



Standard Test Method for Air Permeability of Tire Fabrics, Tire Cord Fabrics, Tire Cord, and Yarns¹

This standard is issued under the fixed designation D2692/D2692M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers the determination of longitudinal air permeability for tire fabrics, tire cord fabrics, tire cords, or yarns embedded in cured rubber compound. This test method is designed to demonstrate the effectiveness of fabric treatments intended to prevent air permeability. This test method is applicable to fabrics made from all types of fibers with all types of rubber compound.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. 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 and health practices and determine the applicability of regulatory limitations prior to use. See the Note in 11.1.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D123 Terminology Relating to Textiles](#)

[D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets](#)

[D6477 Terminology Relating to Tire Cord, Bead Wire, Hose Reinforcing Wire, and Fabrics](#)

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.19 on Industrial Fibers and Metallic Reinforcements.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.1 For definitions of terms relating to tire cord, bead wire, hose wire, and tire cord fabrics, refer to Terminology [D6477](#).

3.1.1.1 The following terms are relevant to this standard: air permeability, chafer fabric, test panel, in air permeability test, tire cord, tire cord fabric, tire fabric, vulcanization, wickproof, in tire fabric, tire cord fabric, tire cord, or yarn.

3.1.2 For definitions of other terms related to textiles, refer to Terminology [D123](#).

3.1.2.1 The following terms are relevant to this standard: skein and yarn.

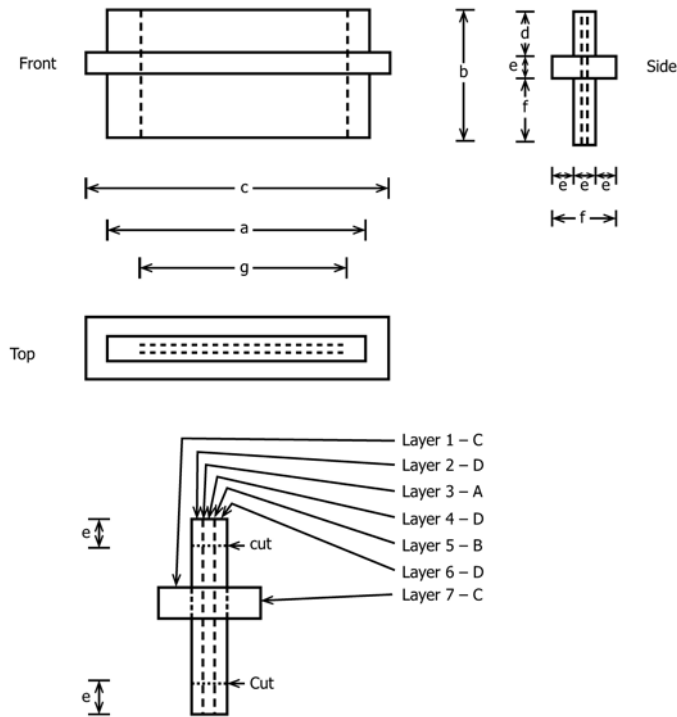
4. Summary of Test Method

4.1 Fabric specimens are embedded in a rubber compound and air pressure is applied to freshly exposed yarn ends. Detergent solution is applied to the opposite end of the yarns which have also been freshly exposed. Air permeability is indicated by continuous formation of air bubbles in the detergent solution due to air passing along the axis of a yarn.

5. Significance and Use

5.1 This test method is considered satisfactory for the acceptance testing of commercial shipments of tire fabrics since this test method has been used extensively in the trade for acceptance testing. This test method is also considered satisfactory for quality control.

5.1.1 In case of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories may be compared using appropriate statistical analysis and an acceptable probability level chosen by the two parties before the testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results with consideration to the known bias.



DIMENSIONS

	a	b	c	d	e	f	g
Inches	3.0	1.5	3.5	0.5	0.25	0.75	2.25
Millimetres	76	38	89	12.6	6.4	19	57

NOTE 1—Lower case letters refer to dimensions. Capital letters refer to pieces prepared as outlined in 10.2.

FIG. 1 Test Panel

5.2 This test method is applicable for testing the air permeability of any fabric that is embedded in a rubber compound, but is particularly useful when testing chafer fabrics to be used in a tubeless tire construction. In tubeless tires, chafer fabric yarns that are air permeable represent potential channels for air to pass through, and thus, this test method provides a prediction of chafer permeability.

5.3 Evaluation of air permeability in other fabric and cord components in such products as tires, rubber brake diaphragms, and pneumatic hoses, is useful.

6. Apparatus and Materials

6.1 *Test Panel Mold*—A fixed dimension mold designed to produce a test panel of dimensions and shape shown in Fig. 1.³

6.2 *Test Chamber*—An air chamber and test panel holder similar to the device shown in Fig. 2.³

6.3 *Rubber Compound*—The test compound in Table 1 shall be used as standard unless otherwise agreed upon between the purchaser and the supplier.

³ The Burlington Diffusion Tester and Test Piece Mold covered by U.S. Patent 3,034,336 has been found satisfactory. Blueprints for the fabrication of the tester and mold may be obtained from Manager of Process Technology, Highland Industries Inc., 215 Drummond Street, Kernersville, NC 27284.

6.4 *Air Supply*—Compressed air, to be controlled at a test pressure agreed upon between the purchaser and the supplier. Commercially available compressed air or dry nitrogen gas is preferred since these products are clean and dry.

6.5 *Vulcanization Press*—For vulcanizing the test panel in the test panel mold. See Practice D3182.

6.6 *Detergent Solution*—Mix 10 g of nonionic detergent with 100 g of tap water. An ethoxylated alkyl phenol, having 10 to 30 mol of ethylene oxide, is the recommended nonionic detergent.⁴

7. Sampling Tire Fabric

7.1 *Lot Sample*—Tire fabrics are shipped in continuous lengths of several hundred metres each, and testing frequency will be as agreed upon between the purchaser and the supplier. In the absence of an applicable material specification for sampling frequency, consider each roll to be a sampling unit for tire fabric.

7.2 *Laboratory Samples*—For acceptance testing, take from each roll a full-width swatch, 1 m [1 yd] long, after first discarding a minimum of 1 m [1 yd] of fabric from the very outside of the roll.

⁴ Common laundry detergent has been found satisfactory for this purpose.