



Standard Test Method for Overlength Fiber Content of Man-Made Staple Fiber¹

This standard is issued under the fixed designation D 3513; 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 determination of the percent by number of overlength or multiple length fibers in a sample of man-made cut staple. The method is applicable to fiber taken immediately after manufacturing, from the bale, or from partially processed stock.

NOTE 1—For measurement of length and length distribution of man-made staple fibers, refer to Test Method D 5103.

1.2 This test method covers procedures using the Fibrosampler Model 335A (inch-pound units), the Fibrosampler Model 335B (SI units), and Fibrosampler combs Model 336.

1.2.1 The Fibrosampler Model 335A is equipped with a sample plate that has 15.8-mm ($\frac{5}{8}$ -in.) diameter sample holes and is recommended for use on blended staple taken from the fiber blender or from a carding machine.

1.2.2 The Fibrosampler Model 335B is equipped with a sample plate that has 10-mm (0.4-in.) diameter sample holes and is recommended for use on unblended staple as may be taken from the fiber cutter or from a bale of staple fiber.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as the standard. The values stated in each unit are not exact equivalents; therefore, each unit must be used independently of the other.

1.4 *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 Textiles²
- D 1447 Test Method for Length and Length Uniformity of Cotton Fibers by Fibrograph Measurement²
- D 3333 Practice for Sampling Man-Made Staple Fibers, Sliver, or Tow for Testing³
- D 5103 Test Method for Length and Length Distribution of Man-Made Staple Fibers (Single-Fiber Test)

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles, and is the direct responsibility of Subcommittee D13.58 on Yarn and Fiber Test Methods.

Current edition approved Feb. 10, 1996. Published April 1996. Originally published as D 3513 – 76 T. Last previous edition D 3513 – 90.

² *Annual Book of ASTM Standards*, Vol 07.01.

³ *Annual Book of ASTM Standards*, Vol 07.02.

3. Terminology

3.1 Definitions:

3.1.1 *fiber beard, n*—in length testing of fibers, fibers caught randomly on a comb which are subsequently straightened and parallelized without stretching or damaging.

3.1.2 *staple, adj and n*—natural fibers or cut lengths from filaments.

3.1.2.1 *Discussion*—Commercial shipments of staple from man-made fibers should not include cut waste or short fibers of variable length made by breaking a tow or top. The term “staple (fiber)” is used in the textile industry to distinguish natural or cut length (fibers) from filaments.

3.1.3 *staple fibers, overlength, n*—man-made staple fibers that are at least 10 % longer than the nominal or average cut length.

3.1.4 *staple fibers, multiple-length, n*—man-made staple fibers that are two or more times the nominal cut fiber length.

3.1.5 For definitions of other textile terms used in this test method, refer to Terminology D 123.

4. Summary of Test Method

4.1 Fibers are caught randomly on a comb to form a fiber beard. The probability that a given fiber length group represented in the original fiber population will appear in the test specimen is proportional to the ratio of the total length of that fiber length group to the total fiber length of the original sample. The beard is biased in the favor of long fibers.

4.2 The fiber beard is brushed out and laid on a specimen board. The density of the beard of the cut staple tapers to a line that is parallel to the base of the comb. The overlength fibers are observed to extend beyond this line and they can be identified easily.

4.3 The noticeably longer fibers are pulled from the fiber beard, verified for over- or multiple-length and counted. The result is then expressed as the percent overlength and percent multiple-length fiber in the original population.

5. Significance and Use

5.1 The existence of overlength fiber in man-made staple can cause serious problems in the spinning of these fibers into yarn. Overlength fibers may create problems in carding, but more especially high-strength multiple cut fibers may cause cockling in spinning.

5.2 Since the overlength fibers are caused by dull or damaged cutting knives or by uneven flow of tow to the staple

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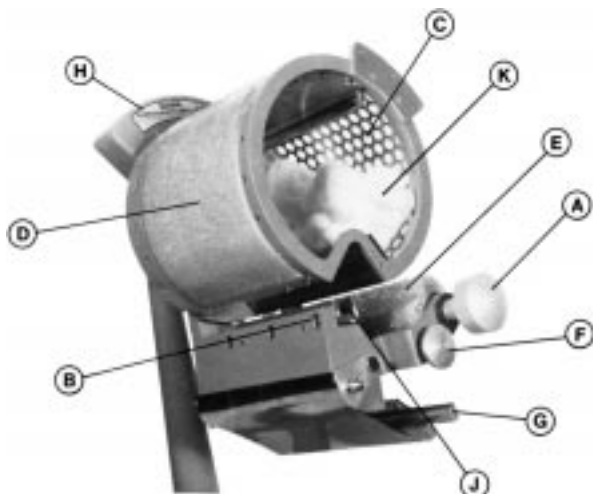


FIG. 1 Fibrosampler

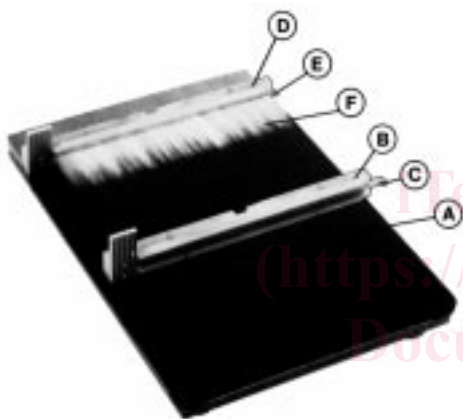


FIG. 2 Fibrosampler Combs

cutter, their existence within the fiber population is not uniform and their occurrence in the population follows a highly skewed distribution.

5.3 Manual methods of determining overlength fiber require much more operator time, and the standard deviations of the test between laboratories and operators are high. Use of the Fibrosampler method greatly reduces both operator time and standard deviation of testing.

5.4 In manufacturing it is important to know if fibers are overlength due to looping of the tow or multiple length due to damaged cutters.

5.5 This method for testing staple fiber for overlength fiber is not recommended for acceptance testing (see 13.1).

5.5.1 In some cases the purchaser and the supplier may have to test a commercial shipment of one or more specific materials by the best available method, even though the method has not been recommended for acceptance testing of commercial shipments. In such a case, if there is a disagreement arising from differences in values reported by the purchaser and the supplier when using this method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the supplier should be determined with each comparison being based on testing specimens randomly drawn from one sample of material of the type being evaluated.

6. Apparatus

6.1 *Fibrosampler*,⁴ Model 335A or 335B (Fig. 1), equipped with the following:

6.1.1 *Combs*,⁴ Model 336 (Fig. 2).

6.1.2 *Spacing Gage*.

6.1.3 *Specimen Board*, board covered with short pile or plush surface on one side, for displaying the test specimen.

6.1.4 *Brush*, for brushing the test specimen.

6.1.5 *Tweezers*, for removing the long fibers from the specimen board for verification.

NOTE 2—Fibrosampler Model 192, which is used for sampling cotton, (Method D 1447) has been used successfully with this method, but the above listed models and combs yield better results because long fibers are less likely to be pulled from the combs during beard preparation.

6.2 *Laboratory Carding Machine* or Opener/Blender Model 338⁴ is needed for use with Fibrosampler Model 335A.

6.3 *Analytical Balance*, capable of weighing the specimen to within 0.01 % of its mass.

6.4 *Scale*, graduated to the nearest 1 mm ($\frac{1}{16}$ -in.).

7. Sampling

7.1 *Lot Sampling*—As a lot sample for acceptance testing, take at random the number of shipping containers directed in the applicable material specification or other agreement between the purchaser and supplier, such as an agreement to use Practice D 3333 or Practice D 2258. Consider shipping containers to be the primary sampling units.

NOTE 3—An adequate specification or other agreement between the purchaser or supplier requires taking into account the variability between shipping units, between packages, ends or other laboratory sampling unit within a shipping unit if applicable, and within specimens from a single package, end or other laboratory sampling unit to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quantity level.

7.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at random from each shipping container in the lot sample the number of laboratory sampling units as directed in an applicable material specification or other agreement between purchaser and supplier such as an agreement to use Practice D 3333 or Practice D 2258. Preferably, the same number of laboratory sampling units are taken from each shipping container in the lot sample. If differing numbers of laboratory sampling units are to be taken from shipping containers in the lot sample, determine at random which shipping containers are to have each number of laboratory units drawn.

7.2.1 Take 100-g samples of staple fiber, sliver or top for each laboratory sampling unit.

7.3 *Test Specimens*—From each laboratory sampling unit, take one specimen. If the standard deviation determined for the laboratory sample is more than a value agreed upon between the purchaser and supplier, continue testing one specimen from each unit in the laboratory sample until the standard deviation for all specimens tested is not more than the agreed to value or, by agreement, stop testing after a specified number.

⁴ Available from Special Instruments Laboratory, Inc., 312 W. Vine Ave., P.O. Box 1950, Knoxville, TN. 37901.