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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428

Standard Specification for A Radial Standard Reference Test Tire[1]

This standard is issued under the fixed designation E 1136; 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 radial-ply standard reference test tire. The tire covered by this specification is primarily for use as a reference for tire traction performance evaluations, but may also be used for other evaluations, such as pavement roughness, noise, or other tests that require a reference tire.

1.2 This specification also provides a standard design of certified construction, accurate dimensions, and specifies a means of storage.

2. Referenced Documents

2.1 *ASTM Standards:*

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension[2]

D 1054 Test Method for Rubber Property Resilience Using a Rebound Pendulum[2]

D 1765 Classification System for Carbon Blacks Used in Rubber Products[2]

D 2240 Test Method for Rubber Property—Durometer Hardness[2]

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets[2]

3. Design and Construction

3.1 The standard reference test tire shall be size P195/75R14, current technology All Season tread design steel-belted radial (see Fig. 1 and Fig. 2).

3.2 The tire shall be designed to conform with the Tire and Rim Association (TRA) standard nominal dimensions and tolerances for cross section and overall diameter found in the Current Year Book.[3]

3.3 The tire used for this specification is produced by the Uniroyal Goodrich Tire Company, Inc.[4] The tire is stamped on the sidewall with the words: "Standard Reference Test Tire."

FIG. 1 Front View of a Radial Reference Tire

4. Materials and Manufacture

4.1 The individual standard reference test tires shall conform to the manufacturer's design standards. Dimensions, weights, and permissible variations are given in Section 7 and Table 1 and Table 2.

[1] This specification is under the jurisdiction of ASTM Committee E-17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.24 on Tire and Slider Characteristics.

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[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] Available from the Tire and Rim Association, 175 Montrose West Ave., Suite 150, Copely, OH 44321.

[4] Available from Uniroyal Goodrich Tire Company, Inc., Opelika Plant, P.O. Box 30, Opelika, AL 36801, Attn: Development Qualification Center SRTT Manager.

FIG. 2 Side View of a Radial Reference Tire

TABLE 1 Formulation of Oil-Extended Styrene-Butadiene BR (75/25) Blend Rubber Tread

Compound	Parts by Mass
SBR 1778[A]	12.38
SBR 1502[B]	66.00
CIS 1-Polybutadiene[C]	25.00
N351 black[D]	64.00
Naphthenic oil	17.13
Zinc oxide	5.00
Stearic acid	1.50
6 PPD[E]	1.50
TMQ[F]	2.00
Antidegradant wax	0.50
Tackifying hydrocarbon resin	2.00
TBBS[G]	0.80
DPG[H]	0.25
Sulfur	1.90

[A]Styrene-butadiene rubber (23.5 % Styrene) contains 27.5 parts of naphthenic oil.
[B]Styrene-butadiene rubber (23.5 % Styrene).
[C]CIS Content 95 % min.
[D]N351 carbon black, see Classification D 1765.
[E]n-1,3-Dimethylbutyl-N′-phenyl-*p*-phenylenediamine.
[F]Polymerized,1,2-dihydro-2,2,4-trimethylquinoline.
[G]N-t-butyl-2-benzothiazole sulfenamide.
[H]Diphenylquanidine.

4.2 Tread compounding, fabric processing, and all the steps in tire manufacturing shall be controlled to ensure minimum variability between tires.

4.3 The standard reference test tire shall be as originally molded without any tread grinding or repairs.

5. Material Requirements

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

TABLE 2 Physical Properties of Tread Compound

Tensile sheet cure, min at 320°F (160°C)	15
Stress at 300 % elongation psi (MPa)	1650 ± 150 (11.4 ± 1.0)
Tensile strength, min, psi (MPa)	2200 (15.2)
Elongation, min %	420
Durometer hardness[A]	65 + 4/−1
Restored energy (rebound or resilience)	39 ± 2

[A]Measured on tire tread.

5.1.1 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.

5.2 The tire shall be of the following construction:

5.2.1 One-ply sidewall (polyester), and

5.2.2 A three-ply tread (one polyester and two steel belts).

6. Physical Properties

6.1 The physical properties of the tread compound are listed in Table 2.

7. Dimensions, Weights, and Permissible Variations

7.1 Details of dimensions are listed as follows and are shown in Fig. 3. When tolerances are not specified, tire dimensions are subject to manufacturer's normal tolerances.

7.1.1 *Inflated Dimensions and Cured Cord Angles*—The tread width shall be 5.40 in. (137.2 mm) and the cross-sectional tread radius shall be 13.0 ± 2.0 in. (330.2 ± 50.8 mm). The tread radius is measured using the three point drop method (see Fig. 4 for an example of how the measurement is taken). The tire shall have a nominal cross-section width of 7.72 in. (196.1 mm), and a nominal outside diameter of 25.51 in. (648.0 mm) when mounted on a TRA design rim width (14 × 5.5 JJ). The cured cord angles shall be 90 ± 2° for the carcass and 21.0 ± 2° for the belts.

7.1.2 *Ribs*—The tire shall have five ribs.

7.1.3 *Grooves*—The tire shall have four circumferential grooves having a minimum groove depth of 0.365 in. (9.3 mm).

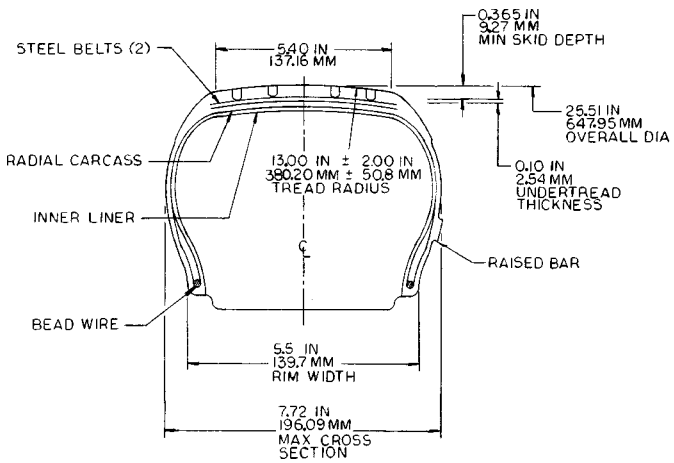

FIG. 3 Tire Cross Section, Including Inflated Tire Dimensions

FIG. 4 Measuring the Tread Radius Using the Three Point Drop Method

7.1.4 *Wear Indicators*—There shall be wear indicators in each groove, laterally across the tread width in six locations, spaced uniformly around the tire circumference. The height of the wear indicators in the grooves shall be 0.063 in. (1.6 mm).

NOTE 1—Groove depth is not to be measured at these wear indicators.

8. Workmanship

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

9. Test Methods

9.1 *Preparation of Tensile Sheet Cure*, shall be in accordance with Practice D 3182.

9.2 *Stress at 300 % Elongation*, shall be in accordance with Test Methods D 412.

9.3 *Tensile Sheet Hardness*, shall be in accordance with Test Method D 2240, using a Type A, Shore durometer.

9.4 *Restored Energy (Rebound or Resilience)*, shall be in accordance with Test Method D 1054.

9.5 *Tensile Strength*, shall be in accordance with Test Methods D 412.

9.6 *Elongation*, shall be in accordance with Test Methods D 412.

9.7 *Tire Tread Hardness*, shall be in accordance with Test Method D 2240 in addition to the following:

9.7.1 Use a Type A, Shore durometer that has an 0.5-in. (12.7-mm) diameter presser foot.[5]

9.7.2 Calibrate the durometer at a reading of 60 hardness.

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

9.7.4 Determine the tire-tread hardness by averaging at least four readings. Take these readings in the center of each rib, excluding the center rib. It is recommended that additional sets of readings be taken around the tread circumference.

9.7.5 Apply the presser foot to the tire tread, as rapidly as possible without shock, keeping the foot parallel to the tread surface. Apply just enough pressure to obtain firm contact between the presser foot and the tire-tread surface. Read the durometer scale within 1 s after the presser foot has made contact with the tire tread, but after the initial maximum transient needle deflection that may occur immediately after contact is made.

10. Certification

10.1 Upon request, the manufacturer shall furnish to the purchaser certification that the test tire meets this specification.

10.2 All tires under certification shall be subject to the manufacturer's normal variation.

11. Storage and Preservation

11.1 The tires shall be stored under dry atmospheric conditions at an average temperature of 65 ± 5°F (18 ± 3°C). The ozone level in the storage area shall not exceed 5 parts/10^8 (or 5 MPa partial pressure), and no tires shall be stored within 30 ft (9.1 m) of electrical motors or other ozone generating equipment. Storage of the tires shall also be in subdued light, with the tires stacked unbundled, no more than eight tires high on a pallet.

12. Recommendations for Tire Use and Operational Requirements

12.1 It is recommended that the tire be used as a reference for performance evaluations (that is, traction, noise, pavement roughness, and the like).

12.2 The tire shall be mounted on a 5.50 ± 0.5-in. (139.7 ± 12.7-mm) width rim (14 × 5.5 JJ recommended).

12.3 When irregular wear or damage results from tests, or when wear influences the test results, the use of the tire shall be discontinued.

12.4 **Caution**—Test results such as measured friction force may be influenced by tire groove depth or tread hardness, or both. The magnitude of this dependence is a function of the water depth, pavement characteristics, test speed, tire aging effects, and break-in.

13. Keywords

13.1 airport runway friction; fixed slip; standard tire; tire pavement friction

[5] Shore model XAHAF has been found suitable.