Association of Textile, Apparel & Materials Professionals

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Water Resistance: Impact Penetration Test

Developed in 1945 by AATCC Committee RA63; revised 1952, 2000; reaffirmed 1957, 1961, 1964, 1967, 1971, 1977, 1980, 1989, 2007, 2013; editorially revised and reaffirmed 1985, 1994; editorially revised 1986, 1987, 2009. Technically equivalent to ISO 18695.

1. Purpose and Scope

1.1 This test method is applicable to any textile fabric, which may or may not have been given a water-resistant or water-repellent finish. It measures the resistance of fabrics to the penetration of water by impact, and thus can be used to predict the probable resistance of fabrics to rain penetration. It is especially suitable for measuring the penetration resistance of garment fabrics.

1.2 The results obtained with this test method depend on the water repellency of the fibers and yarns and on the construction and finish of the fabric.

2. Principle

2.1 A volume of water is allowed to spray against a taut surface of a test specimen backed by a weighed blotter. The blotter is then reweighed to determine water penetration and the specimen is classified accordingly.

3. Terminology

3.1 **water resistance,** n.—*of fabric*, the characteristic to resist wetting and penetration by water. (See also *water repellency.*)

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. Apparatus and Materials

5.1 Impact penetration testers

5.1.1 Type I tester (see 11.1, Figs. 1, 3 and 4)

Fig. 1—Impact penetration Type I tester.

Fig. 2—Impact penetration Type II tester.

5.1.2 Type II tester (see 11.1, Figs. 2, 3 and 4)

5.2 White AATCC Textile Blotting Paper (see 11.2)

5.3 Water, distilled, deionized or reverse osmosis

5.4 Balance accurate to 0.1 g

6. Test Specimens

6.1 A minimum of three specimens are taken, each 178 × 330 mm, with the warp (machine direction of the fabric) in the long direction. The specimens and the blotting paper should be conditioned in an atmosphere of 65 ± 2% RH and 21 ± 1°C (70 ± 2°F) for at least 4 h before testing.

7. Procedure

7.1 One end of the specimen is clamped under the 152 mm spring clamp at the top of the inclined stand. Another 152 ± 10 mm clamp, of 0.4536 kg total mass, is clamped at the free end of the test specimen. A standard blotter paper 152 × 230 mm is weighed to the nearest 0.1 g and inserted beneath the test specimen.

7.2 A 500 ± 10 mL volume of distilled, deionized or reverse osmosis water at 27 ± 1°C is poured into a funnel of the tester and allowed to spray onto the test specimen. The water should be poured into the funnel without imparting any swirling motion of the water in the funnel. (A small blade fixed to the inside of the funnel and

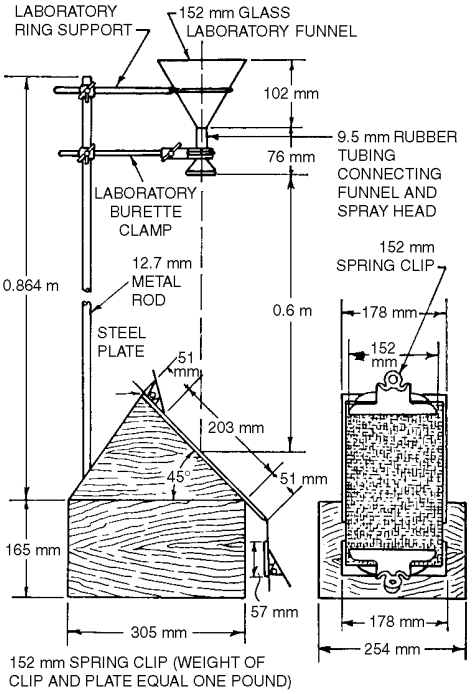

Fig. 3—Structural details of impact penetration tester.

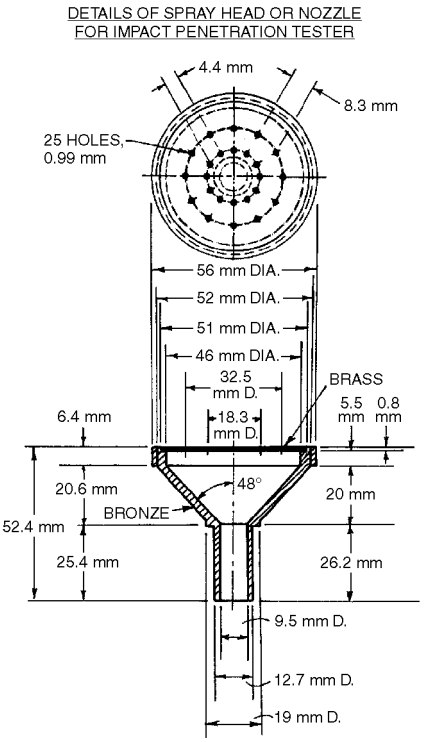

Fig. 4—Details of spray head.

extending down its side, will prevent any swirling motion from being initiated.)

7.3 Upon completion of the spraying period, the test specimen is carefully lifted, the blotter beneath removed, and then quickly reweighed to the nearest 0.1 g.

8. Evaluation

8.1 The increase in mass of the blotter in grams is calculated and the average result of the three test specimens is reported. Individual determinations or average values of over 5.0 g may be simply reported as + 5.0 g or > 5.0 g.

9. Report

9.1 Report the individual determinations and the average. For values of over 5.0 g simply report as + 5.0 g or > 5.0 g.

9.2 Report the test method number and which piece of equipment was used.

10. Precision and Bias

10.1 *Precision.* In 1998, a limited intralaboratory study was completed. The same operator tested all samples.

10.1.2 Three sets of fabrics were analyzed using both pieces of equipment. Each fabric was evaluated 15 times and averages calculated for each group of three. This single laboratory data set was analyzed and used in writing a temporary precision statement, pending a full interlaboratory study. Until a full study is completed, users of the method are advised to exercise conventional statistical caution in making any comparisons of test results and apply these findings with due caution.

10.1.3 Variances ranged in value from 0.1-0.4 with an average value of 0.23 (standard deviation = 0.48) for the Type I tester, as determined by analysis of variance. Critical differences, based on these values and a 95% probability level, may be applied to determine significance (see Table I).

10.1.4 Variances ranged in value from 0.0-0.1 with an average value of 0.01 (standard deviation = 0.10) for the Type II tester, as determined by analysis of variance. Critical differences, based on these values and a 95% probability level, may be applied to determine significance (see Table II).

10.2 *Bias.* The values derived by this procedure can be defined only in terms of a test method. There is no independent, referee method for determining the true value. This test method has no known bias.

11. Notes

11.1 Impact Penetration Testers (see Figs. 1, 2, 3 and 4). These testers, Types I and II, are a combination of the spray test apparatus used in AATCC Method 22, Water Repellency: Spray Test, plus the impact penetration head and stand. The Type II tester is a more sturdy version of the Type I tester with the addition of a drip catcher. Both these testers are available from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: +1.919.549.8141; fax: +1.919.549.8933; e-mail: orders@aatcc.org; web site: www.aatcc.org.

11.2 Blotters suitable for this test can be obtained from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: +1.919.549.8141; fax: +1.919.549.8933; e-mail: orders@aatcc.org; web site: www.aatcc.org.

Table I—Within-Laboratory Critical Differences

Type I Tester—95% Probability Level

Det in Avg (*N*)	Standard Error	Critical Differences
1	0.48	1.11
3	0.28	0.64
5	0.21	0.50
7	0.18	0.41

N = Number of determinations per average
SE = Standard Error for *N* determinations
CD = 2.306 SE

Table II—Within-Laboratory Critical Differences

Type II Tester—95% Probability Level

Det in Avg (*N*)	Standard Error	Critical Differences
1	0.17	0.40
3	0.10	0.23
5	0.08	0.18
7	0.07	0.15

N = Number of determinations per average
SE = Standard Error for *N* determinations
CD = 2.306 SE