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Liquid Moisture Management Properties of Textile Fabrics

Developed in 2009 by AATCC Committee RA63; reaffirmed 2010; revised 2011; editorially revised and reaffirmed 2012.

1. Purpose and Scope

1.1 This test method is for the measurement, evaluation and classification of liquid moisture management properties of textile fabrics. The test method produces objective measurements of liquid moisture management properties of knitted, woven and nonwoven textile fabrics.

1.2 The results obtained with this test method are based on water resistance, water repellency and water absorption characteristics of the fabric structure, including the fabric's geometric and internal structure and the wicking characteristics of its fibers and yarns.

2. Principle

2.1 The liquid moisture management properties of a textile are evaluated by placing a fabric specimen between two horizontal (upper and lower) electrical sensors each with seven concentric pins. A predetermined amount of test solution that aids the measurement of electrical conductivity changes are dropped onto the center of the upward-facing test specimen surface. The test solution is free to move in three directions: radial spreading on the top surface, movement through the specimen from top surface to the bottom surface, and radial spreading on the bottom surface of the specimen. During the test, changes in electrical resistance of specimen are measured and recorded.

2.2 The electrical resistance readings are used to calculate fabric liquid moisture content changes that quantify dynamic liquid moisture transport behaviors in multiple directions of the specimen. The summary of the measured results are used to grade the liquid moisture management properties of a fabric by using predetermined indices.

3. Terminology

3.1 **absorption rate (AR_T) (top surface) and (AR_B) (bottom surface)**, n.—the average speed of liquid moisture absorption for the top and bottom surfaces of the specimen during the initial change of water content during a test.

3.2 **accumulative one-way transport capability (R)**, n.—the difference between the area of the liquid moisture content curves of the top and bottom surfaces

of a specimen with respect to time.

3.3 **bottom surface (B)**, n.—for testing purposes, the side of the specimen placed down against the lower electrical sensor which is the side of the fabric that would be the outer exposed surface of a garment when it is worn or product when it is used.

3.4 **maximum wetted radius (MWR_T) and (MWR_B) (mm)**, n.—the greatest ring radius measured on the top and bottom surfaces.

3.5 **moisture management**, n.—for liquid moisture management testing, the engineered or inherent transport of aqueous liquids such as perspiration or water (relates to comfort) and includes both liquid and vapor forms of water.

3.6 **overall (liquid) moisture management capability (OMMC)**, n.—an index of the overall capability of a fabric to transport liquid moisture as calculated by combining three measured attributes of performance: the liquid moisture absorption rate on the bottom surface (AR_B) the one way liquid transport capability (R), and the maximum liquid moisture spreading speed on the bottom surface (SS_B).

3.7 **spreading speed (SS_T)**, n.—the accumulated rate of surface wetting from the center of the specimen where the test solution is dropped to the maximum wetted radius.

3.8 **top surface (T)**, n.—for testing purposes, the side of a specimen that, when the specimen is placed on the lower electrical sensor, is facing the upper sensor. This is the side of the fabric that would come in contact with the skin when a garment is worn or when a product is used.

3.9 **total water content (U) (%)**, n.—the sum of the percent water content of the top and bottom surfaces.

NOTE: Total water content measurements may be more accurately termed, "total surface water content" particularly in the case of fabric with cellulosic content. Total water content implies that all water in the specimen is being measured which may be the case with some manufactured fabrics. However, when testing cellulosic fibers, moisture trapped in the interior of the fiber (for example, in the lumen of cotton fibers) will not be included with a specimen's detected surface liquid moisture.

3.10 **wetting time (WT_T) (top surface) and (WT_B) (bottom surface)**, n.—the time in seconds when the top and bot-

tom surfaces of the specimen begin to be wetted after the test is started.

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 users' 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 manufacturers' 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 AATCC test methods are not performance specifications as the methods produce measurements only. It is the responsibility of test method users to choose the minimum (or maximum) measurement value that is acceptable for the product being tested.

5.2 This test method focuses on liquid moisture transport in the flat state. The test method may be applicable to the evaluation of fabrics in garments or textile products as they would be exposed to liquid moisture (e.g., perspiration) present on the surface of human skin. It does not measure gaseous moisture transport properties (e.g., water vapor transmission) or tactile properties that also influence human perceptions of comfort.

5.3 Because human perceptions of comfort are influenced by multiple liquid movement properties, as well as ergonomic (garment fit) factors, the use of a single unit of measurement from this test method or any other test method could be misleading as explained in the AATCC/ASTM International's *Moisture Management Technical Supplement as Related to Textile Apparel, Linens and Soft Goods* (see 13.1). Consequently, this test method alone will not give an overall rating of the comfort of a garment or textile product. Overall performance schemes, such as the Grading Graph in 9.2.1, should be developed when trying to correlate a combination of absorption, wicking, liquid and vapor movement that can be related to the environment and preferences of fit and style in which the textile product is to be used and worn.

5.4 This method may not be applicable