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United States Standards for Grades of Grease Mohair

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United States Standards for Grades of Grease Mohair

§32.1 Official grease mohair grades.

The official grades for grease mohair and the specifications for each shall be those set forth in Table 1. However, mohair which qualifies for any of the grades on the basis of its average fiber diameter but whose standard deviation of average fiber diameter exceeds the maximum permitted for that grade shall be assigned a dual grade designation. In such case, the first designation shall indicate the grade based on the average fiber diameter and the second designation shall be that of the next coarser grade.

TABLE 1. SPECIFICATIONS FOR THE OFFICIAL GRADES OF GREASE MOHAIR

Grade	Fiber diameter		Approximate number of fiber measurements[1]
	Limits for average (microns)	Maximum standard deviation (microns)	
Finer than 40s	Under 23.01..............	7.2	1,000
40s	23.01 to 25.00...........	7.6	1,000
36s	25.01 to 27.00	8.0	1,200
32s	27.01 to 29.00	8.4	1,200
30s	29.01 to 31.00	8.8	1,400
28s	31.01 to 33.00	9.2	1,400
26s	33.01 to 35.00	9.6	1,600
24s	35.01 to 37.00	10.0	1,600
22s	37.01 to 39.00	10.5	1,800
20s	39.01 to 41.00	11.0	2,200
18s	41.01 to 43.00	11.5	2,200
Coarser than 18s	43.01 and over	....	2,600

[1]The number of fibers to measure for each test shall be the number needed to attain confidence limits of the mean within ±10.40 micron at a probability of 95 percent. Measurement of the approximate number of fibers for the grades listed above may serve as a guide to meet the required confidence limits. The numbers indicated are based on mohair matchings.

OFFICIAL STANDARDS OF THE UNITED STATES FOR GRADES OF MOHAIR TOP

§32.100 Official mohair top grades.

The official grades for mohair top and the specifications for each shall be those set forth in table 1. However, mohair top which qualifies for a grade on the basis of its average fiber diameter but does not meet the fiber diameter dispersion requirement for that same grade shall be assigned a dual grade designation. In such cases, the first designation shall indicate the grade based on average fiber diameter and the second designation shall be that of the next coarser grade.

TABLE 1.--SPECIFICATIONS FOR THE OFFICIAL GRADES OF MOHAIR TOP

Grade	Limits for average diameter (microns)	Fiber diameter dispersion: percent[1]							
		30 microns and under, minimum	40 microns and under, minimum	50 microns and under, minimum	30.1 microns and over, maximum	40.1 microns and over, maximum	50.1 microns and over, maximum	60.1 microns and over, maximum	Approximate number of fiber measurements[2]
Finer than 40's..	Under 23.55.......	80	....	....	20	1	....	....	1,000
40's...............	23.55 to 25.54....	74	....	....	26	4	....	....	1,000
36's...............	25.55 to 27.54....	67	....	....	33	6	....	....	1,200
32's...............	27.55 to 29.54....	57	....	....	43	8	....	....	1,200
30's...............	29.55 to 31.54....	47	....	....	53	13	....	....	1,400
28's...............	31.55 to 33.54....	....	80	....	....	20	3	....	1,400
26's...............	33.55 to 35.54....	....	73	....	....	27	5	....	1,600
24's...............	35.55 to 37.54....	....	64	....	....	36	8	....	1,600
22's...............	37.55 to 39.54....	....	56	....	....	44	13	....	1,800
20's...............	39.55 to 41.54....	....	....	82	....	....	18	6	2,200
18's...............	41.55 to 43.54....	....	....	77	....	....	23	8	2,200
Coarser than 18s	Over 43.54........	....	.	....	....	....	....	....	2,600

[1]The 2d maximum percent shown for any grade is a part of, and not in addition to, the 1st maximum percent. In each grade, the minimum percent and the 1st maximum percent total 100 percent.

[2]The number of fibers to measure for each test shall be the number needed to attain confidence limits of the mean within ±0.40 micron at a probability of 95 percent. The approximate number of fibers for the grades listed above may serve as a guide to the number of measurements needed to meet the required confidence limits.

DEFINITIONS

§32.200 Meaning of words.

Words used in this part in the singular form shall be deemed to import the plural, and vice versa, as the case may demand.

§32.201 Terms defined.

For the purpose of this part, unless the context otherwise requires, the following terms shall be construed to mean:

(a) *Average fiber diameter.* The sum of the individual diameter measurements divided by the number of fibers measured, as described in §32.302.

(b) *Fineness.* Average fiber diameter.

(c) *Grade.* A numerical designation used in classifying mohair top, based on average fiber diameter and dispersion of fiber diameters.

(d) *Lot.* The entire quantity of mohair top constituting the subject of consideration. As used herein, "lot" refers to a test lot not exceeding 20,000 pounds (9,072 kilograms).

(e) *Micron.* A unit of linear measurement equal to 1/1000 millimeter or 1/25400 inch.

(f) *Mohair.* Fiber from the Angora goat.

(g) *Mohair top.* A continuous, untwisted strand of scoured mohair fibers from which the shorter fibers, i.e., noil, have been removed by combing.

(h) *Sample.* Four slivers (test specimens) of mohair top obtained as described in

§32.302(a)(4).

(i) *Standards.* The official standards of the United States for grades of mohair top.

(j) *Standard samples.* Physical samples representative of the standards.

(k) *Test.* A determination by measurement of the average fiber diameter and the fiber diameter dispersion of a sample of mohair top, conducted in accordance with procedures provided in §32.302.

(l) *Test specimen.* A sliver of mohair top at least 1 yard (0.91 meter) long, obtained as described in §32.302(a)(4).

METHODS FOR DETERMINING GRADE OF GREASE MOHAIR

§32.202 General.

The official standards of the United States for grades of grease mohair as defined in §32.1 shall be the basis for grade determination. Grade may be determined by (a) inspection or (b) by measuring the number of fibers of a sample needed to attain the required precision of the average, calculating the average fiber diameter, and standard deviation in fiber diameter, and comparing the average fiber diameter and standard deviation with the specifications for grades of grease mohair. Both methods for determining grade shall be official; however, if the grade as determined by inspection differs from that determined by measurement, the grade determined by measurement shall prevail. Although these standards are developed specifically for grease mohair and based primarily on tests of grease mohair matchings, they are applicable also to mohair in the pulled or scoured state, or to mohair in the form of card sliver.

§32.203 Inspection method.

Determination of the grade of grease mohair by inspection will be facilitated by comparing the fineness and variability in fineness of fibers of a sample of mohair representative of the lot or fleece with the fibers of valid standard grease mohair samples representative of the official grades. The grade assigned the lot or fleece shall be that of the standard mohair sample which most nearly matches the mohair being graded.

§32.204 Measurement method.

(a) The determination of the grade of grease mohair by measurement shall be by comparison of the measured average fiber diameter and standard deviation of the fiber diameter with the specifications of the Official Standards of the United States for Grades of Grease Mohair in §32.1. This determination shall be made in accordance with the procedure for determining the average fiber diameter and the standard deviation of fiber diameter set forth in paragraph (b) of this section and the procedure for designating grade set forth in paragraph (c) of this section.

(b) Procedure for determining average fiber diameter and standard deviation of fiber diameter:

(1) *Principle of procedure.* The average fiber diameter and standard deviation of fiber diameter are determined by sectioning the fibers in a test specimen to a designated short length, mounting the sections on a slide, projecting the magnified image onto a wedge scale, and measuring the diameter of the required number of the fibers, as specified in this section.

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(2) *Apparatus and material.* The following apparatus and material are needed and these shall comply with the following provisions:

(i) *Microprojector.* The microscope shall be equipped with a fixed body tube, a focusable stage responsive to coarse and fine adjustments, and a focusable substage with condenser and iris diaphragm and a vertically installed adequate light source to give a precise magnification of 500X when equipped with a 10 to 15X eyepiece, and a 20 to 21X objective with an aperture of approximately 0.50 centimeter.

(ii) *Stage micrometer.* Calibrated glass slide used for accurate setting and control of the magnification.

(iii) *Cross sectioning device, heavy duty.* An instrument approximately 2 inches in height, consisting essentially of a metal plate with slot for holding a quantity of fibers, a key for compressing the fibers, and a tongue-propelling arrangement by which the fiber bundle may be extruded for sectioning.

(iv) *Microscope slides.* 1" x 3" (25 x 75 mm.).

(v) *Cover glasses.* No. 1 thickness, 7/8" x 2" (22 x 50 mm.).

(vi) *Mounting medium.* Colorless mineral oil with a refractive index between 1.53 and 1.43, and of suitable viscosity.

(vii) *Wedge scales.* Strips of heavy paper or Bristol board, imprinted with a wedge for measurement of fiber diameter at a magnification of 500X. The wedge is usually divided into 2.5-micron intervals (cells).

(3) *Calibration.* The microscope shall be adjusted to give a magnification of 500X in the plane of the projected image. This shall be accomplished by placing a stage micrometer on the stage of the microprojector and bringing the microscope into such adjustment that an interval of 0.20 mm. on the stage micrometer will measure 100.0 mm. when sharply focused in the center of the image plane.

(4) *Sampling.* The method of obtaining a sample representative of the fineness of a lot of grease mohair, pulled mohair, scoured mohair, or card sliver will differ according to the manner in which it is stored and the equipment available for sampling. Lots may be sampled either by coring or by hand. The sampling procedures are as follows:

(i) *Core sampling.* Core sampling of packaged scoured, pulled, or grease mohair is advisable. Acceptable procedures and schedules for core sampling grease mohair are those described for raw wool in current ASTM Standards on Textile Materials, Designation D 1060, "Standard Method of Core Sampling of Raw Wool Packages for Determination of Percentage of Clean Wool Fiber Present."[1] If a representative portion of the scoured mohair core sample resulting from the test for clean mohair fiber content is available, it may be used for fiber diameter measurements.

(ii) *Hand sampling an individual fleece.* A sample shall consist of approximately 60 grams of mohair and shall be drawn at random from all parts of a fleece.

(iii) *Hand sampling lots of scoured, pulled, and grease mohair.* A sample shall consist of at least 6 pounds of mohair. If the mohair is packaged, the sample shall be drawn by taking a total

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[1] A publication containing these ASTM Standards is published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, for $22.

of at least 50 randomly selected handfuls of mohair from not less than 10 percent of the packages randomly selected from the lot. If the mohair is in piles, the sample shall be drawn by taking a handful from at least 50 locations throughout the pile.

(iv) *Hand sampling card sliver.* Mohair card sliver shall be sampled by drawing at random from the lot, preferably during the carding operation, ten 24-inch lengths of sliver.

(5) *Test specimens.* The method of obtaining a test specimen representative of a sample drawn in accordance with the procedures of paragraph (b)(4) of this section will differ according to the type of sample and the equipment available for subsampling. The methods are as follows:

(i) *Obtaining test specimen from clean fiber core test residue.* The test specimen shall be obtained from the scoured mohair remaining after testing for clean fiber content by using the following procedure: The sample shall be divided into 40 portions of approximately equal size. From each portion, a sufficient quantity of fibers shall be drawn at random to provide an aggregate test specimen of at least 40 grams. These fibers shall be mixed or blended to form the test specimen. For best blending results, test specimens from samples obtained by means of 1 1/4-inch and larger coring tubes should be machine blended. The machine blending of test specimens may be accomplished by carding the specimen three times, breaking the web feeding at right angles after the first and second passes; or by gilling the specimens 15 times, breaking and combining the pieces of sliver to maintain a convenient length. Core samples drawn with smaller coring tubes should not be machine blended since loss of fiber may occur.

(ii) *Obtaining test specimens from other samples (except card sliver).* Test specimens may be obtained by hand sampling or core sampling as described herein:

(a) *Hand sampling.* Samples shall be divided into 40 portions of approximately equal size. From each portion, a sufficient quantity of fiber to provide a test specimen of at least 40 grams shall be drawn at random. Test specimens of grease mohair and pulled mohair shall be scoured or otherwise cleaned. Clean specimens, except those from samples of mohair with fibers less than 1 1/4 inches in length, shall be further blended, preferably by machine, following the procedures described in paragraph (a)(5)(I) of this section.

(b) *Core sampling.* The sample shall be compressed in a suitable container. By means of a ½-inch coring tube with sharp tip, a sufficient number of cores shall be extracted at random to provide a test specimen of at least 40 grams of scoured mohair. Test specimens of grease mohair or pulled mohair shall be scoured or otherwise cleaned.

NOTE: an example of a suitable container would be a box 12 inches by 10 inches by 6 inches deep, equipped with a floating top which has 16 equally spaced holes three fourth inch in diameter over its area. The mohair may be firmly compressed by applying pressure on the top. The top is held in place by two rods extending through holes in the side of the box and over the top. The coring tube is thrust through the holes in the top to sample the mohair.

(iii) *Obtaining test specimens from card sliver samples.* Portions--approximately one-tenth the width of a sliver--shall be stripped from each of the ten 24-inch pieces of sliver obtained in accordance with paragraph (b)(4)(iv) of this section. These pieces shall be combined to form a composite sliver. This will constitute the test specimen.

(6) *Test condition.* Test specimens shall be preconditioned to approximate equilibrium in an atmosphere of 5 to 25 percent relative humidity at a temperature less than 122° F. (50° C.). Then the test specimens shall be conditioned for at least 4 hours in the standard

atmosphere for testing, namely, 63 to 67 percent relative humidity at a temperature of 68° to 72° F. (19.0° to 22.1° C.).

(7) *Preparation of slides*--(i) *Filling cross section device.* A specimen in sliver form shall be placed in the slot of the cross section device at a section of the sliver estimated to be a full fiber length or more from the end of the sliver. The sliver shall be firmly compacted with the compression key which shall then be secured with the set screw. For specimens not in sliver form, from the bulk of the test specimen, small quantities of fibers shall be drawn at random, packing the slot to the required level. The specimen shall be compacted firmly with the compression key which shall then be secured with the set screw.

(ii) *Preliminary section.* The gripped fibers shall be cut off at the upper and lower surfaces of the plate. The fiber bundle shall be extruded to the extent of approximately 0.50 mm. in order to take up slack in the fibers and the propulsion mechanism. The projecting fibers shall be moistened with a few drops of mineral oil. This projecting fiber bundle shall be cut off with a sharp razor blade flush with the upper surface of the fiber holder plate. This section shall be discarded.

(iii) *Final section.* The fiber bundle shall again be extruded, approximately 0.25 mm. The fiber bundle shall be moistened with a few drops of mineral oil, blotting off the excess. The projecting fibers shall be cut off with a sharp razor blade flush with the holder plate. The fiber pieces should adhere to the razor blade.

(iv) *Mounting the fibers.* A few drops of mineral oil shall be placed on a clean glass slide. With a dissecting needle, the fiber pieces shall be scraped from the razor blade onto the slide. The fibers shall be thoroughly dispersed in the oil with the dissecting needle and the slide completed with a cover glass. Sufficient oil should be used in the preparation of the slide to insure thorough distribution of the fibers, but an excess must be avoided, as practically no oil should be permitted to flow out or be squeezed out beyond the borders of the cover glass. If the number of fibers is too great to permit proper distribution on the slide, or if an excess of oil has been used, a portion of the mixture, after thorough dispersion of the fibers, may be wiped away with a piece of tissue or cloth. Slides shall be measured the day they are prepared.

(8) *Measurement of fibers*. The slide shall be placed on the stage of the microprojector, cover glass toward the objective. Fiber diameter measurements shall be made at the approximate midlength of the fibers. Fiber edges appear as fine lines without borders when they are uniformly in focus. It is unusual, however, for both edges of the fiber to be in focus at the same time. If both edges of the fiber are not uniformly in focus, adjustment shall be made so that one edge of the fiber is in focus and the other shows as a bright line. To record the measurement, it is necessary to mark the point where the wedge corresponds with the fiber image as determined by (i) the fine lines of both edges when they are uniformly in focus, or (ii) the fine line of one edge and the inner side of the bright line at the other edge when they are not uniformly in focus. The slide shall be traversed in planned courses so that fibers on all portions of the slide will be measured. Successive fibers should be measured whose midpoints come within the field--a circle 4 inches in diameter, centrally located in the projected area. Fibers shorter than 200 microns or longer than 300 microns and those having distorted images shall be excluded from measurement. The marks on the wedge scale indicating the diameter of fibers measured are counted and combined into cells for calculation as indicated in paragraph (a)(11) of this section.

(9) *Nature of test.* A test shall comprise the measurement of the test specimen by two operators, each operator following independently the procedures of paragraph (b)(7) of this section.

(10) *Number of fibers to measure.* The number of fibers to measure for each test shall be the number needed to attain confidence limits of the mean within ±0.40 micron at a probability of 95 percent. The approximate number of fiber measurements needed for each of the grades—as listed in Table 1—may serve as a guide. However, the precise number of fibers to be measured can be calculated by using the equation shown below:

$$n=(1.96\sigma/0.40)^2$$

In this equation:

n=Number of fibers to be measured, and
σ=Standard deviation of fiber diameters

(11) *Calculation and report.* The measurements of both operators shall be combined and the following calculations made by using the applicable formulae shown below:

(i) Total number of measurements (n)
(ii) The average diameter of fiber (X)

$$X=A+mE_1$$

(iii) The standard deviation (σ);

$$\sigma=m\sqrt{E_2\text{-}E_1{}^2}$$

In the formulae stated above:

A=Midpoint of cell containing the smallest measurement.
m=Cell interval.
$E_1=\Sigma fx/n$
$E_2=\Sigma fx^2/n$
Σ=Summation.
f=Observed frequency.
x=Deviation in cells from A.

An example of the calculations is set forth below:

EXAMPLE OF CALCULATIONS: AVERAGE FIBER DIAMETER, STANDARD DEVIATION, AND CONFIDENCE LIMITS OF MEAN

Cell No.	Cell boundary	A	Deviation in cells from A, x	Observed frequency, f	ix	Fx^2
5.................	10.0 to 12.5.............	11.25	0	1	0	0
6.................	12.5 to 15.0.............	....	1	15	15	15
7.................	15.0 to 17.5.............	....	2	66	132	264
8.................	17.5 to 20.0.............	....	3	141	423	1,269
9.................	20.0 to 22.5.............	....	4	165	660	2,640
10...............	22.5 to 25.0.............	....	5	176	880	4,400
11...............	25.0 to 27.5.............	....	6	138	828	4,968
12...............	27.5 to 30.0.............	....	7	99	693	4,851
13...............	30.0 to 32.5.............	....	8	79	632	5,056
14...............	32.5 to 35.0.............	....	9	55	495	4,455
15...............	35.0 to 37.5.............	....	10	35	350	3,500
16...............	37.5 to 40.0.............	....	11	9	99	1,089
17...............	40.0 to 42.5.............	....	12	8	96	1,152
18...............	42.5 to 45.0.............		13	6	78	1,014
19...............	45.0 to 47.5.............		14	4	56	784
20...............	47.5 to 50.0.............		15	0	0	0
21...............	50.0 to 52.5.............		16	3	48	768
Total.........	....	....	....	1,000	5,485	36,225

Number of measurements (n)=1,000.
A (midpoint of cell containing smallest diameter measurement)=11.25 microns.
m (cell interval)=2.5 microns.
L_1= ($\Sigma fx/n$)=5485/1000=5.4850 and E_2=($\Sigma fx^2/n$)=36.225/1,000=36.2250
Average diameter, $X=A+mE_1$=11.25+2.5 (5.4850)=24.96 microns.[1]
Standard deviation, $\sigma=m\sqrt{E_2-E_1^2}$=2.5$\sqrt{36.2250-30.0852}$=2.5(2.4779)=6.19 microns.[1]
Confidence limits of mean at 95 percent probability level=$\pm(1.96\sigma/\sqrt{n})$=
$\pm12.1324/31.6127$=±0.38 micron.[1]

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[1] Round off the calculated values of average fiber diameter, standard deviation, and confidence limit of the mean to two decimal places as follows: If the figure in the third decimal place is 4 or less, retain the figure in the second decimal place unchanged; otherwise, increase the figure in the second decimal place by 1.

(c) Procedure for designating grade:
(1) *Single grade designation*. If the measured average fiber diameter and standard deviation correspond to requirements set forth for a single grade, that shall be the grade assigned to the sample. Example: Measured average fiber diameter=28.50 microns; standard deviation= 8.1 microns; the grade designation is 32s.
(2) *Dual grade designation*. If the standard deviation exceeds the limits for the grade to which the average fiber diameter corresponds, the mohair shall be assigned a dual grade designation, the second designation being one grade coarser than the grade to which the average fiber diameter corresponds. Example: Measured average fiber diameter =28.50 microns; standard deviation=8.6 microns; the grade designation is 32s/30s.

§32.205   Interpretation.

Since all the portions of a lot of mohair may not be of the same grade, the grade determined represents only the average grade of the entire lot. It should not be construed to represent the grade of any component part of the lot.

METHODS FOR DETERMINING GRADE OF MOHAIR TOP

§32.300   General.

The official standards of the United States for grades of mohair top as defined in §32.100 shall be the basis for grade determination. Grade may be determined by (a) inspection or (b) measuring the number of fibers of a sample needed to attain the required confidence limits of the mean, calculating the average fiber diameter and diameter dispersion, and comparing the average diameter and dispersion with the specifications for grades of mohair top. Both methods for determining grade shall be official; however, if the grade as determined by inspection differs from that determined by measurement, the grade determined by measurement shall prevail

§32.301   Inspection method.

Determination of the grade of mohair top by inspection will be accomplished by comparing the fibers in the mohair top to be graded with the fibers in the mohair top samples certified by the U.S. Department of Agriculture as representative of the official grades. When using the certified samples to determine the grade of mohair top, the grade assigned shall be that of the certified sample which most nearly matches the mohair top being graded.

§32.302   Measurement method.

The determination of the grade of mohair top by measurement shall be by comparison of the measured average fiber diameter and fiber diameter dispersion with the specifications for the official standards of the United States for grades of mohair top. This determination shall be made in accordance with the procedure for determining average fiber diameter and fiber diameter dispersion provided in paragraph (a) of this section and the procedure for designating grade provided in paragraph (b) of this section.

(a) *Procedure for determining average fiber diameter and fiber diameter dispersion--*(1) *Summary of procedure*. The average fiber diameter and fiber diameter dispersion are determined by sectioning the fibers in a test specimen to a designated length, mounting the section of fibers on a slide, projecting the magnified image onto a wedge scale, and measuring the diameter of a minimum number of fibers, as specified in this section.

(2) *Apparatus and material*. The following apparatus and materials are need and shall comply with the following provisions.

(i) *Microprojector*. The microprojector shall be capable of giving a precise magnification of at least 500x. This magnification can be accomplished satisfactorily with a vertically installed microscope equipped with a 10-15x eye-piece, a 20-21x objective with an aperture of approximately 0.50 centimeter, a fixed body tube, a focusable stage responsive to a coarse and fine adjustment, a focusable substage with condenser and iris diaphragm, and a light source that will give a well-defined fiber image. The microscope must be installed so that the projection distance can be adjusted to

produce the required 500x magnification.

(ii) *Stage micrometer*. Calibrated glass slide used for accurate setting and control of the magnification.

(iii) *Cross-sectioning device, heavy duty*. An instrument approximately 2 inches (5 cm.) in height; consisting essentially of metal plate with slot for holding a quantity of fibers, a key for compressing the fibers, and a tongue-propelling arrangement by which the fiber bundle may be extruded for sectioning.

(iv) *Microscope slides*. 1" by 3" (25x75 mm.).

(v) *Cover glasses*. No. 1 thickness, ⅞" by 2" (22x50 mm.)

(vi) *Mounting medium*. Colorless mineral oil with a refractive index between 1.53 and 1.43 and of suitable viscosity.

(vi) *Wedge scales*. Strips of heavy paper or Bristol board imprinted with a wedge for use at a magnification of 500x. The wedge is usually divided into 2.5 micron interval (cells).

(3) *Calibration*. The microscope shall be adjusted to give a magnification of 500x in the plane of the projected image. This may be accomplished by placing a stage micrometer on the state of the microprojector and bringing the microscope into such adjustment that an interval of 0.20 mm. On the stage micrometer will measure 100 mm. when sharply focused in the center of the image plane.

(4) *Sampling*. The lot shall be sampled by drawing from each 20,000 pounds (9,072 kilograms), or fraction thereof, four sections of sliver (test specimens) each of which shall be at least 1 yard (0.91 meter) in length and taken from different balls of mohair top, selected at random. Only one ball shall be taken from any one bale or carton. For broken mohair top (top not wound into balls), and equivalent length of silver shall be taken at random. Only one test specimen shall be taken from any on can or package. The four test specimens shall constitute a sample.

(5) *Test condition*. Test specimens shall be preconditioned to approximate moisture equilibrium in an atmosphere of from 5 to 25 percent relative humidity at a temperature less than 122° F. (50° C.). Then the test specimens shall be conditioned for at least 4 hours in the standard atmosphere for testing, namely, 63 to 67 percent relative humidity at a temperature of 68° to 72° F. (19.9° to 22.1° C.).

(6) *Preparation of slides* - (i) *Filling cross-section device*. Each sliver (test specimen) of mohair top making up the sample shall be placed individually in the slot of the cross-section device, positioning each sliver so that it will be cut at its approximate midlength. The sliver shall be compacted firmly with the compression key and the latter secured with the set screw.

(ii) *Preliminary section*. The gripped fibers shall be cut off at the upper and lower surfaces of the plate. The fiber bundle shall be extruded approximately 0.50 mm. in order to take up slack in the fibers and the propulsion mechanism. The projecting fibers shall be moistened with a few drops of mineral oil. This projecting fiber bundle shall be cut off with a razor blade flush with the upper surface of the fiber holder plate and the section discarded.

(iii) *Final section*. The fiber bundle shall again be extruded, approximately 0.25 mm., i.e., 250 microns. The fiber bundle shall be moistened with a few drops of mineral oil and the excess blotted off. The projecting fibers shall be cut off with a sharp razor blade flush with the holder plate, leaving the fiber pieces adhering to the razor blade.

(iv) *Mounting the fibers*. A few drops of mineral oil shall be placed on a clean glass slide. With a dissecting needle the fiber pieces shall be scraped from the razor blade onto the slide. The fibers

shall be thoroughly dispersed in the oil with the dissecting needle and the slide completed with a cover glass. Sufficient oil should be used the in the preparation of the slide to insure thorough distribution of the fibers, but an excess must be avoided, as practically no oil should be permitted, to flow out or be squeezed out beyond the borders of the cover glass. If the number of fibers is too great to permit proper distribution on the slide, of if an excess of oil has been used, a portion of the mixture, after thorough dispersion of the fibers, may be wiped away with a piece of tissue or cloth. Slides shall be measured the day they are prepared.

(7) *Measurement of fibers*. The slide shall be placed on the stage of the microprojector, cover glass toward the objective. Fiber diameter measurements shall be made at the approximate mid-length of the fibers. Fiber edges appear as fine lines without borders when they are uniformly in focus. It is unusual, however, for both edges of the fiber to be in focus at the same time. If both edges of the fiber are not uniformly in focus, adjustment shall be made so that one edge of the fiber is in focus and the other shows as a bright line. To record the measurement, it is necessary to mark the point where the wedge corresponds with the fiber image as determined by (I) the fine lines of both edges when they are uniformly in focus, or (ii) the fine line of one edge and the inner side of the bright line at the other edge when they are not uniformly in focus. The slide shall be traversed in planned courses so that fibers on all portions of the slide will be measured. Successive fibers should be measured whose mid-points come within the field (a circle 4 inches in diameter, centrally located in the projected area). Fibers shorter than 200 microns or longer than 300 microns and those having distorted images shall be excluded from measurement. The marks on the wedge scale indicating the diameter of fibers measure are counted and combined into cells for calculation as indicated in paragraph (a)(10) of this section. Occasionally a fiber diameter will be less or greater than the extreme limits of the wedge scale. When this occurs, the image of the fiber is projected onto the border of the wedge scale and lines are drawn on the scale at the edges of the fiber image. The distance between the lines is later measured with a metric ruler to obtain the diameter of the fiber. When measuring fiber diameters in this manner, 1 mm. is equal to 2 microns.

(8) *Nature of test*. One test shall consist of the measurement by two operators of the same four slivers (test specimens) of mohair top. The measurement of both operator shall be combined for calculation of average fiber diameter and fiber diameter dispersion.

(9) *Number of slides and fibers*. Each operator shall make a slide from each test specimens, making a total of four slide per operator. The number of fibers to be measured per slide shall be determined by dividing the approximate number of fibers to be measured per test by 8 (the total number of slides prepared per test). The minimum number of fiber measurements required for each test shall be the number needed to attain confidence limits of the mean within ±0.40 micron at a probability of 95 percent. Each operator shall measure approximately one-half the required number of fibers. The approximate number of fiber measurements needed for each of the grades-as listed in §32.100, table 1—may serve as a guide. However, the minimum number of fibers to be measured to attain the prescribed confidence limits can be calculated by using the equation shown below:

$$n=(1.96\sigma/0.40)^2$$

In this equation:

n=Number of fibers to be measured, and σ=Standard deviation of fiber diameters.

(10) *Calculation and report.* The measurements of both operators shall be combined and the following calculations made by using the applicable formulae shown below:

  (i) Total average diameter of fibers (X): $X=A+mE_1$

  (ii) The standards deviation (σ): $\sigma=m\sqrt{E_2-E_1^2}$

  (iii) The confidence limits of mean at 95 percent probability level=$X+(1.96\sigma/\sqrt{n})$

In the formulae stated above:

A=Midpoint of cell containing the smallest measurement.

m=Cell interval.

n=Total number of fiber measurements.

$$E_1=(\Sigma fx/n) \text{ and } E_2=(\Sigma fx^2/n), \text{ where}$$

Σ=Summation.

f=Observed frequency.

x=Deviation in Cells from A.

An example of the calculations is set forth below:

EXAMPLE OF CALCULATIONS: AVERAGE FIBER DIAMETER, STANDARD DEVIATION, AND CONFIDENCE LIMITS OF MEAN

Cell No.	Cell boundaries (microns)	A (microns)	Deviation in cells from A, x	Observed frequency f	fx	fx^2	Cumulative frequency	Cumulative percent
5	10.0 to 12.5.....	11.25	0	1	0	0	1	0.10
6	12.5 to 15.0.....	....	1	15	15	15	16	1.60
7	15.0 to 17.5.....	....	2	66	132	264	82	8.20
8	17.5 to 20.0.....	....	3	141	423	1,269	223	22.30
9	20.0 to 22.5....	....	4	165	660	2,640	388	38.80
10	22.5 to 25.0.....	....	5	176	880	4,400	564	56.40
11	25.0 to 27.5.....	....	6	138	828	4,968	702	70.20
12	27.5 to 30.0.....	....	7	99	693	4,850	801	80.10
13	30.0 to 32.5.....	....	8	79	632	5,056	880	88.00
14	32.5 to 35.0.....	....	9	55	495	4,455	935	93.50
15	35.0 to 37.5.....	....	10	35	350	3,500	970	97.00
16	37.5 to 40.0.....	....	11	9	99	1,089	979	97.90
17	40.0 to 42.5.....	....	12	8	96	1,152	987	98.70
18	42.5 to 45.0.....	....	13	6	78	1,014	993	99.30
19	45.0 to 47.5.....	....	14	4	56	784	997	99.70
20	47.5 to 50.0.....	....	15	0	0	0	997	99.70
21	50.0 to 52.5.....	...	16	3	48	768	1,000	100.00
Total	....			1,000	5,485			36,225

Number of measurements (n)=1,000.

A (midpoint of cell containing smallest diameter measurement)=11.25 microns.

m (cell interval)=2.5 microns.

$E_1=(\Sigma fx/n)=5,485/1000)=5.4850$ and $E_2=(\Sigma fx^2/n)=36,225/1,000)=36,2250$

12

Average diameter

$$X=A+{}^{mE}{}_1=11.25+2.5(5.4850)=24.96 \text{ microns.}[1]$$

Standard deviation, $\sigma=m\sqrt{E_2-E_1{}^2}=2.5\sqrt{36.2250-30.0852}=2.5(2.4779)=6.19$ microns.[1]

Confidence limits of mean at 95 percent probability level= $X\pm(1.96\sigma/\sqrt{n})=24.96\pm(12.1324/31.6127)=$ 24.96±0.38 micron.[1]

[1] Round off the calculated values of average fiber diameter, standard deviation, and confidence limit of the mean to 2 decimal places as follows: If the figure in the 3d decimal place is 4 or less, retain the figure in the 2d decimal place unchanged; otherwise, increase the figure in the 2d decimal place by 1.

(b) *Procedure for designating grade*—(1) *Single grade designation.* If the measured average diameter and the fiber diameter dispersion correspond to a single grade, that shall be the grade assigned.

Example: Average fiber diameter--30.94 microns

Fiber diameter dispersion	Percent
30 microns and under..	51
30.1 microns and over...	49
40.1 microns and over...	10
Grade designation--30s.	

(2) *Dual grade designation.* If the fiber dispersion does not meet the requirements for the grade to which the average fiber diameter corresponds, the mohair top shall be assigned a dual grade designation, the second designation being one grade coarser than the grade to which the average fiber diameter corresponds.

Example: Average fiber diameter--30.94 microns

Fiber diameter dispersion	Percent
30 microns and under..	45
30.1 microns and over...	55
40.1 microns and over...	16
Grade designation--30s--28s.	

SAMPLES REPRESENTATIVE OF OFFICIAL GRADES STANDARDS OF THE UNITED STATES FOR GREASE MOHAIR

§ 32.400   Standard samples of grease mohair grades; method of obtaining.

Samples certified as representative of the official standards of the United States for grades of grease mohair will be furnished as follows, subject to other conditions of this section, upon filing of an approved application and prepayment of the costs thereof as fixed in §32.401. The certification will be issued by the U.S. Department of Agriculture and will be signed by the Director of the Livestock Division or other official duly authorized by him.

(a) Samples representative of each of the standard grades of grease mohair:

(1) *Complete set*. Ten certified samples of grease mohair, grades 40s through 18s.

(2) *Individual sample*. Individual certified samples of grease mohair.

NOTE: A certified sample consists of grease mohair randomly selected from a bulk sample. The measured average and standard deviation of fiber diameter of bulk sample were within the limits corresponding to the grade of the standard sample as set forth in §32.1.

(b)   Each application for standard samples of grease mohair shall be upon an application form furnished or approved by the Consumer and Marketing Service, shall be signed by the applicant, and shall be accompanied by certified check, draft, post office money order, or express money order, payable to the "Agricultural Marketing Service," in an amount to cover the cost of the samples requested, and shall incorporate the following agreement.
  (1) That no samples representative of the official grease mohair standards shall be considered or used as representing such standards after cancellation in accordance with this section.
  (2) That the said standard samples shall be subject to inspection by the Secretary or by any duly authorized officer or agent of the Department of Agriculture during usual business hours of the person having custody of the samples.
  (3) That the certificate covering any of the samples representative of the standards may be revoked and canceled by the Director of the Livestock Division, if it is found upon such inspection that the said samples are not representative of the official standards.

§32.401 Cost of standard samples for grease mohair grades.
  (a) *Complete set*. $22 each, delivered to any destination with the United States and $25 each, delivered to any destination outside the United States.
  (b) *Individual sample*. $2.50 each, delivered to any destination within the United States, and $3 each, delivered to any destination outside the United States.

§32.402 Standard samples of mohair top grades; method of obtaining.
  Samples certified as representative of the official standards of the Unites States of grades of mohair top will be furnished when available as follows, subject to other conditions for this section, upon filing of an approved application and prepayment of the cost thereof as fixed in §32.403. The certification will be issued by the U.S. Department of Agriculture and will be signed by the Director of the Livestock Division or other official duly authorized by him.
  (a) Samples representative of the official grades of mohair top: (1) *Complete set*. Nine certified samples of mohair top, grades 40s through 20s.
  (2) *Individual sample*. Individual certified samples of mohair top, grades 40s through 20s.
  (b) Each application for standard samples of mohair top shall be upon an application form furnished or approved by the Agricultural Marketing Service, shall be signed by the applicant, and shall be accompanied by certified check, draft, postal money order, or express money order, payable to the "Agricultural Marketing Service," in an amount to cover the cost of the samples requested and shall incorporate the following agreement:
  (1) That no samples representative of the official mohair top standards shall be considered or used as representing such standards after cancellation in accordance with this section.
  (2) That the said standard samples shall be subject to inspection by the Secretary or by any duly authorized officer or agent of the Department of Agriculture during usual business hours of the

person having custody of the samples.

(3) That the certificate covering any of the samples representative of the standards may be revoked and canceled by the Director of the Livestock Division, if it is found upon such inspection that the said samples are not representative of the official standards.

§ 32.403   Cost of standard samples for mohair top grades.

(a) *Complete set*. Twenty-seven dollars each, delivered to any destination within the United States and $30 each, delivered to any destination outside the United States.

(b) *Individual sample*. Three dollars each, delivered to any destination within the United States, and $3.50 each, delivered to any destination outside the United States.