Designation: D1770 – 94 (Reapproved 2012)ε1

Standard Test Method for Neps, Vegetable Matter, and Colored Fiber in Wool Top[1]

This standard is issued under the fixed designation D1770; 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 This test method covers the determination of the number of neps and pieces of vegetable matter by size classes, and the number of colored fibers, in 15 g samples of wool top.[2]

1.2 This test method is applicable to wool top in any form.

NOTE 1—For the determination of number of neps per specified mass of cotton samples, refer to Test Method D1446.

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:*[3]

D123 Terminology Relating to Textiles

D1776 Practice for Conditioning and Testing Textiles

D1446 Method of Test for Number of Neps in Cotton Samples (Withdrawn 1977)[4]

D4845 Terminology Relating to Wool

2.2 *ASTM Adjuncts:*[5]

Nep Scale Standard (1 Photo), Vegetable Matter Standard (1 Photo)

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: colored fiber, *in wool top*; laboratory sample; lot, *in acceptance testing*; nep; test specimen, *for wool top*; top, *in wool*; vegetable matter.

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

4. Summary of Test Method

4.1 Four test specimens are taken and examined in accordance with specified procedures. Each observed nep or piece of vegetable matter is classified by size, by visual comparison with a specified standard size chart. The numbers of each class of neps and class of vegetable matter pieces, and the number of colored fibers, are recorded for each specimen. From these data the average counts per specimen of 15 g are calculated.

5. Significance and Use

5.1 Test Method D1770 for the determination of neps, vegetable matter, and colored fiber may be used for the acceptance testing of commercial shipments of wool top but caution is advised because the between-laboratory precision is known to be poor. 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 D1770 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.

[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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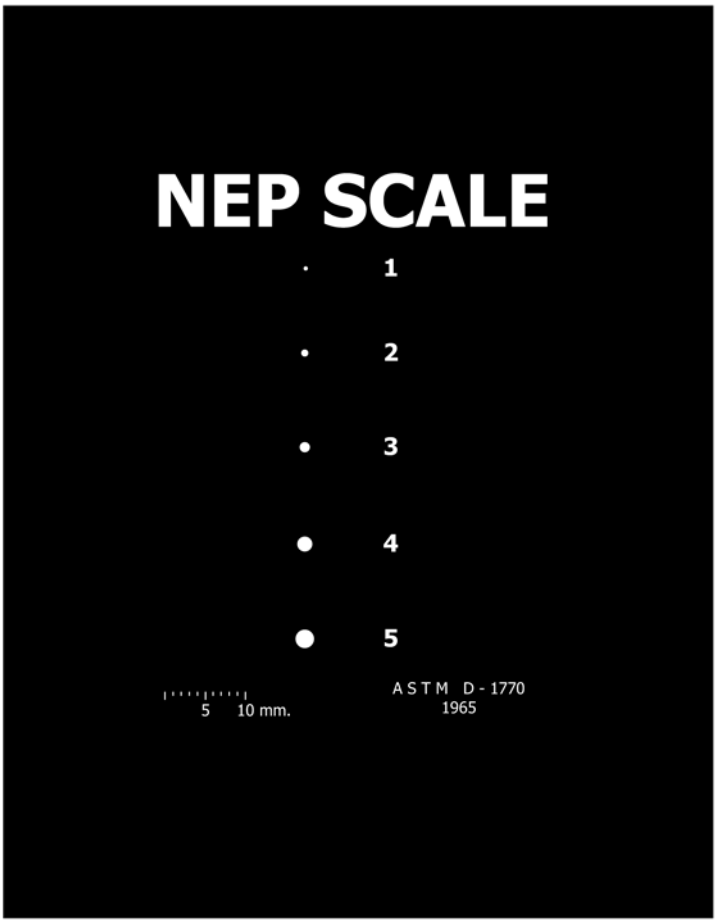
[2] For additional information, reference may be made to "Neps in Worsted Sliver," *Wool Science Review*, Vol 22, March 1963, pp. 28–38.

[3] 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.

[4] The last approved version of this historical standard is referenced on www.astm.org.

[5] Original prints of these illustrations are available from ASTM International Headquarters. Order Adjunct No. ADJD1770 for Nep Scale Standard and Vegetable Matter Standard.



NOTE 1—Figs. 1 and 2 should preferably not be used as substitutes for the original prints obtainable from ASTM.[5]

FIG. 1 Visual Standard

6. Apparatus

6.1 *Nep Scale Standard,* see Fig. 1 and ADJD1770.[5]

6.2 *Vegetable Matter Standard,* see Fig. 2 and ADJD1770.[5]

6.3 *Examination Surfaces,* consisting of a dark surface illuminated from above for nep test and a white surface illuminated from above for vegetable matter and colored fiber tests. Alternatively, a white translucent surface with underlighting may be used for all tests. When a translucent surface is used, colored fibers must be reexamined on an over-lighted white surface to avoid inclusion of medullated fibers.

6.4 *Tweezers,* with pointed ground ends.

6.5 *Balance or Scale,* capacity at least 25 g with a sensitivity of 0.01 g.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping containers directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider shipping containers to be the primary sampling units.

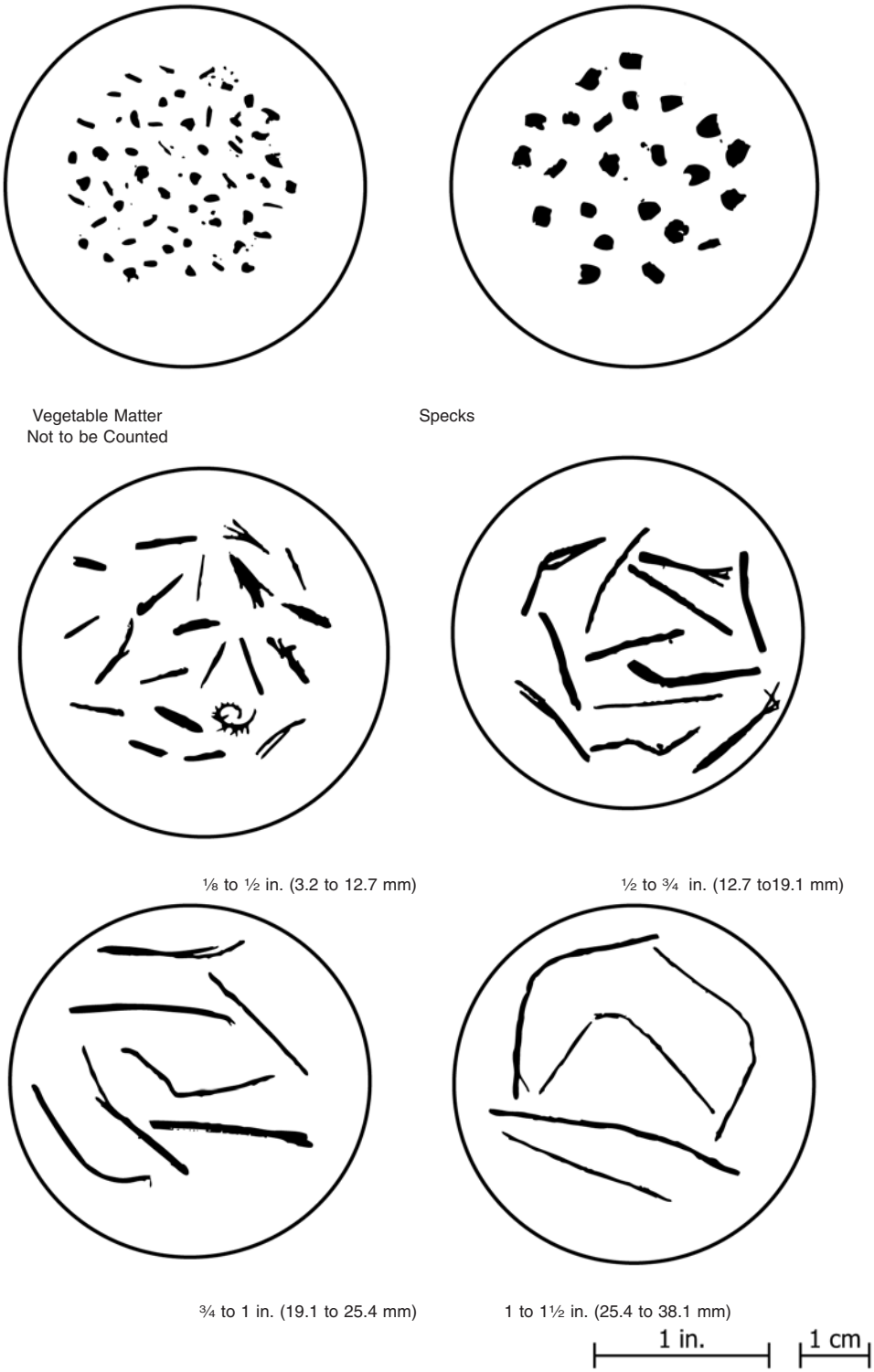
NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping containers, between laboratory samples within a shipping container, and between test specimens within a laboratory sample to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take from each shipping container in the lot sample the first 3 yd (3 m) of material from the lead end of the strand that has a clean, uniform appearance. If the shipping containers in the lot sample contain multiple packages, take a laboratory sample from one package drawn at random from each shipping container.

7.3 *Test Specimens*—After conditioning, take one test specimen from each unit in the laboratory sample by starting at a random location along the length of the sample and cutting with scissors a section long enough to weigh 15.00 ± 0.10 g, adjusting the length as needed to obtain the required mass. Record the mass of the conditioned specimen to the nearest 0.01 g.

8. Conditioning

8.1 Bring the laboratory samples to moisture equilibrium for obtaining test specimens in the standard atmosphere for testing textiles as directed in Practice D1776. Preconditioning is not necessary.



NOTE 1—Figs. 1 and 2 should preferably not be used as substitutes for the original prints obtainable from ASTM.[5]

FIG. 2 Vegetable Matter Classes

9. Procedure

9.1 Test each weighed specimen, in the prevailing atmosphere if preferred, as follows:

9.1.1 Draw a portion not exceeding one-tenth of the specimen and spread it over the prescribed examination surface.

9.1.2 Remove with tweezers each colored fiber and reserve for counting.

9.1.3 Also remove with tweezers each nep (except those obviously smaller than size 1 on the nep scale, Fig. 1), and each piece of vegetable matter (except those obviously smaller than the "specks" class, Fig. 2), and reserve for size classification and counting.

9.1.4 Repeat the operations described in 9.1.1 – 9.1.3 on additional portions of the specimen until the entire specimen has been treated.

9.1.5 Count and record the number of colored fibers removed from the specimen.

9.1.6 Classify each removed nep as to size by comparing it with the nep scale standard (see Note under Fig. 1), discard those classified as smaller than size 1, and count and record the number in each nep size class.

9.1.7 Classify each removed piece of vegetable matter as to size by comparing it with the vegetable matter standard (see Note under Fig. 2), discard those classified as smaller than "specks," and count and record the number in each vegetable matter size class.

NOTE 3—The original prints of the pictures on which Figs. 1 and 2 are based are available from ASTM and should be used in classifying neps or vegetable matter.

9.2 Calculate the test results as directed in Section 10.

10. Calculation

10.1 Calculate the total mass of the four specimens tested.

10.2 Calculate the total number of colored fibers in the four specimens, and the total number of observed neps in each size class and of pieces of vegetable matter in each size class.

10.3 *Colored Fiber*—Calculate to the nearest 0.1 unit the average number of colored fibers per 15 g of wool top using Eq 1:

$$F = f \times 15/w \quad (1)$$

where:

F = average number of colored fibers per 15 g of wool top.

f = total number of colored fibers in the four specimens, and

w = combined mass of the four specimens, in grams.

10.4 *Neps*—Calculate to the nearest 0.1 unit the average number of neps of each nep size class per 15 g of wool top, using Eq 2:

$$N_i = n_i \times 15/w \quad (2)$$

where:

N_i = average number of neps of nep size class i per 15 g of wool top,

n_i = total number of neps of nep size class i in the four specimens, and

w = combined mass of the four specimens, in grams.

10.5 *Vegetable Matter*—Calculate to the nearest 0.1 unit the average number of vegetable matter pieces of each size class per 15 g of wool top, using Eq 3:

$$V_j = v_j \times 15/w \quad (3)$$

where:

V_j = average number of vegetable matter pieces of size class j per 15 g of wool top,

v_j = total number of vegetable matter pieces of size class j in the four specimens, and

w = combined mass of four specimens, in grams.

10.6 *Combined "Defects"*— If the term "defects" is used to mean colored fibers, neps of stated size classes, and vegetable matter pieces of stated size, classes, then for any specified combination of defects, the average number of defects per 15 g of wool top may be calculated by using Eq 4:

$$D = d \times 15/w \quad (4)$$

where:

D = average number of specified defects per 15 g of wool top,

d = total number of specified defects in the four specimens, and

w = combined mass of four specimens, in grams.

10.7 *Conversion to 0.5-oz Sample Basis*— The average counts per 15 g of wool top may be converted to average counts per 0.5 oz by using Eq 5:

$$A = 0.945\,M \quad (5)$$

where:

A = average count per 0.5 oz of wool top,

M = average count per 15 g of wool top, and

0.945 = factor obtained from 15/(28.35/2).

11. Report

11.1 State that the specimens were tested as directed in Test Method D1770. Describe the lot of wool top and the method of sampling used.

11.2 Report the following information:

11.2.1 Number of specimens tested.

11.2.2 Average number of neps of each size class, average number of vegetable matter pieces of each size class, and average number of colored fibers per 15 g of wool top or, if required, per 0.5 oz.

11.2.3 Average number of combined specified defects per 15 g (or 0.5 oz), if required.

12. Precision and Bias

12.1 *Introduction*—Test results are reported as the average counts of specified defects per 15-g specimen of wool top. The precision of test results is evaluated in terms of the total count of a specified defect for all specimens included in each test result since such total counts have a Poisson distribution while the average defect counts do not have such a distribution. If the total counts for actual test results include bias due to systematic sampling or testing errors, the critical differences in Table 1 will be overly optimistic and the confidence limits in Table 2 will be widened by the existence of such bias.

12.2 *Interlaboratory Test Data*[6]—An interlaboratory test was run in 1976 in which randomly drawn samples of one ball

[6] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting RR:D13-1038.

TABLE 1 Value of *b* for Critical Differences in Defect Counts, *a* and *b*, for Two Test Results[A]

r = *a* + *b*	*b*	*r* = *a* + *b*	*b*	*r* = *a* + *b*	*b*	*r* = *a* + *b*	*b*
1	0	26	7	51	18	76	28
2	0	27	7	52	18	77	29
3	0	28	8	53	18	78	29
4	0	29	8	54	19	79	30
5	0	30	9	55	19	80	30
6	0	31	9	56	20	81	31
7	0	32	9	57	20	82	31
8	0	33	10	58	21	83	32
9	1	34	10	59	21	84	32
10	1	35	11	60	21	85	32
11	1	36	11	61	22	86	33
12	2	37	12	62	22	87	33
13	2	38	12	63	23	88	34
14	2	39	12	64	23	89	34
15	3	40	13	65	24	90	35
16	3	41	13	66	24	91	35
17	4	42	14	67	25	92	36
18	4	43	14	68	25	93	36
19	4	44	15	69	25	94	37
20	5	45	15	70	26	95	37
21	5	46	15	71	26	96	37
22	5	47	16	72	27	97	38
23	6	48	16	73	27	98	38
24	6	49	17	74	28	99	39
25	7	50	17	75	28	100	39

[A] The probability level for the critical difference is 95 % for two-sided limits. If the observed value of $b \leq$ the tabulated value, the two test results should be considered significantly different at the indicated probability level.

a = the larger of two counts, each of which is the total count for all specimens in a test result, and each of which is based on the same number of specimens,
b = the smaller of two counts taken as specified for *a*, and
r = *a* + *b*.

Where *r* > 100, use the following:

$$b = c - 1 - k\sqrt{c}$$

where:

b = calculated value of *b*, rounded to the nearest whole number,
c = *r*/2, and
k = 1.386 for the 95 % probability level.

of wool top were tested in each of five laboratories. Each laboratory used two operators, each of whom tested four specimens of the material. The average count per 14-g specimen were found to be: total neps, 40.5; total vegetable matter pieces, 9.5; colored fibers, 20.5. The test results indicated significant differences between laboratories and between operators within laboratories for neps and colored fibers, and between laboratories for vegetable matter pieces.

12.3 *Critical Differences*—Table 1 contains criteria for determining whether the total defect counts for two test results, each based on the same number of specimens of a stated size, should be considered significantly different at the 95 % probability level. No justifiable statement can be made about the between-laboratory precision of Test Method D1770 for testing the number of neps, vegetable matter pieces, and colored fibers in wool top until the amount of bias, if any, between the two specific laboratories has been established by comparisons based on recent data obtained on specimens randomly drawn from one sample of wool top of the type to be tested.

12.4 *Confidence Limits*—Table 2 shows the 95 % confidence limits for the total count of a specified defect or group of defects in a single test result obtained as directed in Test Method D1770.

12.5 *Bias*—The true values for the count of neps, vegetable matter, and colored fiber in wool top can be defined only in terms of a specific test method. Within this limitation, the procedures in Test Method D1770 have no bias.

12.5.1 Although the average results obtained by many operators in many laboratories should contain no bias, the results of the interlaboratory test suggest that differences sometimes exist between operators or between laboratories.

13. Keywords

13.1 impurity; vegetable matter; wool

TABLE 2 95 % Confidence Limits for Defect Counts per Test Results[A]

Observed Count	Lower Limit	Upper Limit	Observed Count	Lower Limit	Upper Limit
0	0.0	3.7			
1	0.0	5.6	26	17.0	38.1
2	0.2	7.2	27	17.8	39.3
3	0.6	8.8	28	18.6	40.5
4	1.1	10.2	29	19.4	41.6
5	1.6	11.7	30	20.2	42.8
6	2.2	13.1	31	21.1	44.0
7	2.8	14.4	32	21.9	45.2
8	3.4	15.8	33	22.7	46.4
9	4.1	17.1	34	23.5	47.5
10	4.8	18.4	35	24.4	48.7
11	5.5	19.7	36	25.2	49.8
12	6.2	21.0	37	26.0	51.0
13	6.9	22.2	38	26.9	52.2
14	7.6	23.5	39	27.7	53.3
15	8.4	24.7	40	28.6	54.5
16	9.1	26.0	41	29.4	55.6
17	9.9	27.2	42	30.3	56.8
18	10.7	28.4	43	31.1	57.9
19	11.4	29.6	44	32.0	59.1
20	12.2	30.8	45	32.8	60.2
21	13.0	32.1	46	33.7	61.4
22	13.8	33.3	47	34.5	62.5
23	14.6	34.5	48	35.4	63.6
24	15.4	35.7	49	36.2	64.8
25	16.2	36.9	50	37.1	65.9

[A] Lower confidence limit for counts = $c\,[1 - (1/9\,c) - t(1/9\,c)^{1/2}]^3$
Upper confidence limit for counts = $d\,[1 - (1/9\,d) + t(1/9\,d)^{1/2}]^3$

where:

c = observed number of counts,
d = $c + 1$, and
t = value of Student's t for infinite degrees of freedom, two-sided limits, and the specified probability level ($t = 1.960$ at the 95 % probability level).