Designation: D2612 – 99 (Reapproved 2018)

Standard Test Method for Fiber Cohesion in Sliver and Top (Static Tests)[1]

This standard is issued under the fixed designation D2612; 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 describes the measurement of fiber cohesion as the force required to cause initial drafting in a bundle of fibers in sliver and top. The observed cohesive force required to separate the fibers is converted to cohesive tenacity based on the linear density of the specimen.

NOTE 1—For determination of fiber cohesion in dynamic tests, refer to Test Method D4120.

1.2 The values stated in SI units are to be regarded as standard. Inch-pound units appear in parentheses for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D76 Specification for Tensile Testing Machines for Textiles
D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D2258 Practice for Sampling Yarn for Testing
D3333 Practice for Sampling Manufactured Staple Fibers, Sliver, or Tow for Testing
D4120 Test Method for Fiber Cohesion in Roving, Sliver, and Top in Dynamic Tests
D4848 Terminology Related to Force, Deformation and Related Properties of Textiles

3. Terminology

3.1 *Definitions:*

3.1.1 *cohesive force, n— in sliver and top testing*, the force required to overcome cohesion of a test specimen held in a fixed position between two slowly separating clamps.

3.1.1.1 *Discussion*—In static tests, cohesive force is measured while a test specimen is held in fixed position between two slowly separating clamps. In dynamic tests, cohesive force is the force required to maintain drafting in a roving, sliver, or top.

3.1.2 *fiber cohesion, n*—the resistance to separation of fibers in contact with one another.

3.1.2.1 *Discussion*—This resistance is due to the combined effects of the surface characteristics, length, crimp, finish, and linear density of the fibers. Cohesion should not be confused with adhesion or sticking together as in a glutinous substance.

3.1.3 For definitions of other terms related to force and deformation in textiles, refer to Terminology D4848. For definitions of other textile terms used in this test method, refer to Terminology D123.

4. Summary of Test Method

4.1 The test procedure is based upon the measure of the maximum resisting force when a length of sliver or top is pulled in an axial direction. Specified lengths of sliver or top are placed in the clamps of a tensile testing machine and the maximum force developed during separation of the clamps is recorded. The cohesive tenacity is calculated in terms of the force per unit linear density of the tested specimen. The cohesive tenacity is considered a measure of the cohesion of the fibers in the specimen and is reported in micronewtons/tex (gf/denier).

5. Significance and Use

5.1 Fiber cohesion is related to the resistance to drafting encountered during textile processing and is affected by such fiber properties as surface lubrication, linear density, surface configuration, fiber length, and crimp.

5.2 Fiber cohesion is affected by the alignment of fiber in sliver in addition to the factors listed in 5.1. A half turn of twist in a 140-mm specimen has been found to increase the breaking

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[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.

force by 30 % and a full turn by 60 %. For this reason, care must be exercised in precise mounting of specimens.

5.3 For the same reason given in 5.2, card sliver gives a different breaking tenacity than draw sliver of the same fiber. Fibers are more aligned in draw sliver, resulting in lower cohesion.

5.4 Increasing the gage length of test specimens reduces the breaking force and apparent cohesion.

5.5 The mathematical relationship between the observed value for breaking tenacity and processability has not been established, but the observed values can be used in comparing various fiber characteristics on a relative basis.

5.6 This method for measuring fiber cohesion in sliver or top (static tests) is not recommended for acceptance testing because it is an empirical method which must be followed explicitly. Results obtained under other conditions cannot be expected to be comparable.

5.6.1 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 case of dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and 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, which are as homogeneous as possible and which are from a lot of material of the type in question. Test specimens then should be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using appropriate statistical analysis and a probability level chosen by the two parties prior to testing. 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 with consideration to the known bias.

6. Apparatus and Material

6.1 *Tensile Testing Machine,* a constant-rate-of-specimen-extension (CRE) type, conforming to Specification D76, having adequate response characteristics to properly record the load-elongation curve of the sliver under test. The capacity of the machine must be selected for the maximum force to fall within 50 to 90 % of full scale.

6.2 *Balance,* having a capacity of at least 10 g and a sensitivity of 0.01 g.

6.3 *Clamps,* preferably pneumatically operated, with faces at least 12.5 mm (0.5 in.) wider than the test specimen, in the dimension perpendicular to the direction of load application, and at least 25 mm (1.0 in.) in the dimension parallel to the direction of load application.

6.4 *Mounting Template*—A sheet of paper approximately 215 by 280 mm (8.5 by 11 in.), or a longer length when the specimen length exceeds 280 mm with a 75-mm (3.0 in.) diameter hole cut in the center is used as a mounting board. Two gage reference lines, separated by a distance equal to the desired specimen length, are drawn across the short dimension of the paper. The hole is centered between the two reference gage lines.

6.5 *Tape,* cellophane adhesive or masking type, 13-mm (0.5-in.) wide.

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 D3333 or Practice D2258. Consider shipping containers to be the primary sampling units.

NOTE 2—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 D3333 or Practice D2258. 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 Each laboratory sampling unit should be at least 100 m (100 yd) long.

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.

8. Preparation of Test Specimens

8.1 Take the test specimens at random from the laboratory sample to be tested. Take care that the specimen is neither stretched nor distorted.

8.2 For slivers produced on a short-fiber processing system, such as the cotton system, take specimens having a length equal to the nominal staple length plus 4.0 in. (100 mm). For top produced on a long-fiber system of processing, such as the worsted system, take specimens having a length equal to the fiber length determined from a fiber sorting, plus 4.0 in. (100 mm).

8.2.1 Use the staple length determined by a classer using the hand-stapling technique in the case of cotton, or assigned by the fiber producer to man-made fibers developed for processing