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J918a

PASSENGER CAR TIRE PERFORMANCE REQUIREMENTS AND TEST PROCEDURES - SAE J918a

SAE Recommended Practice

Report of Passenger Car Tire Committee approved June 1965 and last revised January 1966.

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 passengre cars. For related information on older tire sizes and for those sizes used on import vehicles, contact Society of Automotive Engineers, Inc., 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 wtih 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.

3.5 PHYSICAL DIMENSIONS - Using the procedure described in paragraph 4.5, all tires shall meet the requirements of the minimum size factor dimensions listed in Table 2.

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. The tire shall be conditioned at room temperature for at least 3 hr, after which the pressure shall be adjusted to 24 psi for 4-ply rating and 32 psi for 8-ply rating tires. 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./minute. 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. It shall then be conditioned at a temperature of 100 ± 5F for a minimum of 3hr. Immediately prior to test, the inflation pressure shall be adjusted to the value specified in Table 2.

4.2.2 Equipment - The test wheel shall be a flatfaced steel wheel, 67.23in. 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 controlled at a temperature of 100 ± 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

Table 1 - Minimum Breaking Energy Requirements

Tire Size Code[a]	Breaking Energy, Min, in.-lb 4-Ply Rating, 24 psi	8-Ply Rating, 32 psi
6.00-13	1250	1875
6.50-13	1250	1875
7.00-13	1375	2060
6.00-14	1250	1875
6.50-14	1250	1875
7.00-14	1375	2060
7.50-14	1500	2250
8.00-14	1625	2435
8.50-14	1625	2435
9.00-14	1625	2435
9.50-14	1625	2435
6.00-15	1250	1875
6.50-15	1250	1875
6.70-15	1375	2060
7.10-15	1375	2060
7.60-15	1500	2250
8.00-15	1625	2435
8.20-15	1625	2435
6.45-14	1250	1875
6.95-14	1250	1875
7.35-14	1375	2060
7.75-14	1500	2250
8.25-14	1625	2435
8.55-14	1625	2435
8.85-14	1625	2435
6.85-15	1250	1875
7.35-15	1250	1875
7.75-15	1375	2060
8.15-15	1375	2060
8.45-15	1500	2250
8.85-15	1625	2435
9.15-15	1625	2435
9.00-15	1625	2435

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

Table 2 - Inflation Pressures, Rim, and Minimum Size Factors for Tire Tests

Tire Size Code[a]	Measuring Rim[a], in.	Tire Inflation, lb/sq in. 4-Ply Rating	8-Ply Rating	Minimum Size Factor[b]
6.00-13	4J	24	32	29.37
6.50-13	4-1/2J	24	32	30.75
7.00-13	5J	24	32	31.88
6.00-14	4J	24	32	30.64
6.50-14	4-1/2K	24	32	31.75
7.00-14	5K	24	32	32.88
7.50-14	5-1/2K	24	32	34.19
8.00-14	6K	24	32	35.17
8.50-14	6K	24	32	35.91
9.00-14	6-1/2K	24	32	36.91
9.50-14	6-1/2K	24	32	37.74
6.00-15	4J	24	32	31.64
6.50-15	4-1/2K	24	32	32.75
6.70-15	4-1/2K	24	32	33.95
7.10-15	5K	24	32	34.89
7.60-15	5-1/2K	24	32	36.05
8.00-15	6L	24	32	36.84
8.20-15	6L	24	32	37.50
6.45-14	4-1/2J	24	32	30.92
6.95-14	5J	24	32	31.96
7.35-14	5J	24	32	32.92
7.75-14	5-1/2JK,J,K	24	32	34.09
8.25-14	6JK,K	24	32	35.11
8.55-14	6JK,K	24	32	36.06
8.85-14	6-1/2JK	24	32	36.82
6.85-15	5J,K	24	32	32.48
7.35-15	5-1/2JK,J,K	24	32	33.86
7.75-15	5-1/2JK,J,K	24	32	34.53
8.15-15	6JK,K,L	24	32	35.50
8.45-15	6JK,K,L	24	32	36.37
8.85-15	6-1/2JK	24	32	37.29
9.15-15	6-1/2JK	24	32	37.92
9.00-15	6JK	24	32	37.45

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

[b] The size factor of a tire is the sum of its section width (on its measuring rim) and its outer diameter. If tire is measured on rim 1/2in. narrower than shown above, subtract 0.2 from size factor; if tire is measured on rim 1/2in. wider than shown above, add 0.2 to size factor.

Table 3 - Tire Endurance Test

Speed, mph	Pressure 4-Ply Rating	Pressure 8-Ply Rating	Test Load (See Table 5, Col. No.)	hr	Total Miles
50	24[a]	32[a]	1	4	-
50	-	-	2	6	-
50	-	-	3	24	1700

[a] The test will be conducted without adjustment of inflation pressure. This permits normal pressure buildup.

Table 4 - High Speed Performance

Speed, mph	Inflation Pressure, psi 4-Ply Rating	Inflation Pressure, psi 8-Ply Rating	Test Load	hr	Total Miles
50	30	38	See	2	-
75	30	38	Table 5,	1/2	-
80	-	-	Col. No. 1	1/2	-
85	-	-		1/2	220

to 30 psi for 4-ply ratings and 38 psi for 8-ply ratings. It shall then be conditioned at a temperature of 100 ± 5 F for a minimum of 3 hr. Immediately prior to test the inflation pressure shall be adjusted to 30 psi for 4-ply ratings and 38 psi for 8-ply ratings.

4.3.2 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 controlled at a temperature of 100 ± 5 F.

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

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 2 hr breakin running at 50 mph, tire should be allowed to cool to a temperature of 100 F. Inflation pressure should then be readjusted to initial pressure and test continued without further adjustment in inflation pressure. This permits normal pressure buildup.

After cooling period resume test at 75 mph. Increase speed 5 mph every 1/2 hr until maximum indicated speed has been achieved. Standard highway tires shall be tested at speeds up to and including 85 mph requirement. Deep tread winter tires shall be tested at speeds up to and including the 80 mph requirement.

4.4 RESISTANCE TO TIRE BEAD UNSEATING -

4.4.1 Preparation of Tire-Wheel Assembly for Bead Unseating Test - The tire should be washed and dried at the two beads, mounted on a new, finished, painted rim without the use of lubrication, and inflated to 24 psi at ambient temperature.

4.4.2 Equipment - A fixture used to support the mounted tire-wheel assembly is shown in Fig. 1. A standard block, detailed in Fig. 2, is forced against the tire side wall as dictated by the fixture geometry. This load can be applied by a hydraulic ram or its equivalent.

4.4.3 Procedure - With the tire and wheel mounted in the fixture the load should be applied through the block to the tire wall at a rate of 2 in./minute. The load at which the bead unseats should be recorded. Raise the block and rotate the tire-wheel assembly one wheel stud hole. Repeat

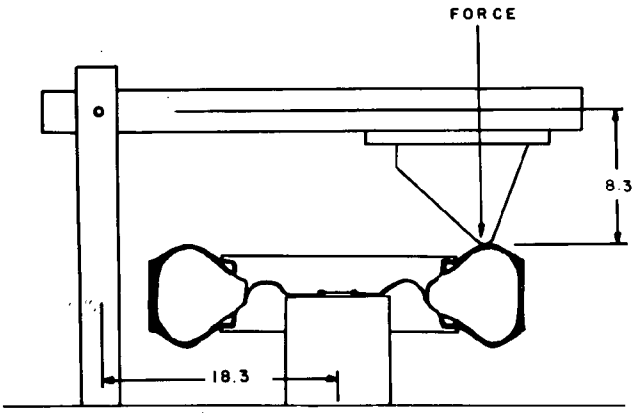

Fig. 1 - Fixture used to support mounted tire-wheel assembly