



Designation: E 1844 – 96 (Reapproved 2004)

Standard Specification for A Size 10 × 4–5 Smooth-Tread Friction Test Tire¹

This standard is issued under the fixed designation E 1844; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the general requirements for a smooth-tread standard tire for measuring tire-pavement friction forces.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

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.*

2. Referenced Documents

2.1 ASTM Standards:²

- D 297 Methods for Rubber Products—Chemical Analysis
 - D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - D 1054 Test Method for Rubber Property—Resilience Using a Goodyear-Healey Rebound Pendulum
 - D 1765 Classification System for Carbon Blacks Used in Rubber Products
 - D 2240 Test Method for Rubber Property—Durometer Hardness
 - D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets
 - E 867 Terminology Relating to Vehicle-Pavement Systems
- #### 2.2 Other Document:
- Griptester—GTSV1 Descriptive Booklet³

3. Terminology

3.1 Terminology used in this specification is in accordance with Terminology E 867.

4. Materials and Manufacture

4.1 The individual standard tires shall conform to the design standards of Section 6. Dimensions, weights, and permissible variations are also given in Section 6 and Fig. 1 and Fig. 2.

4.2 Tread compounding, fabric processing, and all tire manufacturing shall be certified to ensure that the specifications are met (see Section 8).

4.3 The markings on the tire, as shown in Fig. 1, shall be molded on the sides of the tire.

4.4 Fig. 1 shows a view of the tread surface and a side view of the tire. Fig. 2 is a typical tire cross-section with critical dimensions identified.

5. Material Requirements

5.1 The compounding requirements for the tread compound are given in Table 1.

5.2 The fabric shall be Nylon, 1260/2 Denier.

NOTE 1—Certain proprietary products have been specified since exact duplication of properties of the finished tire may not be achieved with other similar products. This inclusion does not in any way comprise a recommendation for these proprietary products nor against similar products of other manufacturers, nor does it imply any superiority over any such similar products.

6. Physical Requirements

6.1 The physical and mechanical test requirements of the tread compound are given in Table 2.

7. Construction, Dimensions and Permissible Variations

7.1 *Construction*—The tire shall be size 10 × 4–5, tube type, two plies, nylon cord, and bias construction.

7.2 *Dimensions*—Tread width shall be 51 ± 2.0 mm (2.0 ± 0.08 in.), the tread radius shall be 165 ± 25 mm (6.5 ± 1.0 in.), the cross-sectional width shall be 102 ± 2 mm (4.0 ± 0.08 in.), and the outside diameter at the centerline shall be 258 ± 2 mm (10.15 ± 0.08 in.) when measured on a 89 mm (3.5 in.) wide rim at 138 ± 3 kPa (20 ± 0.5 PSI). See Fig. 2 which shows the inflated dimensions of the new tire.

7.3 *Tread*—The tread surface shall be smooth (blank) without any ribs or grooves. The tread shall have a thickness of 5 mm (0.20 in.) and an undertread thickness of 2 ± 0.5 mm (0.08 ± 0.02 in.) at the tread centerline.

¹ This specification is under the jurisdiction of ASTM Committee E17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.24 on Tire and Slider Characteristics.

Current edition approved Dec. 1, 2004. Published December 2004. Originally approved in 1996. Last previous edition approved in 1996 as E 1844 – 96.

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 Available from Findlay-Irvine Ltd., Bog Road, Penicuik, Midlothian EH269BU, Scotland.

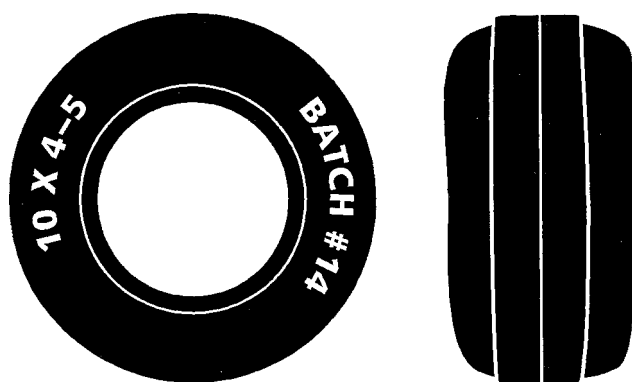


FIG. 1 Molded on Tire: 10 × 4–5 Tread ASTM Batch No.

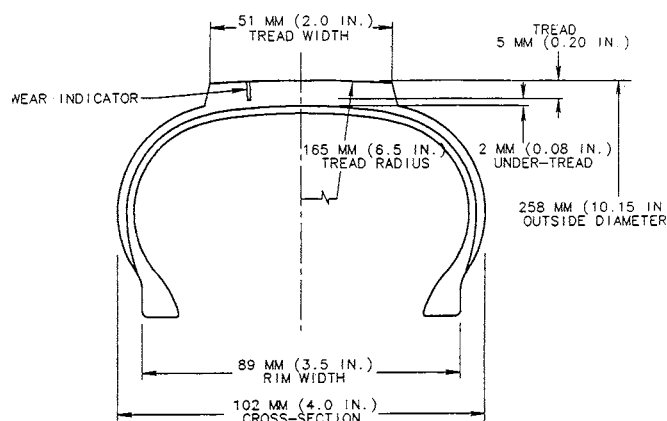


FIG. 2 Tire Section—Inflated Dimensions

TABLE 1 Compounding of Tread Rubber^A

Material	Parts by Mass
SBR 1714 ^B	89.38
CB1252 ^C	48.12
N347 ^D	75.00
High-Aromatic Oil	9.00
Zinc Oxide	3.00
Stearic Acid	2.00
Santoflex 13 ^E	2.00
Paraffin Wax	2.00
Santocure NS ^F	1.10
DPG ^G	0.10
Sulfur	1.80

^ASee Practice D 3182.^BStyrene-butadiene rubber (23.5 % styrene) 37.5 parts of high-aromatic oil.^CCis-polybutadiene with 37.5 parts of high-aromatic oil or equivalent.^DN347 Carbon Black, see Classification D 1765.^EDimethyl butylphenyl phenylenediamine.^FButyl benzothiazole sulfenamide.^GDiphenyl guanidine.

7.4 *Wear Indicators*—There will be two holes molded into the tire tread, 5.0 mm (0.20 in.) deep and 3.2 mm (0.125 in.) in diameter. These two wear-indicators will be spaced 180° apart.

8. Workmanship

8.1 Tires shall be free of defects in workmanship and material.

9. Test Methods

9.1 For information on the following, refer to the ASTM standards listed.

TABLE 2 Physical Properties of Tread Compound

Tensile Sheet Cure, min at 300°F (149°C)	30
300 % modulus, psi (MPa) (Test Methods D 412)	800 ± 200 (5.5 ± 1.4)
Tensile sheet durometer (Test Method D 2240)	58 ± 2
Restored energy (rebound or resilience) (Test Method D 1054)	46 ± 2
Specific gravity (Methods D 297)	1.13 ± 0.02
Tensile strength, min psi (MPa) (Test Methods D 412)	2000 (13.8)
Elongation, min % (Test Methods D 412)	500
Tire tread durometer (Test Method D 2240)	58 ± 2

9.1.1 *Tensile Sheet Cure*—Practice D 3182.

9.1.2 *Modulus (300 %)*—Test Methods D 412.

9.1.3 *Tensile Sheet Durometer*—Test Method D 2240, using a Type A Shore Durometer.

9.1.4 *Restored Energy (Rebound or Resilience)*—Test Method D 1054.

9.1.5 *Specific Gravity*—Test Method D 297.

9.1.6 *Tensile Strength*—Test Methods D 412.

9.1.7 *Elongation*—Test Methods D 412.

9.1.8 *Tire Tread Durometer*—Test Method D 2240, in addition to the following specific procedures:

9.1.8.1 Use a Type A Durometer. A12.7 mm (0.5 in.) diameter presser foot, a sure code XAHAF is recommended.

9.1.8.2 The Durometer shall be calibrated at a reading of 60 hardness.

9.1.8.3 Condition the tire and durometer to equilibrium at 23 ± 2°C (73.4 ± 3.6°F) before determining tread hardness.

9.1.8.4 Determine the tire tread hardness by averaging at least one set of six readings. A set should consist of readings taken at approximately equally spaced intervals around the tread circumference.

9.1.8.5 Apply the presser foot to the tire tread as rapidly as possible without shock, keeping the foot parallel to the tread surface. Apply just sufficient pressure to obtain firm contact between the presser foot and tire tread surface. Read the durometer scale within 1 s after the presser foot is in contact with the tread, but after initial maximum transient which may occur immediately after contact is made.

10. Precision and Bias

10.1 Precision standards are currently under development.

11. Certification

11.1 Tires are to be inflated and measured prior to shipment. Upon request, the manufacturer shall furnish the purchaser with certification that the test tire meets this specification.

11.2 The Annex to this specification suggests a test procedure for determining the reliability, performance and consistency of the tires.

11.3 All tires under certification shall be subject to the manufacturers normal variation.

12. Packaging and Preservation

12.1 Tires should be stored in a dry area, at a temperature not exceeding 32.2°C (90°F) and in subdued light. Tires must not be stored near electric motors, welders, or other ozone generating equipment.

