



Standard Test Method for Water Retention of Textile Fibers (Centrifuge Procedure)¹

This standard is issued under the fixed designation D 2402; 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 water retention of man-made and natural fibers as staple, tow, or filament and spun yarns. It is intended to give a measure of the amount of water which cannot be removed from thoroughly wetted fiber solely by mechanical means as applied by centrifugal force (see 3.1.2).

1.2 *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.* For specific precautionary statements, see Section 9.

2. Referenced Documents

2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles²
- D 629 Test Methods for Quantitative Analysis of Textiles²
- D 1776 Practice for Conditioning Textiles for Testing²
- D 2258 Practice for Sampling Yarn for Testing²
- D 2494 Test Method for Commercial Mass of a Shipment of Yarn or Man-Made Staple Fiber or Tow²
- D 3333 Practice for Sampling Man-Made Staple Fibers, Sliver, or Tow for Testing³
- D 4920 Terminology Relating to Moisture in Textiles³

3. Terminology

3.1 Definitions:

3.1.1 *moisture pick-up*—as in Terminology D 4920.

3.1.2 *water retention, n*—the water remaining in and on a material after a specified mechanical treatment.

3.1.2.1 *Discussion*—In this test method, water retained by fiber masses includes water absorbed from the prevailing atmosphere, water imbibed during (not following) immersion, and water adhering to fiber surfaces after being subjected to 1000 times normal gravitational acceleration (*g*) for 5 min.

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. This version of Test Method D 2402 corrects the error in Eq 2 that was introduced in the 1978 edition and mistakenly used the moist fiber mass instead of the moisture mass and replaces the conditioned fiber basis introduced in the 1990 edition to the previous dried fiber basis.

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² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 07.02.

TABLE 1 Analysis of Data

	Cotton			Polyester		
	Oper 1	Oper 2	Combined	Oper 1	Oper 2	Combined
Number	12	12	24	12	12	24
Average in %	30.20	32.80	31.46	4.821	4.077	4.453
Standard deviation	0.860	0.859	1.566	0.257	0.426	0.525
% CV			4.98			11.79

Water retention is traditionally based on the oven-dried fiber mass and, as such, is a type of moisture pick-up.

3.2 For definitions of other moisture terms related to textiles, refer to Terminology D 4920.

4. Summary of Test Method

4.1 A specimen is thoroughly wetted-out by immersion, centrifuged for 5 min at an acceleration of 9800 m/s² and weighed wet. Then, the wet specimen is dried and reweighed. Water retention is calculated and reported as a percentage of the dry mass.

5. Significance and Use

5.1 This test method for testing for water retention of fibers after centrifuging is not recommended for acceptance testing of commercial shipments because the test is more appropriate for development and research. However, if the test is to be used for acceptance testing, comparative tests as described in 5.1.1 are advised.

5.1.1 In the case of a dispute arising from differences in reported test results using Test Method D 2402 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if statistical biases exist between their laboratories. 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 the Student's *t*-test for unpaired data with an acceptable probability level chosen by the two parties while designing the test program. If the analysis shows a bias, its cause must be found and corrected, or the purchaser and supplier must agree to interpret future test data with consideration for the known bias.

5.2 The amount of water retained by a fiber mass increases with an increase in the hydrophilic tendency of the fiber. Thus the data obtained can be used to indicate the following: