



SURFACE VEHICLE RECOMMENDED PRACTICE

J2704™

NOV2018

Issued 2005-01
Reaffirmed 2010-09
Revised 2017-09
Stabilized 2018-11

Superseding J2704 SEP2017

Tire Normal Force/Deflection and Gross Footprint Dimension Test

RATIONALE

This technical report is being Stabilized because it covers technology which is mature and not likely to change in the foreseeable future.

STABILIZED NOTICE

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1. SCOPE

This SAE Recommended Practice describes a test method for determining the vertical force and deflection properties of a non-rolling tire and the associated contact patch length and width. The method applies to any tire so long as the equipment is properly scaled to conduct the measurements for the intended test tire. The data are suitable for use in determining parameters for road load models and for comparative evaluations of the measured properties in research and development.

NOTE: Herein, road load models are models for predicting forces applied to the vehicle spindles during operation over irregular pavements. Within the context of this Recommended Practice, forces applied to the pavement are not considered.

1.1 Procedures

Two procedures are specified. The first procedure produces tire normal force/deflection data. The second procedure produces gross footprint, tire contact area, dimensions. Properly applied, the second procedure can simultaneously produce both normal force/deflection data and gross footprint dimensions.

1.2 Test Machines

This document is test machine neutral. It may be applied using any type of test machine capable of fulfilling the requirements stated in this document. The test machine must be capable of accommodating the tire sizes which are to be tested.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J2047 Tire Performance Technology

SAE J2429 Free-Rolling Cornering Test for Truck and Bus Tires

SAE 770870 The Effect of Tire Break-in on Force and Moment Properties, K. D. Marshall, R. L. Phelps, M. G. Pottinger, and W. Pelz, 1977.

SAE 810066 The Effect of Aging on Force and Moment Properties of Radial Tires, M. G. Pottinger and K. D. Marshall

2.1.2 ISO Publication

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO Standard 17025 General requirements for the competence of testing and calibration laboratories

2.1.3 OSHA Publication

Available from U.S. Department of Labor/OSHA, 200 Constitution Avenue, Washington, DC 20210, Tel: 800-321-6742, www.osha.gov/pls/publications/pubindex.list.

OSHA Standard 1910.177 Servicing Multi-piece and Single Piece Rim Wheels—Available in wall chart form as #TTMP-7/95.

3. DEFINITIONS

The definitions that follow are of special meaning in this Recommended Practice and are either not contained in other Recommended Practices or are worded somewhat differently in this practice.

3.1 CONTACT PATCH

This is the total area of the tire surface that touches the road surface. It is possible because of the large normal forces applied in the procedures specified in this Recommended Practice for the total area in contact to include parts of the tire surface that are normally considered to be parts of the sidewalls as well as portions of the tire surface normally considered to be part of the tread surface. Figure 1 is an example of an ink block contact area print.

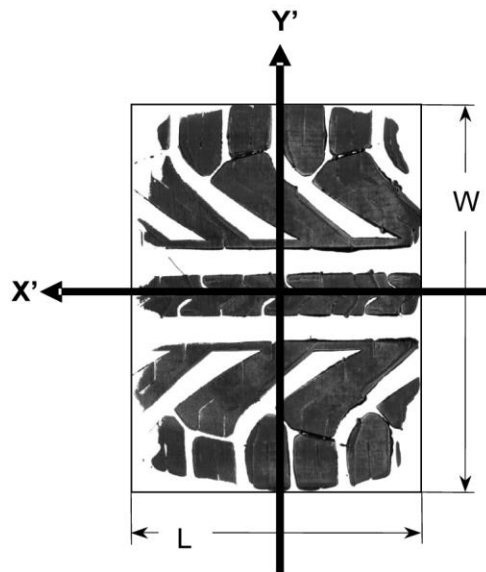


Figure 1 - Ink block contact area print

3.2 CONTACT PATCH DIMENSIONS

For purposes of this practice a rectangle is imposed about the contact patch as illustrated in Figure 1. The rectangle's sides touch the most forward, most rearward, leftmost and rightmost points composing the contact patch. The sides are parallel to the X' and Y' axes of the SAE Tire Axis System, which are shown in Figure 1.

3.2.1 CONTACT PATCH LENGTH, L

Contact Patch Length is the distance from the rearward edge of the imposed rectangle (the edge with the most algebraically negative X' coordinate) to its forward edge (the edge with the most algebraically positive X' coordinate).

3.2.2 CONTACT PATCH WIDTH, W

Contact Patch Width is the distance from the leftmost edge of the imposed rectangle (the edge with the most algebraically negative Y' coordinate) to its rightmost edge (the edge with the most algebraically positive Y' coordinate).

3.3 TEST

A Test is execution of the procedure described in this Recommended Practice one time on one tire at a single set of test conditions.

3.4 TEST PROGRAM

A Test Program is a designed experiment involving a set of the tests described in this practice¹.

¹ There are many experimental possibilities: repeated tests of the same tire, tests of the same tire under multiple test conditions, tests of tires with different specifications (design details), application of this test as part of a series of different tests, etc.