



Designation: E 1551 – 93a (Reapproved 1998)

## Standard Specification for Special Purpose, Smooth-Tread Tire, Operated on Fixed Braking Slip Continuous Friction Measuring Equipment<sup>1</sup>

This standard is issued under the fixed designation E 1551; 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 special purpose, smooth-tread standard tire for measuring tire-pavement friction forces. The tire is utilized on fixed braking slip continuous friction measuring equipment such as the Runway Friction Tester, Surface Friction Tester, or BV-11 Skiddometer Trailer.

1.2 The values stated in inch-pound units are to be regarded as the standard.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 297 Test Methods for Rubber Products—Chemical Analysis<sup>2</sup>

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension<sup>2</sup>

D 1054 Test Method for Rubber Property—Resilience Using a Rebound Pendulum<sup>2</sup>

D 1765 Classification System for Carbon Blacks Used in Rubber Products<sup>2</sup>

D 2240 Test Method for Rubber Property—Durometer Hardness<sup>2</sup>

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets<sup>2</sup>

#### 2.2 Other Documents:

K.J. Law Slip Friction Tester —Instruction and Servicing Manual

Surface Friction Tester —Instruction and Servicing Manual  
BV-11 Skiddometer Trailer—Instruction and Servicing Manual

DOT/FAA/AS-90-1 Reliability and Performance of Friction Measuring Tires and Friction Equipment Correlation<sup>3</sup>

Advisory Circular 150/5320-12 —“Measurement, Con-

struction and Maintenance of Skid Resistant Airport Pavement Surfaces”<sup>4</sup>

Tatra-Intertech Friction Tester —Instruction and Servicing Manual<sup>5</sup>

### 3. Materials and Manufacture

3.1 The individual standard tires shall conform to the design standards of Section 5. Dimensions, weights, and permissible variations are also given in Section 5 and in Fig. 1 and Fig. 2.

3.2 Tread compounding, fabric processing, and all steps in tire manufacturing shall be certified to ensure that the specifications are met (see Section 7, Test Methods).

3.3 The markings on the tire as shown in Fig. 1 shall be molded on both sides of the tire.<sup>6</sup>

3.4 Fig. 1 shows a view of the tread surface and a side view of the standard, special purpose, smooth tread tire and Fig. 2 is a typical tire cross section with critical dimensions identified.

### 4. Material Requirements

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

4.2 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.

### 5. Construction, Dimensions and Permissible Variations

5.1 *Construction*—The tire shall be a size 4.00-8, tube type, four plies, Nylon cord, and bias construction.

5.2 *Dimensions*—Tread width shall be  $2.4 \pm 0.1$  in. ( $61 \pm 2.5$  mm), the tread radius shall be  $10.0 \pm 1.5$  in. ( $254 \pm 38$  mm), the cross-sectional width shall be  $4.1 \pm 0.15$  in. ( $104 \pm 3.8$  mm), and the outside diameter at the tread centerline shall

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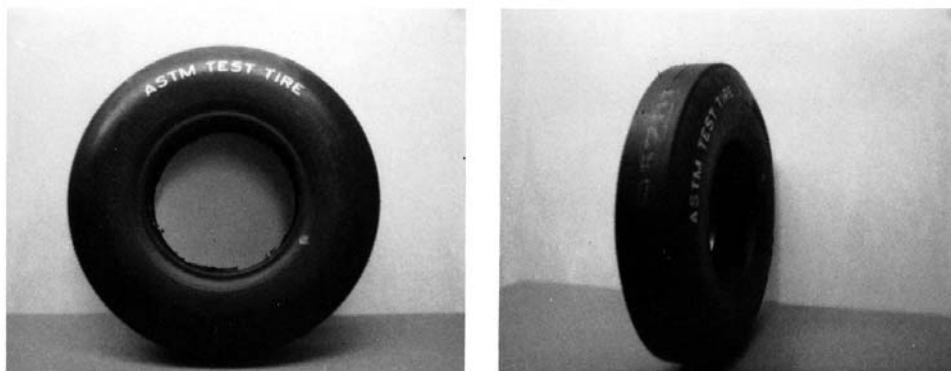
<sup>2</sup> *Annual Book of ASTM Standards*, Vol 09.01.

<sup>3</sup> Available from National Technical Information Service, Springfield, VA 22161.

<sup>4</sup> Available from U.S. Department of Transportation Federal Aviation Administration, 800 Independence Ave., S.W., Washington, DC 20591.

<sup>5</sup> Available from Intertech Engineering Inc., 726 S. Mansfield Ave., Los Angeles, CA 90036.

<sup>6</sup> ASTM E1551 tire is available from Specialty Tires of America, Inc., P.O. Box 749, 1600 Washington St., Indiana, PA 15701.



Suggested Marking on Tire  
 ASTM Test Tire E 1551  
 4.00 – 8 NHS  
 6 Ply Rating  
 Tube Type  
 Manufacturer's Name or Trademark

FIG. 1 Test Tire

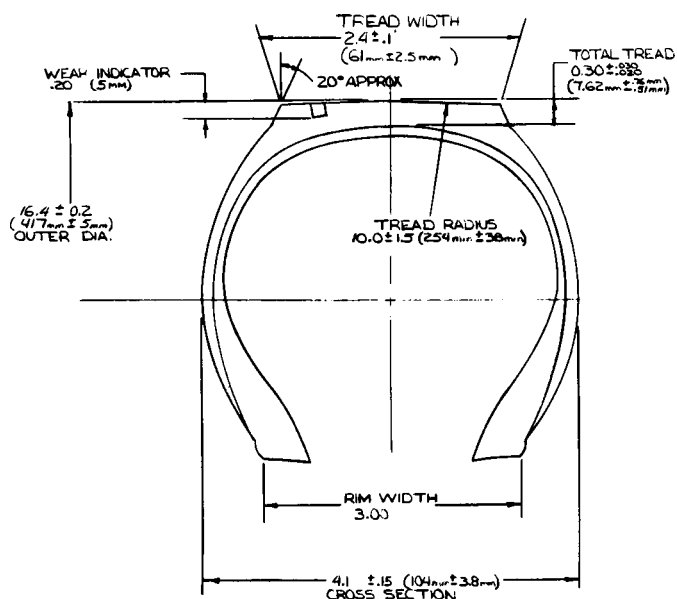


FIG. 2 Tire Section, Including Inflated Dimensions

be  $16.4 \pm 0.2$  in. ( $417 \pm 5$  mm) when measured on an 8 by 3.00D rim at  $30 \pm 0.5$  psi ( $207 \pm 2$  kPa) inflation pressure. See Fig. 2 which shows inflated dimensions of the new tire.

**5.3 Tread**—The tread surface shall be smooth (blank) without any ribs or grooves. The tread shall have a thickness of 0.16 in. (4.1 mm) and an under skid thickness of  $0.14 \pm 0.03$  in. ( $3.56 \pm 0.76$  mm).

**5.4 Wear Indicators**—There will be four holes molded into the tire 0.16 in. (4.1 mm) deep and 0.125 in. (3.18 mm) diameter. These four wear indicators will alternate from one side of the tread centerline to the other and be spaced  $90^\circ$  apart.

## 6. Workmanship

**6.1** Tires shall be free of defects in workmanship and material.

TABLE 1 Compounding of Tread Rubber<sup>A</sup>

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

<sup>A</sup>See Practice D 3182.

<sup>B</sup>Styrene-butadiene rubber (23.5 % styrene) 37.5 parts of high-aromatic oil.

<sup>C</sup>Cis-polybutadiene with 37.5 parts of high-aromatic oil or equivalent.

<sup>D</sup>N347 Carbon Black, see Classification D 1765.

<sup>E</sup>Dimethyl butylphenyl phenylenediamine.

<sup>F</sup>Butyl benzothiazole sulfenamide.

<sup>G</sup>Diphenyl guanidine.

## 7. Test Methods

**7.1 Tensile Sheet Cure**—Practice D 3182.

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

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

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

**7.5 Specific Gravity**—Test Methods D 297.

**7.6 Tensile Strength**—Test Methods D 412.

**7.7 Elongation**—Test Methods D 412.

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

**7.8.1** Use a Type A Durometer. A0.5-in. (12.7-mm) diameter presser foot, Shore, code XAHAF is recommended.

**7.8.2** The durometer shall be calibrated at a reading of 60 hardness.

**7.8.3** Condition the tire and durometer to equilibrium at  $73.4 \pm 3.6^\circ\text{F}$  ( $23 \pm 2^\circ\text{C}$ ) before determining tread hardness.