Designation: E524 – 08 (Reapproved 2015)

Standard Specification for Standard Smooth Tire for Pavement Skid-Resistance Tests[1]

This standard is issued under the fixed designation E524; 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 the standard smooth tire for pavement testing. The tire covered by this specification is intended for evaluation of tire-pavement friction.

1.2 The terminology in this specification is consistent with Definitions E867.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D297 Test Methods for Rubber Products—Chemical Analysis

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D1054 Test Method for Rubber Property—Resilience Using a Goodyear-Healey Rebound Pendulum (Withdrawn 2010)[3]

D1765 Classification System for Carbon Blacks Used in Rubber Products

D2240 Test Method for Rubber Property—Durometer Hardness

D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets

E867 Terminology Relating to Vehicle-Pavement Systems

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 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.

3.3 A small raised guideline shall be molded on the tire shoulder area to provide a rapid visual check as to whether the maximum wear level for testing has been reached. Tires should actually be removed from service as recommended in 11.5. The marking on the tire, as suggested in Fig. 1, and curb ribs shall be molded on both sides of the tire.

3.4 Fig. 1 is a photograph of the standard tire and Fig. 2 is a cross section of a typical tire.[4]

3.5 Tire should be mounted so that t is rotated in the direction of the arrow on the side of the tire. See Fig. 1.

4. Material Requirements

4.1 The compounding formulation for the tread portion of the tire is given in Table 1.

4.2 *Fabric*—The fabric shall be polyester body or carcass plies and fiber glass belt plies.

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. Dimensions, Weights, and Permissible Variations

5.1 *General*—Details of dimensions are listed as follows and are shown in Fig. 2. When tolerances are not specified, tire dimensions are subject to manufacturer's normal tolerances.

5.1.1 *Design and Construction*—The tire shall be a size G78-15 tubeless type, belted bias construction (two body plies plus two belt plies). The tread width shall be 5.85 in. (148.6

[1] The 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 Sept. 1, 2015. Published December 2015. Originally approved in 1975. Last previous edition approved in 2008 as E524 – 08. DOI: 10.1520/E0524-08R15.

[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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Specification E524 tire is available from Specialty Tires of America, P.O. Box 749, 1600 Washington St., Indiana, PA 15701. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

FIG. 1 Test Tire

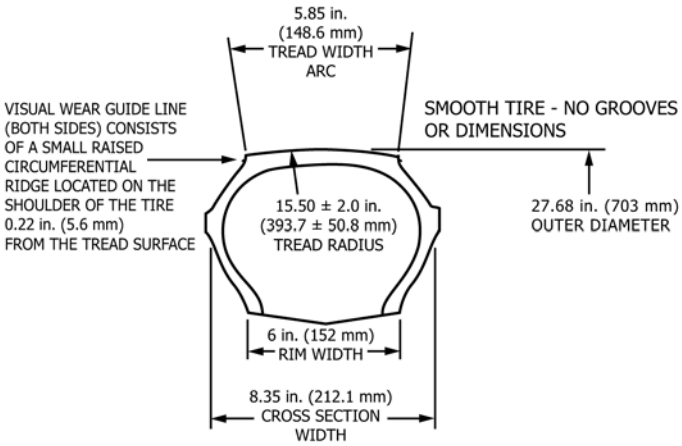

FIG. 2 Tire Section, Including Inflated Tire Dimensions

TABLE 1 Compounding of Tread Rubber[A]

Material	PPHR
SBR 1712[B]	89.38
BR 1208[C]	35.00
Zinc oxide	3.00
Stearic acid	2.00
Paraffin wax	2.00
N339[D]	75.00
6PPD[E]	2.00
High aromatic oil	22.12
TBBS[F]	1.10
DPG[G]	0.10
Sulfur	1.80

[A] See Practice D3182.
[B] Styrene-butadiene rubber (23.5 % styrene) 37.5 parts of high-aromatic oil.
[C] High cis-polybutadiene.
[D] N339 Carbon Black, see Classification D1765.
[E] Dimethyl butylphenyl phenylenediamine.
[F] Butyl benzothiazole sulfenamide.
[G] Diphenyl guanidine.

mm) and the cross-sectional tread radius shall be 15.50 ± 2.0 in. (393.7± 50.8 mm). The tread shall have a thickness of 0.385 in. (9.8 mm) and an under tread thickness of 0.10 in. (2.5 mm). The tire shall have a recommended cross-section width of 8.35 in. (212.1 mm) and a recommended section height of 6.34 in. (161.0 mm) when mounted on a Tire and Rim Association 15x6JJ rim. The cured crown angles shall be 33 ± 2° for the body plies, and 27 ± 2° for the belt plies.

5.1.2 *Wear Indicators*—A visual wear guideline shall be located on the shoulder of the tire 0.22 in. (5.6 mm) from the tread surface as shown in Fig. 2.

6. Workmanship

6.1 Tires shall be free of defects in workmanship and materials.

7. Physical Requirements

7.1 The physical and mechanical test requirements are given in Table 2.

8. Test Methods

8.1 *Tensile Sheet Cures*—Practice D3182.

8.2 *Modulus (300 %)*—Test Methods D412.

8.3 *Tensile Sheet Durometer*—Test Method D2240, using a Type A Shore durometer.

8.4 *Restored Energy (Rebound or Resilience)*—Test Method D1054.

8.5 *Specific Gravity*—Methods D297.

8.6 *Tensile Strength*—Test Methods D412.

8.7 *Elongation*—Test Methods D412.

8.8 *Tire Tread Durometer*—Test Method D2240, in addition to the following procedures:

8.8.1 Use a Type A durometer. (A 0.5-in. (12.7-mm) diameter presser foot, Shore, Code XAHAF is recommended.)

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

TABLE 2 Physical Properties of Tread Compound

Tensile Sheet Cure, min. at 302°F (150°C)	30
300 % modulus, psi (Test Methods D412)	1000 ± 200
Specific gravity (Test Methods D297)	1.13 ± 0.02
Tensile strength, min psi (Test Methods D412)	2000
Elongation, min % (Test Methods D412)	500
Tire tread durometer (Test Method D2240)	58 ± 2

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

8.8.4 The tire tread hardness is to be determined by averaging at least one set of 6 readings. A set should consist of readings taken at equally spaced intervals across the tread. It is recommended that additional sets of readings be taken around the tread circumference.

8.8.5 Apply 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 presser foot and tire tread surface. Read the durometer scale within 1 s after presser foot is in contact with the tire tread, but after initial maximum transient which may occur immediately after contact is made.

9. Certification

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

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

10. Preservation

10.1 Tires shall be kept dry under ordinary atmospheric conditions in subdued light, 70 ± 25°F (21 ± 13.8°C). Tires should not be stored near electric motors, welders, or other ozone generating equipment.

11. Recommendations for Tire Use and Operational Requirements

11.1 The tire is for skid testing only and is not designed for general highway service. Necessary transporting of test equipment should be on commercial tires.

11.2 A new tire break in of 200 miles (320 km) min should be made on tires by the purchaser before using the tire for testing.

11.3 The tire shall be operated with not less than 24 psi (165 kPa) inflation.

11.4 The recommended static test load on the tire shall be 1085 lbf (4826 N), with loading to a maximum of 1380 lbf (6138 N) permissible, at 24 psi (165 kPa) inflation.

11.5 When irregular wear or damage results from tests or when the tire is worn to the wear line, the use of the tire as a standard test tire shall be discontinued.

11.6 **Caution**—Measured friction force and skid number (SN) may be influenced by tire tread hardness. The magnitude of this dependence is a function of the water depth, pavement characteristics, test speed, and tire aging effects.

12. Keywords

12.1 skid number; skid trailer; skid-resistance; smooth tire; tire-pavement friction; water depth