

# Test Method for Absorbency of Textiles

Developed in 1954 by AATCC Committee RA34; Jurisdiction transferred in 2003 to AATCC Committee RA63; reaffirmed 1968, 1972, 1975, 1979, 1992, 2000, 2014, 2018; editorially revised and reaffirmed (with title change) 1986; revised 1995, 2007 (with title change), 2010; editorially revised 2012, 2016, 2019.

## Foreword

The original test method for the measurement of absorbency of bleached textiles was developed to help textile dyeing and finishing mills determine the effect and efficiency of textile preparation and processing applications. Later, the test method was used as one of several measurements for judging water resistance and repellency (i.e., non-absorbency) of textile finish applications. After some time, the test method was also used to judge the durability of textile applications to home laundering.

Option B has been added to AATCC TM79 to recognize variations from the original procedure that have come into use by retailers and independent laboratories. Option B was first published as an unofficial method in the 2004 AATCC/ASTM International's *Concept 2 Consumer Technical Supplement: A Compilation of Procedures and Guidelines for Textile Products*, TS-018, and as MM-TS-01 Quick Water Absorbency procedure in the 2008 AATCC/ASTM International's *Moisture Management Technical Supplement: Applicable to Apparel, Linens and Soft Goods* (see 12.1).

Because the rate of water flow (drops per milliliter) and height above the specimen (mm) can be accurately and precisely determined for Option A, this option is more rigorously controlled. Therefore, in case of dispute, Option A is to be considered the reference procedure.

## 1. Purpose and Scope

1.1 The test method is for the determination of the water absorbency of yarns, fabrics and garments. It can be used on textiles of any fiber content or construction, including woven, knit and non-woven.

## 2. Principle

2.1 A drop of water is allowed to fall from a fixed height onto the taut surface of a test specimen. The wetting time re-

quired for a drop of water to lose any light reflection and change to a dull, wet spot is recorded.

## 3. Terminology

3.1 **absorbency**, n.—the propensity of a material to take in and retain a liquid, usually water, in the pores and interstices of the material.

NOTE: Absorbency is sometimes referred to as wettability.

3.2 **wetting**, n.—the time required for a drop of water to lose its light reflection characteristic, i.e., when it changes to a dull, wet spot due to the absorbent propensity of a textile material.

3.3 **textile product**, n.—an article of fabric, or other flexible material, made to protect or decorate the body (garments), for use in the home (bedding, drapery, towels, table linens), or other uses (i.e., handkerchiefs, etc.).

## 4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

## 5. Uses and Limitations

5.1 Absorbency is one of several factors that influence textile processing such as fabric preparation, dyeing, and the application of finishes. Often interchanged with the term wettability, the absorbency characteristics of a fabric can influence the uniformity and completeness of bleaching and dyeing by the ability to take in water into the fiber, yarn, or fabric construction. The suitability of a fabric for a particular use, for example gauze or toweling, may also be dependent upon a fabric's ability and propensity to take in water.

5.2 Water absorbency may help judge or interpret "comfort." However, users of AATCC TM79 should be cautioned that its test results should not be the only criterion for the assessment of comfort (see

the 2008 AATCC/ASTM International's *Moisture Management Technical Supplement: Applicable to Apparel, Linens and Soft Goods*, p19) (see 12.1).

5.3 Users of the AATCC TM79 should be cautioned about the interpretation of results that may be impacted by whether the face or the back of a textile fabric is tested. If the objective is to measure the absorbency of finishing, processing or durability to laundering, the face side of a sample would be exposed to water during the test. However, if the objective of performing the test is to evaluate the absorbency of a textile for further processing, then the side of the textile that would be worn next to the skin would be exposed to the water drops during testing. Further, if textiles are used in a product as a composite, the absorbency of the individual fabrics will be different than that of the end product.

5.4 If liquids other than distilled water are used to perform this test method, test results might not be comparable.

5.5 It is not known how test results from this test method would compare to other absorbency test methods.

5.6 No statement can be made about the comparison or correlation of the results between Options A and B in this method.

## 6. Apparatus (see 12.2)

6.1 Beaker, with opening of a size that allows for the support of the outer edge of the specified embroidery hoop.

6.2 Option A: Burette,  $10 \pm 0.05$  mL with 0.5 mL graduations that allows a delivery rate of 15-25 drops per milliliter.

6.3 Option A: Burette stand.

6.4 Distilled or deionized water,  $21 \pm 2^\circ\text{C}$  ( $70 \pm 4^\circ\text{F}$ ).

6.5 Embroidery hoop,  $152 \pm 5$  mm ( $6.0 \pm 0.2$  in.) in diameter (see 12.1).

6.6 Stopwatch or timer.

6.7 Option B: Medicine dropper, 76 mm glass, 2mL capacity, capable of dispensing 20 drops per milliliter.

## 7. Test Specimens

7.1 Take two  $200 \pm 5 \times 200 \pm 5$  mm specimens from each sample on which a total of five water drop sites can be tested. If sufficient fabric is available, five specimens from different locations of a sample (i.e., different length  $\times$  width locations; side-middle-side locations on a sample cut; or front-back-sleeve garment panels) can be prepared for each water drop test site. Otherwise, five water drop

tests may be performed on one specimen if the test sites are at least  $25 \pm 2.5$  mm ( $1 \pm 0.12$  in.) away from the hoop edge and no closer together than  $25 \pm 2.5$  mm ( $1 \pm 0.12$  in.) from the previous water drop test site's outside edge. For performing the 5-drop testing on garments or full cuts of a sample, it may not be necessary to cut specimens from the actual sample but insert different areas in the embroidery hoop.

7.2 If performing tests on yarns, skeins should be prepared in such a way that there are no gaps between individual yarn wraps when inserted into the embroidery hoop.

7.3 Specimens should be brought to moisture equilibrium in a standard atmosphere according to ASTM D1776, Standard Practice for Conditioning and Testing Textiles (see 12.3) having a relative humidity of  $65 \pm 5\%$  at  $21 \pm 2^\circ\text{C}$  ( $70 \pm 4^\circ\text{F}$ ). If the absorbency of a fabric from a wet processing stage is required, such as after bleaching, specimens for testing should be air dried before conditioning prior to testing (see 12.4).

## 8. Procedure

8.1 Perform all tests in the standard atmosphere for testing.

8.2 Option A – Burette.

8.2.1 Select a location in the conditioned laboratory area that has overhead lighting to facilitate the judgment of the test end point; i.e., wetting (see 3.2).

8.2.2 Determine the burette's stopcock position that will deliver the specified number of water drops (see 6.2).

8.2.3 Mount a specimen in an embroidery hoop so that the side of the specimen to be tested is up and the surface specimen is taut and free of wrinkles but without stretching or distorting the structure of the fabric.

8.2.4 Place the embroidery hoop with the specimen surface  $10 \pm 1.0$  mm ( $0.394 \pm 0.04$  in.) below the tip of the burette and allow one drop of distilled or deionized water to fall on the cloth. Start the stopwatch or timer immediately. Observe the water drop without moving the beaker with the specimen from under the burette to avoid disturbance of the water drop and its interface with the specimen surface.

8.2.5 Stop the timer or stopwatch when

the drop of water loses its reflectivity (see 3.2). If the water drop does not immediately disappear, observe the water drop from other positions until it finally vanishes. The end point will be the time, less than 60 s, it takes for the water drop to no longer reflect light and appear only as a dull wet spot.

8.2.6 Record the elapsed time to the nearest second. If the water drop disappears immediately, record as "zero." If the wetting time exceeds 60 s, record the time as "60 + s."

8.2.7 Repeat steps 8.2.4-8.2.6 for the additional four test locations.

8.3 Option B – Medicine Dropper.

8.3.1 Follow steps 8.2.3-8.2.6 except using the specified medicine dropper that is held at an approximate 10 mm height from the test specimen surface is used. A  $10 \pm 1.0$  mm height sighting device can be made to help assure consistent height placement of the medicine dropper. Do not move the specimen in the embroidery hoop until the water drop no longer reflects light and the site appears only as a dull wet spot. Record the time it takes for a water drop to disappear as stated in 8.2.6. Repeat the steps for all specimens.

## 9. Calculation and Interpretation

9.1 For Options A and B.

9.1.1 Calculate the average and the standard deviation of the five recorded times and report to the nearest second. In the case where the five tests include immediate absorption times ("zeroes"), the average should be calculated using all times including zero(s). In the case where some of the five tests include absorption times greater than 60 s (60 +), use all of the wetting times to calculate the average and report with a plus sign (+) and note the number of tests that exceeded 60 s.

9.1.2 Shorter times indicate better absorbency.

## 10. Report

10.1 Report the average absorbency time and standard deviation, if desired.

## 11. Precision and Bias

11.1 Precision.

11.1.1 *Interlaboratory Study.* Tests for

absorbency of textiles using Options A and B were conducted in 2009, with one laboratory, three operators, and six samples. The samples were (a) bleached cotton nonwoven, (b) 100% cotton jersey knit, (c) 100% cotton interlock knit, (d) 100% cotton twill weave, (e) cotton/polyester blend woven, and (f) 100% polyester woven.

11.1.2 The analysis of variance technique was applied to the data set. The analysis of variance indicated that there was no significant variation due to the fabric, operator or day. Therefore, all data were combined to calculate the precision of the test method. All data and the analysis are being retained for reference at the AATCC Technical Center.

11.1.3 The data for Option A is shown below in Table I. The average for all 180 points was 11 s, the standard deviation was 16 s, and 95% confidence interval was  $\pm 2$  s.

11.1.4 The data for Option B is shown below in Table II. The average for all 180 points was 9 s, the standard deviation was 14 s, and 95% confidence interval was  $\pm 2$  s.

11.1.5 *Between-laboratory* precision has not been established for this test method. Until such precision information is available, users of the method should use standard statistical techniques in making any comparison of test results for *between-laboratory* averages.

11.2 *Bias.* The true value of absorbency of textile fabrics can be defined only in terms of a test method. There is no independent method for determining the true value. In estimating this property, the test method has no known bias.

## 12. Notes

12.1 Available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: +1.919.549.8141; fax: +1.919.549.8933; e-mail: [ordering@aatcc.org](mailto:ordering@aatcc.org); web site: [www.aatcc.org](http://www.aatcc.org).

12.2 These items may be obtained from any lab equipment supplier.

12.3 Available from ASTM International, 100 Barr Harbor Dr., W. Conshohocken PA 19428; tel: +1.610.832.9500; fax: +1.610.832.9555; web site: [www.astm.org](http://www.astm.org).

12.4 It has been observed that if specimens collected at drying cans are not brought to moisture equilibrium, the wetting times could falsely indicate poor absorbency for that fabric.