Designation: D7025 – 09 (Reapproved 2021)ε1

Standard Test Method for Assessing Clean Flax Fiber Fineness[1]

This standard is issued under the fixed designation D7025; 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—Research report information was added to Section 18 editorially in August 2021.

1. Scope

1.1 This test method provides two options that cover the determination of the fineness of clean loose flax fibers by: Option 1, measuring the specific surface area by the resistance of a plug of flax fibers to air flow under prescribed conditions, or Option 2, estimating the mass per unit length.

NOTE 1—For other methods for determining the fineness of fibers refer to Appendix X1.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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]

D123 Terminology Relating to Textiles

D1441 Practice for Sampling Cotton Fibers for Testing

D1577 Test Methods for Linear Density of Textile Fibers

D1776/D1776M Practice for Conditioning and Testing Textiles

D6798 Terminology Relating to Flax and Linen

3. Terminology

3.1 For terminology relating to Flax, see Terminology D6798.

3.1.1 The following terms are relevant to this standard: fineness index and specific surface index.

3.2 For definitions of all other textile terms, see Terminology D123.

4. Summary of Test Method

4.1 Using Option 1, a predetermined mass of clean loose flax fibers generated by using a mechanical blender is placed in the specimen holder and compressed to a fixed volume.

4.1.1 The resistance to airflow is measured using a cotton fiber instrument that provides a reading. This reading is converted to a specific surface index which is derived from the linear density of flax.

4.2 Using Option 2, the average linear density of single fibers in a bundle is calculated from mass and length measurements on the bundle and the number of single fibers in the bundle.

NOTE 2—There may be no overall correlation between the results obtained with Options 1 and 2. Consequently, these two options cannot be used interchangeably. In case of controversy, Option 1 shall prevail.

5. Significance and Use

5.1 This test method for determining fineness of cleaned flax fibers is considered satisfactory for acceptance testing of commercial shipments when the levels are controlled by use of a range of calibration standards.

5.1.1 If there are differences of practical significance between reported test results for two or more laboratories, comparative tests should be performed by those laboratories to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, use test samples that are as homogenous as possible, are drawn from the material from which the disparate test results were obtained, and are randomly assigned in equal numbers to each laboratory for testing. These test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or

[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.17 on Bast Fibers and Plants.

Current edition approved Feb. 1, 2015. Published August 2021. Originally approved in 2004. Last previous edition approved in 2015 as D7025–09 (2015)ε1. DOI: 10.1520/D7025-09R21E01.

[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.

future test results for that material must be adjusted in consideration of the known bias.

5.2 The resistance that a plug of flax fibers offers to the flow of air is measured as an approximate indication of the average relative fineness of the fibers.

5.2.1 The total surface area of finer fibers has a larger per unit mass and increased resistance to airflow than do coarser fibers.

5.3 Instruments are available to indicate the resistance to air flow using either compressed air or a vacuum; and are constructed *(1)* to measure airflow under constant pressure drop across the plug, *(2)* to measure pressure drop when a constant flow of air is maintained, or *(3)* to indicate resistance to air flow from both a balanced and unbalanced Wheatstone bridge.

5.4 The reliability of the results of any test method depends primarily upon how well the specimens tested represent the original source material. Flax fibers are different from many textile fibers, such as cotton or synthetic ones, in that they are not individual filaments but bundles of fibrous material that may or may not be completely separated into individual filaments and therefore have a high degree of variability. While cleaning and processing can produce separation and changes in length, there is no certainty of fibrillation of the fibrous material.

NOTE 3—A modification of this test method can be used in commercial trading to select bales that will conform to contract guarantees for specified specific surface index. For this purpose, the usual practice to test only one specimen per sample.

5.4.1 This specific surface index reading is related to the average linear density of single fibers in a bundle calculated from mass and length measurements on the bundle and the number of single fibers in the bundle.

5.5 The specific surface index of flax fibers may be a function of fineness, degree of retting, cleanliness, variety, bundle separation, and plant maturity harvest date. This fineness of flax fibers affects their mill processing and spinning performance as well as contributes significantly to the appearance and strength of the yarns produced.

5.6 The accuracy of weighing can be controlled by the number of fibers composing the bundle. However, with short fiber of low linear density the number of fibers to be counted becomes prohibitive unless the bundle mass is kept low.

6. Apparatus and Materials

6.1 *Air-Flow Instrument,*[3] a device calibrated in micronaire readings or yielding numerical readings from which specific surface index readings can be computed.

6.2 *Balances,* with one having a capacity suitable for mass of the specific surface index specimen to be used and sensitivity of at least 0.2 % of the mass and another for linear density having a capacity of 15 mg and sensitivity of at least 0.005 mg.

6.3 *Air Supply,* to furnish the required pressure or vacuum to operate the instrument in accordance with the manufacturer's instructions.

6.4 *Fineness Calibration Standards,* viscose rayon fibers reduced to 5 cm with a nominal linear density of 1.1, 1.5, or 3.0 denier and a nominal specific surface fineness index value of 2.55, 2.9, or 4.0.

6.5 *Mechanical Cutting Device, Template, Stelometer Clamps, or Die,* having a precision of 0.1 % designed to permit cutting fibers of a specified length.

6.6 *Stationary Coarse Comb,* approximately 63 mm in width and having needles approximately 12.5 mm in length and spaced 19 needles to the centimeter.

6.7 *Mechanical Blender,* to open and blend the flax fibers.

7. Sampling and Selection of Specimens

7.1 Take the test specimen by random sampling from the laboratory sample prepared as recommended in Practice D1441.

7.1.1 Pass the test specimen through a mechanical blender to open and blend fibers as directed in 6.1 of recommended Practice D1441.

8. Conditioning

8.1 Bring the laboratory sample from the prevailing atmosphere to moisture equilibrium for testing which is 21 °C ± 1 °C (70 °F ± 2 °F) and 65 % ± 2 % relative humidity and check the equilibrium as directed in Practice D1776/D1776M. No preconditioning is required.

OPTION 1: SPECIFIC SURFACE INDEX FINENESS

9. Scope

9.1 This option covers the fineness measurement by resistance to airflow which is converted to the specific surface index to help characterize fibers by approximating the fineness. (See Note 2.)

10. Procedure

10.1 Test the conditioned calibration specimens in the atmosphere for testing textiles.

10.1.1 Set up and adjust the instrument as directed in the manufacturer's instructions.

10.1.2 Adjust the instrument if necessary to secure values, which correspond to the values assigned to the Calibration Reference Standards at the beginning of each testing period.

10.2 Use a mechanical blender twice to open and blend each standard viscose rayon fiber.

10.3 Using 5 g specimens, make two tests with each standard viscose rayon fiber.

10.3.1 When the average of the two results is not within 0.1 unit of the established specific surface index reading, recheck the instrument and the technique used by the operator.

10.3.2 Check the instrument against the standards again at the end of each testing period.

[3] Apparatus and accessories are commercially available.