and Assignment of Grade[1]

This standard is issued under the fixed designation D3991; 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.

ε[1] NOTE—The terminology section was updated in July 2012.

1. Scope

1.1 These specifications cover the classification, by fineness grade, of wool or mohair that is in the grease, pulled, washed, or scoured state, or in the form of card sliver.

1.2 These specifications are applicable also to assignment of grade for wool or mohair in spun materials or products processed beyond carding on the woolen system but not on the worsted system which involves a combing process.

NOTE 1—For fineness specifications for wool top, mohair top, and alpaca, refer to Specifications D3992 and D2252.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D2130 Test Method for Diameter of Wool and Other Animal Fibers by Microprojection

D2252 Specification for Fineness of Types of Alpaca

D3992 Specifications for Fineness of Wool Top or Mohair Top and Assignment of Grade

D4845 Terminology Relating to Wool

2.2 *Federal Standards:*

Official Standards of the United States for Grades of Wool, Section 31.0[3]

Measurement Method for Determining Grade of Wool, Section 31.204[3]

Official Standards of the United States for Grades of Grease Mohair, Section 32.1[4]

Measurement Method for Determining Grade of Grease Mohair, Section 32.204[4]

NOTE 2—A discussion on the development of grease mohair standards can be found in the literature.[5,6]

3. Terminology

3.1 For all terminology related to D13.13, refer to Terminology D4845.

3.1.1 The following terms are relevant to this standard: average fiber diameter, fineness, grade, mohair, wool.

3.2 For all other terminology related to textiles, refer to Terminology D123.

4. Requirements

4.1 The grade of wool shall conform to the requirements of Table 1.

4.2 The grade of mohair shall conform to the requirements of Table 2.

5. Significance and Use

5.1 These specifications are considered satisfactory for classifying wool or mohair by grade and provide a basis for acceptance of commercial shipments.

5.2 Grade determined by visual examination is a common trade practice. In case of doubt or dispute, comparison of the measured average fiber diameter and fiber diameter standard deviation with the respective specification shall be used as the referee procedure for assigning grade.

5.3 This specification is not intended for application to mixed lots, that is, lots of wool or mohair consisting of fleeces of different grades that are to be segregated into smaller more homogeneous lots before use.

6. Test Method

6.1 Test the material as directed in Test Method D2130. Measure at least the minimum number of fibers needed to

[1] These specifications are under the jurisdiction of ASTM Committee D13 on Textiles and are the direct responsibility of Subcommittee D13.13 on Wool and Felt.

Current edition approved July 1, 2012. Published August 2012. Originally approved in 1981. Last previous edition approved in 2006 as D3991–94 (2006). Replaces D419 and D3109. DOI: 10.1520/D3991-94R12E01.

[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] *Federal Register*, Vol 30, No. 161, Aug. 20, 1965, pp 10829–10833.

[4] *Federal Register*, Vol 36, No. 129, July 3, 1971, pp 12681–12685.

[5] Keller, H. R., Ray, H. D., Lineberry, C. T., and Pohle, E. M., "Fineness Relationship of Grease Mohair, Card Sliver, and Top," *Textile Research Journal*, Vol 42, No. 2, February 1971.

[6] ASTM Research Report No. D13 – 1012. A copy is available from ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

TABLE 1 Specifications for Grades of Wool[A]

Grade	Range for Average Fiber Diameter, μm	Standard Deviation, max, μm
Finer than 80s	under 17.70	3.59
80s	17.70 to 19.14	4.09
70s	19.15 to 20.59	4.59
64s	20.60 to 22.04	5.19
62s	22.05 to 23.49	5.89
60s	23.50 to 24.94	6.49
58s	24.95 to 26.39	7.09
56s	26.40 to 27.84	7.59
54s	27.85 to 29.29	8.19
50s	29.30 to 30.99	8.69
48s	31.00 to 32.69	9.09
46s	32.70 to 34.39	9.59
44s	34.40 to 36.19	10.09
40s	36.20 to 38.09	10.69
36s	38.10 to 40.20	11.19
Coarser than 36s	over 40.20	

[A] The specifications in this table conform to the Official Standards of the United States for Grades of Wool as promulgated by the U.S. Department of Agriculture, effective Jan. 1, 1966.

TABLE 2 Specifications for Grades of Mohair[A]

Grade	Range for Average Fiber Diameter, μm	Standard Deviation, max, μm
Finer than 40s	under 23.01	7.2
40s	23.01 to 25.00	7.6
36s	25.01 to 27.00	8.0
32s	27.01 to 29.00	8.4
30s	29.01 to 31.00	8.8
28s	31.01 to 33.00	9.2
26s	33.01 to 35.00	9.6
24s	35.01 to 37.00	10.0
22s	37.01 to 39.00	10.5
20s	39.01 to 41.00	11.0
18s	41.01 to 43.00	11.5
Coarser than 18s	over 43.01	

[A] The specifications in this table conform to the Official Standards of the United States for Grades of Grease Mohair as promulgated by the U.S. Department of Agriculture, effective Aug. 1, 1971.

attain confidence limits of the mean within ±0.4 μm at a probability level of 95 % (see Annex A1 of Test Method D2130).

6.1.1 In case of dispute the microprojector procedure, Test Method D2130, is specified as the referee method.

7. Assignment of Grade

7.1 Compare the observed average fiber diameter and standard deviation in fiber diameter, determined as directed in Section 6, with the specifications for the various grades for the material being tested.

7.1.1 *Wool*—Assign the grade that corresponds to the average fiber diameter and maximum standard deviation requirements specified in Table 1. If the observed standard deviation exceeds the maximum specified for the grade to which the observed average fiber diameter corresponds, assign to the wool the next coarser grade. Assignment of grade is illustrated by the following examples:

7.1.1.1 *Example 1*—Average fiber diameter, 27.25 μm; standard deviation, 6.72 μm; assigned grade, 56s.

7.1.1.2 *Example 2*—Average fiber diameter, 27.25 μm; standard deviation, 7.80 μm; assigned grade, 54s.

7.1.1.3 *Example 3*—Average fiber diameter, 27.25 μm; standard deviation, 8.50 μm; assigned grade, 54s.

7.1.2 *Mohair*—Assign the grade that corresponds to the average fiber diameter and maximum standard deviation requirements specified in Table 2. If the observed standard deviation exceeds the maximum specified for the grade to which the observed average fiber diameter corresponds, assign to the mohair a dual grade designation, the second designation being one grade coarser than the grade to which the average fiber diameter corresponds. Assignment of grade is illustrated by the following examples:

7.1.2.1 *Example 1*—Average fiber diameter, 28.50 μm; standard deviation, 8.1 μm; grade designation, 32s.

7.1.2.2 *Example 2*—Average fiber diameter, 28.50 μm; standard deviation, 8.6 μm; grade designation, 32/30s.

7.2 *Interpretation of Results*—The true average fiber diameter of a lot of wool or mohair can be determined only by measurement of every fiber in the lot. Since this is not practicable, reliance is placed on the result obtained through the measurement of a sample. The likelihood that the observed average fiber diameter correctly identifies the grade increases as the average approaches the midpoint of the fineness range of the grade concerned, and decreases as the average approaches either limit of such range. The probability of the correctness of the grade designation of a lot may be increased by increasing the number of fibers measured.

8. Conformance

8.1 When the purchaser and the supplier have agreed upon specific requirements for fineness, wool or mohair that fails to meet those requirements may be rejected. Rejection should be reported to the supplier in writing. In case of disagreement with the results of the tests, the supplier may make claim for a retest.

9. Keywords

9.1 animal fibers (except wool); number grade; wool; yarn