



Technical Report Preprint

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J918

PASSENGER CAR TIRE PERFORMANCE REQUIREMENTS AND TEST PROCEDURES - SAE J918

SAE Recommended Practice

Report of Passenger Car Tire Committee approved June 1965.

1. SCOPE

This SAE Recommended Practice provides minimum performance requirements and accompanying uniform laboratory test procedures for evaluating certain essential characteristics of new tires intended for use on passenger cars.

(The requirements published in this SAE Recommended Practice pertain to tire sizes currently used on American passenger cars. For related information on older tire sizes and for those sizes used on import vehicles, contact Society of Automotive Engineers, Detroit Branch Office, 724 New Center Building, Detroit, Michigan 48202.)

2. DEFINITIONS

2.1 Bead - That part of the tire which is shaped to fit the rim. Made of high tensile steel wires, wrapped and reinforced by the plies.

2.2 Carcass - Tire structure, excepting tread and sidewall rubber.

2.3 Chunking - Separation of the tread from the carcass in small particles which may range from a very small size to several square inches in area.

2.4 Cord - Textile, steel wire strands, and the like, forming the plies in the tire.

2.5 Groove - Space between two tread rows.

2.6 Ply - Layer of rubber-coated parallel cords forming of tire body.

2.7 Ply rating - An index number by which the design guide rating of a tire is defined.

2.8 Rib - Tread section running circumferentially around tire.

2.9 Rim - Metal support for tire or tire and tube assembly on the wheel. Tire beads are seated on the rim.

2.10 Sidewall - Portion of tire between buttress and bead.

2.11 Tread - Portion of tire which comes in contact with road.

2.12 Tread separation - Tread pulling away from tire body.

3. REQUIREMENTS

3.1 STRENGTH - When tested in accordance with the procedures described in paragraph 4.1 the breaking energy for a tire shall meet or exceed the requirements established

in Table 1. Breaking energy value for a tire size not listed in Table 1 shall not be less than that shown for the nearest smaller size tire in cross section and of the same ply rating.

3.2 TIRE ENDURANCE - When tested in accordance with the procedures described in paragraph 4.2, tires shall show no evidence of tread, ply, cord or bead separation or broken cord.

3.3 HIGH SPEED PERFORMANCE - When tested in accordance with the procedures described in paragraph 4.3, tires shall show no evidence of separation or tread chunking.

3.4 RESISTANCE TO TIRE BEAD UNSEATING - When tested in accordance with the procedures described in paragraph 4.4, the applied force required to unseat the tire bead at the point of contact shall not be less than 2500 lb for conventional (bias ply) tires on 13, 14, or 15 in. rims, conforming to Tire and Rim Association standards.

4. TEST PROCEDURES

4.1 STRENGTH - Determination of the breaking energy value shall be made after the endurance test (see paragraph 4.2) and in the following manner. A cylindrical steel plunger 3/4 in. in diameter with a hemispherical end shall be forced into the tread as near to the centerline as possible, avoiding penetration into a tread groove, at the rate of 2 in. per minute. The tire shall be mounted on the rim and inflated to the pressure shown in Table 2. Five measurements of force and penetration at break shall be made at points equally spaced around the circumference of the tire. In the event the tire fails to break before the plunger is stopped by reaching the rim, the force and penetration shall be taken as this occurs.

The energy to break a tire shall be calculated from the average energy values at break by means of the following formula:

$$W = \frac{F \times P}{2}$$

where

W = Energy at break, in.-lb

F = Force at break, lb

P = Penetration at break, in.

4.2 ENDURANCE TEST, EVALUATION OF RESISTANCE TO PLY SEPARATION AND CORD FLEX FAILURE - Test procedure shall be as follows:

4.2.1 Preparation of Tire for Endurance Test - The tire shall be mounted on the rim and inflated to the pressure shown in Table 2. The average radial deflection of the tire at the load shown in Table 2 shall be determined on a flat

surface after the tire has been conditioned at a temperature of $100 \pm 5F$ for a minimum of 3 hr and with inflation pressure adjusted to the value specified in Table 2.

4.2.2 Equipment - The test wheel shall be a flatfaced steel wheel, 67.23 in. in diameter, and at least the same width as the cross-sectional diameter of the tire to be tested. The tire while being tested shall be located in an air space

Table 2 - Inflation Pressures, Loads, and Rim for Tire Tests

Table 1 - Minimum Breaking Energy Requirements

Tire Size Code ^a	Breaking Energy, in./lb, minimum
6.00-13	1000
6.50-13	1000
7.00-13	1100
6.00-14	1000
6.50-14	1000
7.00-14	1100
7.50-14	1200
8.00-14	1300
8.50-14	1300
9.00-14	1300
9.50-14	1300
6.00-15	1000
6.50-15	1000
6.70-15	1100
7.10-15	1100
7.60-15	1200
8.00-15	1300
8.20-15	1300
8.90-15	1500
6.15-14	1000
6.45-14	1000
6.95-14	1000
7.35-14	1100
7.75-14	1200
8.25-14	1300
8.55-14	1300
8.85-14	1300
6.35-15	1000
6.85-15	1000
7.35-15	1100
7.75-15	1200
8.15-15	1300
8.45-15	1300
8.85-15	1300
9.15-15	1300
9.00-15	1300

^a Designation as reported in the YearBook of the Tire and Rim Association, Inc., Comand Bldg., 34 N. Hawkins Ave., Akron, Ohio 44313

Tire Size Code ^a	Ply Rating	Test Rim ^a in.	Tire	
			Test Load, lb	Inflation, lb/sq in.
6.00-13	4	4J	730	24
6.50-13	4	4-1/2J	840	24
7.00-13	4	5J	920	24
6.00-14	4	4J	800	24
6.50-14	4	4-1/2K	890	24
7.00-14	4	5K	980	24
7.50-14	4	5-1/2K	1090	24
8.00-14	4	6K	1180	24
8.50-14	4	6K	1270	24
9.00-14	4	6-1/2K	1360	24
9.50-14	4	6-1/2K	1470	24
6.00-15	4	4J	900	26
6.50-15	4	4-1/2K	1000	26
6.70-15	4	4-1/2K	1120	26
7.10-15	4	5K	1210	26
7.60-15	4	5-1/2K	1320	26
8.00-15	4	6L	1400	26
8.20-15	4	6L	1420	24
8.90-15	6	6-1/2L	1790	28
6.15-14	4	4J	730	24
6.45-14	4	4-1/2J	840	24
6.95-14	4	5J	920	24
7.35-14	4	5J	1020	24
7.75-14	4	5-1/2JK	1120	24
8.25-14	4	6JK	1210	24
8.55-14	4	6JK	1320	24
8.85-14	4	6-1/2JK	1390	24
6.35-15	4	4-1/2J	800	24
6.85-15	4	5J	900	24
7.35-15	4	5-1/2JK	1035	24
7.75-15	4	5-1/2JK	1100	24
8.15-15	4	6JK	1180	24
8.45-15	4	6JK	1280	24
8.85-15	4	6-1/2JK	1370	24
9.15-15	4	6-1/2JK	1470	24
9.00-15	4	6JK	1420	24

^a Designation as reported in the Yearbook of the Tire and Rim Association, Comand Bldg., 34 N. Hawkins Ave., Akron, Ohio 44313

Table 3 - Tire Endurance Test

Speed, mph	Pressure	Test Load, % ^a	hr.	Cumulative Total Miles
50	See	100	4	200
50	Table	120	6	500
50	2	140	24	1700

^a 100% test load shall be the load necessary to obtain the same average radial deflection of the tire against the test wheel as was determined in paragraph 4.2.1

1. LOAD ARM TO BE PARALLEL TO TIRE & RIM ASSEMBLY AT TIME OF ENGAGEMENT.

2. LOAD BLOCK TO CONTACT TIRE AT MAXIMUM SECTION OF TIRE.

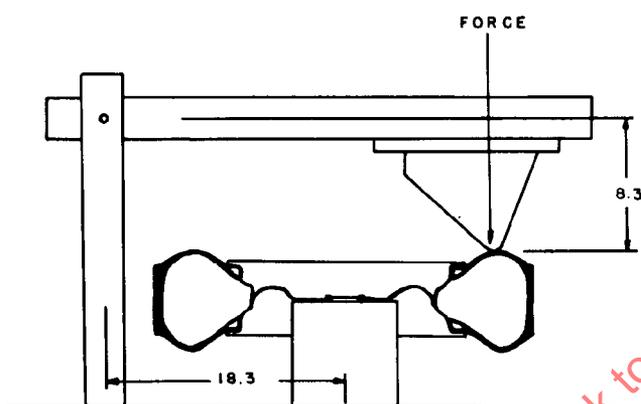


Fig. 1 - Fixture used to support mounted tire-wheel assembly

controlled at a temperature of $100 \pm 5F$.

4.2.3 Procedure - The tire and wheel assembly shall be mounted on the test axle and pressed against the test wheel with the required axle load. Specifications for the test shall be as shown in Table 3.

4.3 HIGH SPEED PERFORMANCE - Test procedure for evaluation of high speed performance shall be as follows:

4.3.1 Preparation of Tire for High Speed Test - The tire shall be mounted on the rim shown in Table 2 and inflated to 30 psi pressure. The average radial deflection of the tire at the load shown in Table 2 shall be determined on a flat surface after the tire has been conditioned at a temperature of $100 \pm 5F$ for a minimum of 3 hr and the inflation pressure adjusted to 30 psi.

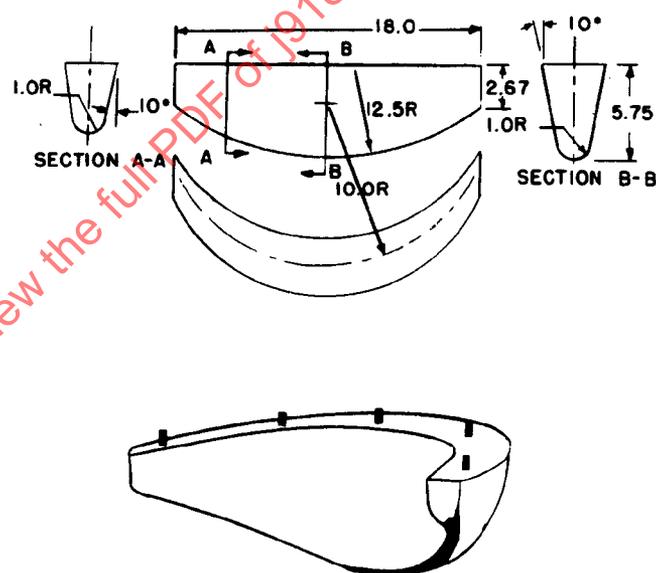
4.3.2 Equipment - The test wheel shall be a flatfaced steel wheel having a diameter of 67.23 in. and at least the same width as the cross-sectional diameter of the tire to be tested. The tire, while being tested, shall be located in an air space controlled at a temperature of $100 \pm 5F$.

NOTE: Alternate diameter test wheels may be used providing adequate correlation to 67.23 in. test wheel is provided.

Table 4 - High Speed Performance

Speed, mph	Inflation Pressure, psi	Test Load ^a	hr	Cumulative Total Miles
50	30	From	2	100
75	30	Table	1/2	137.5
80		2	1/2	177.5
85			1/2	220

^a Test load for a specific tire size shown in Table 2 shall be that necessary to obtain the same average radial deflection of the tire against the test wheel as was determined in paragraph 4.3.1. Adjustment of 100% load in this manner permits test wheels of different diameters to be used.



MATERIAL : HARDWOOD

Fig. 2 - Standard block

4.3.3 Procedure - The tire and wheel assembly shall be mounted on the test axle and pressed against the test wheel with the required axle load. Specifications for the progressive test speeds and conditions shall be as shown in Table 4.

After 2hr breakin running at 50 mph, tire should be allowed to cool to 100 F temperature. Inflation pressure should then be readjusted to 30 psi before continuing test.

After cooling period resume test at 75 mph. Increase speed 5 mph every half hour until maximum indicated speed has been achieved. Standard highway tires shall be tested at speeds up to and including 85 mph for a total test mileage of 220 miles. Deep tread winter tires shall be tested at speeds