Designation: F 1502 – 94 (Reapproved 1999)

Standard Test Method for Static Measurements on Tires for Passenger Cars, Light Trucks, and Medium Duty Vehicles[1]

This standard is issued under the fixed designation F 1502; 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 test method covers methods for performing certain mechanical static measurements on tires. The term "static" implies that the tire is not rotating while measurements are being made.

1.2 *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:*

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

F 421 Test Method for Measuring Groove and Void Depth in Passenger Car Tires[3]

F 538 Terminology Relating to the Characteristics and Performance of Tires[3]

F 870 Test Method for Tread Footprints of Passenger Car Tires Groove-Area Fraction and Dimensional Measurements[3]

F 1082 Practice for Tires—Determining Precision for Test Method Standards[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *outside diameter*, *n*—the maximum diameter of a tire when it is mounted and inflated.

3.1.2 *overall width*, *n*—the maximum cross-sectional width of a tire, including protective or decorative ribs.

3.1.3 *tire weight*, *n*—the weight of an unmounted tire without tube or flap.

3.1.4 *tread arc width*, *n*—the length of the arc measured from one extreme of the tread design proper to the opposite extreme; that is, from shoulder to shoulder perpendicular to the circumferential center line.

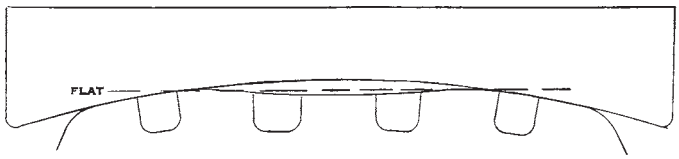

FIG. 1 Type C: Tread Contour with a Center-Low Oxbow

3.1.5 *tread hardness*, *n*—the hardness of an element in the tread design as measured by a designated standard gage.

3.1.6 *tread radius*, *n*—the radius of a circle whose arc best fits the tread surface when the radius template used is held perpendicular to the circumferential center line of an inflated tire.

4. Significance and Use

4.1 Static measurements of tires are important to tire manufacturers, processing engineers, and vehicle design engineers for purposes of commerce (in consumer/vendor agreements) and in tire research and development.

4.2 The procedures are sufficiently detailed to achieve commercially acceptable reproducibility among laboratories and may therefore be used for specification, compliance, or reference purposes.

4.3 Changes attributable to growth after inflation may be obtained by comparing measurements made immediately after inflation with those made 18 to 24 h later. This is the principal purpose for which tire width measurements, for example, are made.

5. Tire Marking

5.1 For measurements other than weight, the tire shall be marked at six equally spaced locations around the circumference. Starting at the DOT serial, make radial lines from bead to bead, perpendicular to the tread center line, at 60-degree intervals. Number the resulting sections "1" through "6" in a clockwise sequence as viewed from the side containing the serial number.

6. Procedures

6.1 *Tire Weight*:

[1] This test method is under the jurisdiction of ASTM Committee F-09 on Tires and is the direct responsibility of Subcommittee F09.30 on Laboratory (Non-Vehicular) Testing.

Current edition approved Feb. 15, 1994. Published April 1994.

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

[3] *Annual Book of ASTM Standards*, Vol 09.02.

FIG. 2 Outside Diameter Measurement

FIG. 3 Overall Width Measurement

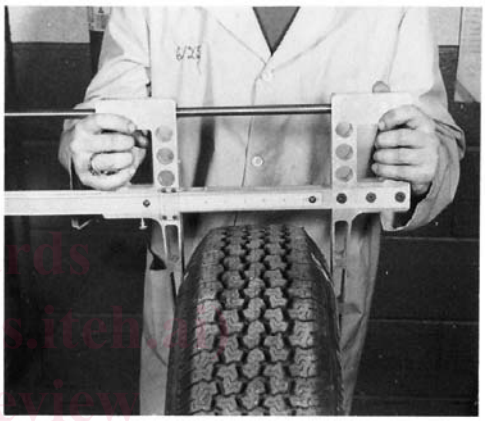

FIG. 4 Overall Width Measurement

6.1.1 Weigh the test tire on a scale that is accurate to 0.045 kg (0.1 lb) in the required range. A scale of 0–90 kg (0–200 lb) has been found to be satisfactory for tires within the scope of this test method.

6.1.2 The scale used should be calibrated with weights traceable to the National Institute of Standards Technology (NIST).

6.2 *Outside Diameter*:

6.2.1 Mount the test tire on a rim of the correct diameter for the tire size and the measuring rim width listed for that tire in the current yearbook of the Tire and Rim Association[4] (or applicable document[5,6]), unless another width is chosen.

6.2.2 Inflate the tire to the maximum pressure given on the sidewall unless another pressure has been chosen. Do not exceed the maximum pressure given on the sidewall. Record the value used. Allow 24 h for inflation growth and adjust pressure if necessary.

6.2.3 The assembly of wheel and inflated tire shall be in temperature equilibrium with the environment in which the measurements are to be made. This can usually be achieved in 3 h at room temperature, 24± 8°C (75 ± 15°F).

6.2.4 Anchor the end of a "diameter" (pi) tape in the tread center (or other maximum diameter location, that is, center low oxbow (Fig. 1), at any circumferential location. Use a thumbtack if necessary. See Fig. 2.

6.2.5 Carefully align the tape around the tire circumference so that it is parallel to the plane of the tread center line. Read and record the indicated diameter.

6.3 *Overall Width*:

6.3.1 Mount and condition the test tire as in 6.2.1 to 6.2.3.

6.3.2 Use an outside caliper or other direct-reading device that is graduated in 0.25 mm (0.01 in.). See Fig. 3 and Fig. 4.

6.3.3 The measured overall width shall include protective side ribs, bars, and decorations.

6.3.4 Section width can be obtained by subtracting heights of sidewall protuberances from the overall width obtained in 6.3.3.

6.3.5 Record individual and average overall width measurements from 6.3.3 to the nearest 0.25 mm (0.01 in.) from at least three equally spaced circumferential locations as marked in 5.1.

6.4 *Tread Radius*:

6.4.1 Prepare the tire as in 6.2.1 to 6.2.3.

6.4.2 Tread radius templates commonly have radii ranging from 120 mm (4.75 in.) to 300 mm (12.0 in.) in 12.8 mm (0.50 in.) increments and from 300 mm (12.0 in.) to 900 mm (35.5 in.) in 12.8 mm (0.50 in.) increments. Choose the one that most closely fits the tread arc defined by one of the following types of contour. See Fig. 5.

NOTE 1—For tires outside or different from these most popular tread radius contours, that is, extreme low profile types, identify those radii which most closely define the tread contour.

6.4.2.1 *Type A Single (Primary)* (see Fig. 6)—This type is characterized by a tread arc that can be uniformly contacted by one of the templates. Choose the one that most closely fits the arc defined by three points, the tread center, and two shoulders. Since a perfectly uniform radius is not always attainable, other typical variations are discussed as means for arriving at a best descriptive fit.

[4] Current yearbook of the Tire and Rim Association available from the Tire and Rim Association, Inc., 175 Montrose Avenue, West, Suite 150, Copley, OH 44321.

[5] Current yearbook of the European Tyre and Rim Technical Organization available from the ETRTO, 32 Avenue Brugmann, 1060 Brussels, Belgium.

[6] Current yearbook of the Japan Automotive Tire Manufacturers' Association Inc. available from JATMA, 9th Floor, Toranomon Bldg., 1-12, Toranomon 1-chome, Minato-ku, Tokyo, Japan.