



Designation: D 3660 – 90

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St., Philadelphia, Pa. 19103

Reprinted from the Annual Book of ASTM Standards, Copyright ASTM
If not listed in the current combined index, will appear in the next edition

Standard Test Method for Staple Length of Man-Made Fibers, Average and Distribution (Fiber Array Method)¹

This standard is issued under the fixed designation D 3660; 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 measurement of the average staple length and length distribution of man-made fibers using a fiber array method. It is applicable to any textile fiber in raw stock, sliver, top, or roving form having a nominal cut length in the range from 1 to 2.5 in. (25 to 64 mm).

1.1.1 When used to measure lengths of fiber at early stages of yarn processing (through roving), the method may not reflect the original staple length profile due to possible damage during processing and blending.

NOTE 1—This method replaces the Comb Method Option A previously published as Sections 8 through 15 of Test Method D 540, Method of Testing Man-Made Staple Fibers.² For determination of average length and length distribution of man-made fibers by single-fiber length machine, refer to Test Method D 3661, Test Method for Staple Length of Man-Made Fibers, Average and Distribution (Single-Fiber Length Machine Method).³

NOTE 2—For methods covering the determination of the average length and length distribution of natural fibers, refer to the following methods: for cotton, D 1440, Test Method for Length and Length Distribution of Cotton Fibers (Array Method)⁴ and D 1447, Test Method for Length and Length Uniformity of Cotton Fibers by Fibrograph Measurement;⁴ for wool, D 519, Test Method for Length of Fiber in Wool Top,⁴ D 1234, Method for Sampling and Testing Staple Length of Grease Wool,⁴ and D 1575, Test Method for Fiber Length of Wool in Scoured Wool and Card Sliver.⁴

1.2 *This standard does not purport to address the safety problems 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 Textiles⁴
 - D 1776 Practice for Conditioning Textiles for Testing⁴
 - D 3333 Practice for Sampling Man-Made Staple Fibers⁴

3. Terminology

3.1 Definitions:

3.1.1 *array, fiber length, n*—a series of individual fibers that are arranged in order based on fiber length or a series of

groups of fibers that represent essentially uniform lengths within a group and which are arranged in order based on group length.

3.1.2 *length distribution, n—of fibers*, a graphic or tabular presentation of the proportion or percentage (by number or by mass) of fibers having different lengths.

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

4. Summary of Test Method

4.1 A sorting apparatus consisting of two banks of parallel combs is used to straighten and parallel the fibers of a test specimen containing nominally 6400 fibers.

4.2 Fibers are drawn from one bank of combs and transferred to the other bank to align one end of each fiber with the base comb. Groups of fibers are then drawn from the far end of the second comb bank and laid out on a short cut-pile surface where their lengths are measured. The fiber pulls are classified in groups according to their observed lengths.

4.3 Each length group of fibers is weighed and the relative number of fibers calculated. The average staple length and the length distribution are calculated based on number of fibers.

5. Significance and Use

5.1 This test method is intended primarily for research and development, and arbitration. Although it can be used for quality control and product specifications, there are more economical procedures for these uses. The method may be used for acceptance testing even though information on between-laboratory precision is incomplete. In such a case, if there is a disagreement arising from differences in values reported by the purchaser and the seller when using this method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each comparison being based on testing specimens randomly drawn from one sampling unit of material of the type being evaluated.

5.2 The fiber array method provides information on the cut length and length distribution of a sample of cut staple fiber. The results can be plotted to show the length distribution as a function of fiber numbers in the sample.

5.3 Data obtained from fiber array tests may be used to judge the best draft-roll setting for fiber processing and the extent of fiber breakage during processing steps.

5.4 This method uses a sample size calculated to be 6400 fibers. Because this number is relatively large, the method can be expected to detect the presence of abnormally long fibers when these fibers are present to the extent of at least 4 in each 6400 fibers. The presence of these unusually long

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.57 on Fiber Test Methods, General.

Current edition approved July 27, 1990. Published September 1990. Originally published as D 3660 – 77 T. Last previous edition D 3660 – 81.

² Discontinued—See 1973 Annual Book of ASTM Standards, Part 25.

³ Annual Book of ASTM Standards, Vol 07.02.

⁴ Annual Book of ASTM Standards, Vol 07.01.