



Designation: D8041/D8041M – 16 (Reapproved 2023)

## Standard Test Method for Whole Boot Breathability (MVTR)<sup>1</sup>

This standard is issued under the fixed designation D8041/D8041M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 The whole boot breathability test method is designed to indicate the Moisture Vapor Transmission Rate (MVTR) through the boot upper by means of a difference in temperature and moisture vapor concentration between the interior of the boot and the exterior environment. This method is intended for a size 10 R U.S. (Regular width) boot that is at least 6 in. [15.2 cm] tall above the insole.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system is to be used independently of the other, without combining values in any way. Combining values from the two systems may result in non-conformance with the standard.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Terminology

#### 2.1 Definitions:

2.1.1 *boot, n*—footwear in which the upper reaches above the ankle.

2.1.2 *eyelet, n*—textile, metal or plastic reinforcements around the holes which carry the lace.

2.1.3 *foot form assembly, n*—relating to this test method, the foot form consists of boot plug with copper tubing in a shape of a foot.

2.1.4 *footwear, n*—wearing apparel for feet (such as shoes, boots, slippers).

2.1.5 *gusset, n*—the part of the vamp that extends over the instep of the foot between the eyestays and allows expansions of the opening at the top of the footwear.

2.1.5.1 *Discussion*—For slip-on footwear this may include an elastic gusset that allows expansion at the opening at the top of the footwear.

2.1.6 *heel, n*—the part of the boot which supports the back part of the foot.

2.1.7 *insert, n*—removable foot bed which is shaped or molded to match the approximate contour of the bottom surface of the foot.

2.1.8 *plug, n*—a circular or oval shaped (non metallic) boot plug that holds the (copper foot form) water heating assembly and seals the top of the water holding bootie insert and upper at the water interface. The plug must be made from material that is impervious to both liquid water and water vapor.

2.1.9 *sole or outsole, n*—the bottom layer of the footwear, including the heel, in contact with the ground forming the walking surface.

2.1.10 *upper, n*—the entire part of the footwear located above the sole. Includes external leather and synthetic materials as well as internal linings.

2.1.11 *water holding bootie insert (WHBI), n*—a thin, flexible, waterproof, breathable bootie meeting the requirements of 6.3.

### 3. Summary of Test Method

3.1 A test sample boot fitted with a water holding bootie insert (WHBI) is filled with preheated water and weighed. The water is kept at a constant temperature for 6 h and then the boot (with water) is reweighed. The loss in weight is used to calculate the Moisture Vapor Transmission Rate (MVTR) of the footwear, otherwise known as breathability.

### 4. Significance and Use

4.1 The materials and construction methods used in the manufacture of footwear play a significant role in the “breathability” of the footwear. This test method provides a means to measure moisture vapor permeability, expressed as MVTR, which is one aspect of comfort of the footwear.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.03 on Footwear.

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