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Water Resistance: Hydrostatic Pressure Test

Developed in 1968 by AATCC Committee RA63; reaffirmed 1971, 1974, 1977, 1980, 1989, 2003, 2013; editorially revised 1982, 1986, 2006; editorially revised and reaffirmed 1985, 2008; revised 1995, 1998, 2014. Related to ISO 811.

1. Purpose and Scope

1.1 This test method measures the resistance of a fabric to the penetration of water under hydrostatic pressure. It is applicable to all types of fabrics, including those treated with a water resistant or water repellent finish.

1.2 Water resistance depends on the repellency of the fibers and yarns, as well as the fabric construction.

1.3 The results obtained by this method may not be the same as the results obtained by the AATCC methods for resistance to rain or water spray.

2. Principle

2.1 One surface of the test specimen is subjected to a hydrostatic pressure, increasing at a constant rate, until three points of leakage appear on its other surface. The water may be applied from above or below the test specimen.

2.2 This test is traditionally performed without a restraint (Method A). A restraint may be used as agreed upon by the purchaser and supplier to prevent excessive deformation for the intended end use of the fabric (Method B). In general, Method B will produce higher results than Method A.

3. Terminology

3.1 **hydrostatic pressure**, *n.*—the force distributed over an area exerted by water.

3.2 **water resistance**, *n.*—of fabric, the characteristic to resist wetting and penetration by water.

3.3 **water repellency**, *n.*—of fabric, in textiles, the characteristic of fiber, yarn, or fabric to resist wetting.

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 recommenda-

tions. 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.

4.2 Manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

5. Apparatus and Materials (see 11.1)

5.1 Hydrostatic Tester.

5.1.1 For Option 1, Hydrostatic Pressure Tester (see 11.2).

5.1.2 For Option 2, Hydrostatic Head Tester (see 11.3).

5.2 Water, distilled or de-ionized.

5.3 For Method B, Restraint: 200 × 200 ± 10 mm square, made of 6.0 ± 0.5 mm thick clear cast acrylic.

5.4 For Method B, Blotter Paper: 200 × 200 ± 10 mm square of paper towel, a color that will exhibit a color change when wet (light blue preferred).

6. Test Specimens

6.1 A minimum of three fabric specimens should be taken diagonally across the width of the fabric to be representative of the material. Cut specimens at least 200 × 200 mm to allow proper clamping.

6.2 Handle the specimens as little as possible and avoid folding or contaminating the area to be tested.

6.3 Condition the test specimens at 21 ± 2°C (70 ± 5°F) air at 65 ± 2% RH for at least 4 h before testing.

6.4 The surface of the fabric to be exposed to water must be specified because different results may be obtained on the face and the back. Identify that surface on a corner of each specimen.

7. Procedure

7.1 Method A (traditional method).

7.1.1 Verify the water in contact with the test specimen is regulated at 21 ± 2°C (70 ± 5°F) (see 11.4).

7.1.2 Dry the clamping surface.

7.1.3 Clamp the specimen with the surface to be tested facing the water (see 11.6).

7.1.4 Operation.

7.1.4.1 Option 1—Hydrostatic Pressure Tester (see 11.2). Turn on the motor, press the lever to raise the overflow device at the rate of 10 mm/s, and close the air vent as soon as water flows from it.

7.1.4.2 Option 2—Hydrostatic Head Tester (see 11.3). Select the gradient of 60 mbar/min, press the start button (see 11.5).

7.1.5 Disregarding water droplets that appear within approximately 3 mm of the specimen clamping ring, record the hydrostatic pressure at the moment water droplets penetrate the fabric in three different places.

7.2 Method B (restrained specimen method).

7.2.1 Verify the water in contact with the test specimen is regulated at 21 ± 2°C (70 ± 5°F) (see 11.4).

7.2.2 Dry the clamping surface.

7.2.3 Position the specimen with the surface to be tested facing the water (see 11.6). Place the blotter paper on the side of the fabric not facing the water, then place the restraint so the blotter paper is sandwiched between the fabric and restraint. Clamp the fabric, paper and restraint assembly in place.

7.2.4 Operation.

7.2.4.1 Option 1—Hydrostatic Pressure Tester (see 11.2). Turn on the motor, press the lever to raise the overflow device at the rate of 10 mm/s, and close the air vent as soon as water flows from it.

7.2.4.2 Option 2—Hydrostatic Head Tester (see 11.3). Select the gradient of 60 mbar/min, press the start button (see 11.5).

7.2.5 Disregarding water droplets that appear within approximately 3 mm of the specimen clamping ring, record the hydrostatic pressure at the moment water droplets penetrate the fabric in three different places.

8. Calculation

8.1 Calculate the average hydrostatic pressure for each sample.

Table I—Components of Variance for Two Fabrics (Method A, Option 1 Tester)

Component	Variance Fabric 1	Variance Fabric 2
Laboratory	13.450	7.323
Operator	3.127	2.145
Specimen	30.253	5.382

Table II—Fabric 1—Critical Differences—95% Confidence (Method A, Option 1 Tester)

Det in Avg (M)	Single Operator	Within Laboratory	Between Laboratory
1	15.25	16.02	18.97
2	10.78	11.84	15.61
3	8.80	10.08	14.31
4	7.62	9.06	13.62
5	6.82	8.04	13.19