Technical Report Reprint

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J918b

PASSENGER CAR TIRE PERFORMANCE REQUIREMENTS AND TEST PROCEDURES - SAE J918b

SAE Recommended Practice

Report of the SAE Passenger Car Tire Committee approved June 1965 and last revised December 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 and newly retreaded 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 and popular sizes used on imported passenger cars. For related information on tire sizes not listed, contact Society of Automotive Engineers, Inc., Detroit Branch Office, 18121 East Eight Mile Road, East Detroit, Michigan 48021.)

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 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 ribs.

2.6 MEASURING RIM - A rim that meets the measurements specified by the Tire and Rim Association, Inc. (TRA) or, where applicable, by the European Tire and Rim Technical Organization (ETRTO).

2.7 PLY - Layer of rubber-coated parallel cords forming tire body.

2.8 PLY RATING - An index of tire strength; does not necessarily represent the actual number of plies in the tire.

2.9 RETREADED TIRE - A used tire to which a new tread has been affixed to extend the useful life of the tire.

2.10 RIB - Tread section running circumferentially around tire.

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

2.12 SIDEWALL - Portion of tire between tread and bead.

2.13 SIZE FACTOR - The sum of the tire section width (on its measuring rim) and the outer diameter.

Table 1A - Minimum Breaking Energy Requirements, in. - lb

	4-Ply Rating - 24 psi		8-Ply Rating - 32 psi	
Tire Size*	Rayon	Nylon & Polyester	Rayon	Nylon & Polyester
6.00-13	1650	2600	3300	5200
6.50-13	1650	2600	3300	5200
7.00-13	1650	2600	3300	5200
6.00-14	1650	2600	3300	5200
6.50-14	1650	2600	3300	5200
7.00-14	1650	2600	3300	5200
7.50-14	1650	2600	3300	5200
8.00-14	1650	2600	3300	5200
8.50-14	1650	2600	3300	5200
9.00-14	1650	2600	3300	5200
9.50-14	1650	2600	3300	5200
6.00-15	1650	2600	3300	5200
6.50-15	1650	2600	3300	5200
6.70-15	1650	2600	3300	5200
7.10-15	1650	2600	3300	5200
7.60-15	1650	2600	3300	5200
8.00-15	1650	2600	3300	5200
8.20-15	1650	2600	3300	5200
8.90-15	1650	2600	3300	5200
6.45-14	1650	2600	3300	5200
6.95-14	1650	2600	3300	5200
7.35-14	1650	2600	3300	5200
7.75-14	1650	2600	3300	5200
8.25-14	1650	2600	3300	5200
8.55-14	1650	2600	3300	5200
8.85-14	1650	2600	3300	5200
6.85-15	1650	2600	3300	5200
7.35-15	1650	2600	3300	5200
7.75-15	1650	2600	3300	5200
8.15-15	1650	2600	3300	5200
8.45-15	1650	2600	3300	5200
8.85-15	1650	2600	3300	5200
9.15-15	1650	2600	3300	5200
9.00-15	1650	2600	3300	5200

*Designation established by Tire and Rim Association, Inc., Comand Building, 34 N. Hawkins Ave., Akron, Ohio 44313.

2.14 TREAD - Portion of tire which comes in contact with road.

2.15 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 Tables 1A-1E. Breaking energy value for a tire size not listed in these tables shall not be less than that shown for the nearest smaller size tire of the same ply rating.

Static breaking energy values for nylon and polyester cord tires are established substantially higher than those for rayon cord tires. These differentials are necessary in static test requirements in order to insure comparable impact resistance under dynamic conditions.

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, tread chunking, 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 tread, ply, cord or bead separation, tread chunking, or broken cord.

3.4 TUBELESS TIRE RESISTANCE TO 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 tire sizes listed in Tables 1A-1C. These tire sizes should be tested on either the (H) hump, (FHA) hump, or (SL) special ledge as specified in the TRA Year Book. The applied force required to unseat the tire bead of tire sizes listed in Tables 1D and 1E, when used on the wheels normally supplied with the vehicle, shall not be less than 2000 lb.

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 Tables 2A-2E.

3.6 TEST SAMPLE - Three new or newly retreaded tires are required for each test sample as follows:

(1) First tire shall be used for physical dimensions, resistance to bead unseating, and strength in this sequence.

(2) Second tire shall be used for tire endurance.

(3) Third tire shall be used for high speed performance.

4. TEST PROCEDURES

4.1 STRENGTH -

4.1.1 Preparation of Tire for Strength Test - The tire shall be mounted on the rim and 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, type A radial, and 32 psi for 8-ply rating tires.

4.1.2 Equipment - The test machine shall be one which can force a cylindrical steel plunger 3/4 in. in diameter,

Table 1B - Minimum Breaking Energy Requirements, in. - lb ("70 Series" Tires)

	4-Ply Rating - 24 psi		8-Ply Rating - 32 psi	
Tire Size*	Rayon	Nylon & Polyester	Rayon	Nylon & Polyester
D70-14	1650	2600	3300	5200
E70-14	1650	2600	3300	5200
F70-14	1650	2600	3300	5200
G70-14	1650	2600	3300	5200
H70-14	1650	2600	3300	5200
J70-14	1650	2600	3300	5200
E70-15	1650	2600	3300	5200
F70-15	1650	2600	3300	5200
G70-15	1650	2600	3300	5200
H70-15	1650	2600	3300	5200
J70-15	1650	2600	3300	5200
K70-15	1650	2600	3300	5200
L70-15	1650	2600	3300	5200

*Designation established by Tire and Rim Association, Inc., Comand Building, 34 N. Hawkins Ave., Akron, Ohio 44313.

Table 1C - Minimum Breaking Engery Requirements, in. - lb (Radial Ply, Type A Tires)

Tire Size*	At 24 psi
165R13	2600
175R13	2600
185R13	2600
195R13	2600
155R14	2600
165R14	2600
175R14	2600
185R14	2600
195R14	2600
205R14	2600
215R14	2600
225R14	2600
165R15	2600
175R15	2600
185R15	2600
195R15	2600
205R15	2600
215R15	2600
225R15	2600
235R15	2600

*Designation established by Tire and Rim Association, Inc., Comand Building, 34 N. Hawkins Ave., Akron, Ohio 44313.

Table 1D - Minimum Breaking Energy Requirements, in. - lb
(Tires for Imported Cars)

Tire Size*	4-Ply Rating - 24 psi	
	Rayon	Nylon & Polyester
"Super Baloon" Sizes		
5.20-10	1250	1950
5.20-12	1250	1950
5.60-12	1250	1950
5.20-13	1250	1950
5.60-13	1250	1950
5.90-13	1250	1950
6.40-13	1650	2600
6.70-13	1650	2600
5.20-14	1250	1950
5.60-14	1250	1950
5.90-14	1250	1950
6.40-14	1650	2600
5.20-15	1250	1950
5.60-15	1250	1950
5.90-15	1250	1950
"Low Section" Sizes		
5.00-12	1250	1950
5.50-12	1250	1950
6.00-12	1250	1950
5.00-13	1250	1950
5.50-13	1250	1950
7.25-13	1650	2600
7.50-13	1650	2600
5.50-15L	1250	1950
6.00-15L	1650	2600
6.50-15L	1650	2600
7.00-15L	1650	2600
"Super Low Section" Sizes		
145-10/5.95-10	1250	1950
125-12/5.35-12	1250	1950
135-12/5.65-12	1250	1950
145-12/5.95-12	1250	1950
155-12/6.15-12	1250	1950
135-13/5.65-13	1250	1950
145-13/5.95-13	1250	1950
155-13/6.15-13	1650	2600
165-13/6.45-13	1650	2600
175-13/6.95-13	1650	2600
185-13/7.35-13	1650	2600
135-14/5.65-14	1250	1950
145-14/5.95-14	1250	1950
155-14/6.15-14	1650	2600
125-15/5.35-15	1250	1950
135-15/5.65-15	1250	1950
145-15/5.95-15	1250	1950
155-15/6.35-15	1650	2600
175-15/7.15-15	1650	2600
235-15	1650	2600

*Designation established by European Tire and Rim Technical Organization.

with a hemispherical end, into the tire at a rate of 2 in./minute.

4.1.3 Procedure - The plunger shall be forced into the tread as near to the centerline as possible, avoiding penetration into a tread groove. 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 -

4.2.1 Preparation of Tire for Endurance Test - The tire shall be mounted on the rim and inflated to the pressure shown in Tables 2A-2E. 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 the value specified in Tables 2A-2E.

4.2.2 Equipment - The test wheel shall be a flat-faced 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.

Table 1E - Minimum Breaking Energy Requirements, in. - lb
(Radial Ply Tires for Imported Cars)

Tire Size*	4-Ply Rating - 24 psi
145R10 (145-10)	1950
125R12 (125-12)	1950
135R12 (135-12)	1950
145R12 (145-12)	1950
155R12 (155-12)	1950
135R13 (135-13)	1950
145R13 (145-13)	1950
155R13 (155-13)	1950
135R14 (135-14)	1950
145R14 (145-14)	1950
125R15 (125-15)	1950
135R15 (135-15)	1950
145R15 (145-15)	1950
155R15 (155-15)	1950

*Designation established by European Tire and Rim Technical Organization.

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 -

4.3.1 Preparation of Tire for High Speed Test - The tire shall be mounted on the rim shown in Tables 2A-2E and inflated 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 in-

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

Tire Size	Measuring Rim (TRA)	Tire Inflation, psi		Minimum Size Factor, in.
		4-Ply Rating	8-Ply Rating	
6.00-13	4J, JJ	24	32	29.37
6.50-13	4-1/2J, JJ	24	32	30.75
7.00-13	5J, JJ	24	32	31.88
6.00-14	4J, JJ	24	32	30.64
6.50-14	4-1/2K, J, JJ	24	32	31.75
7.00-14	5K, J, JJ	24	32	32.88
7.50-14	5-1/2K, J, JJ, JK	24	32	34.19
8.00-14	6K, JJ, JK	24	32	35.17
8.50-14	6K, JJ, JK	24	32	35.91
9.00-14	6-1/2K, JJ, JK	24	32	36.91
9.50-14	6-1/2K, JJ, JK	24	32	37.74
6.00-15	4J, JJ	24	32	31.64
6.50-15	4-1/2K, J, JJ	24	32	32.75
6.70-15	4-1/2K, J, JJ	24	32	33.95
7.10-15	5K, J, JJ	24	32	34.89
7.60-15	5-1/2K, J, JJ, JK	24	32	36.05
8.00-15	6L	24	32	36.84
8.20-15	6L	24	32	37.50
8.90-15	6-1/2L	24	32	39.54
6.45-14	4-1/2J, K, JJ	24	32	30.92
6.95-14	5J, K, JJ	24	32	31.96
7.35-14	5J, K, JJ	24	32	32.92
7.75-14	5-1/2JK, J, K, JJ	24	32	34.09
8.25-14	6JK, K, JJ	24	32	35.11
8.55-14	6JK, K, JJ	24	32	36.06
8.85-14	6-1/2JK, JJ	24	32	36.82
6.85-15	5J, K, JJ	24	32	32.48
7.35-15	5-1/2JK, J, K, JJ	24	32	33.86
7.75-15	5-1/2JK, J, K, JJ	24	32	34.53
8.15-15	6JK, K, L, JJ	24	32	35.50
8.45-15	6JK, K, L, JJ	24	32	36.37
8.85-15	6-1/2JK, JJ	24	32	37.29
9.15-15	6-1/2JK, JJ	24	32	37.92
9.00-15	6JK, JJ	24	32	37.45

Note 1: If a tire is measured on a rim 1/2 in. narrower than shown above, add 0.2 in. to the size factor so obtained before comparing to the minimum size factor in this table.

Note 2: If a tire is measured on a rim 1/2 in. wider than shown above, subtract 0.2 in. from the size factor so obtained before comparing to the minimum size factor in this table.

Table 2B - Inflation Pressures, Rim, and Minimum Size Factors for Tire Tests ("70 Series" Tires)

Tire Size	Measuring Rim (TRA)	Tire Inflation, psi 4-Ply Rating	Tire Inflation, psi 8-Ply Rating	Minimum Size Factor, in.
D70-14	5-1/2JJ	24	32	32.87
E70-14	5-1/2JJ	24	32	33.45
F70-14	5-1/2JJ	24	32	34.18
G70-14	6JJ	24	32	35.14
H70-14	6JJ	24	32	36.19
J70-14	6-1/2JJ	24	32	36.91
E70-15	6JJ	24	32	34.17
F70-15	6JJ	24	32	34.91
G70-15	6JJ	24	32	35.68
H70-15	6JJ	24	32	36.68
J70-15	6-1/2JJ	24	32	37.34
K70-15	6-1/2JJ	24	32	37.62
L70-15	6-1/2JJ	24	32	38.09

Note 1: It is permissible to use existing J or JK rims in same widths as shown above.

Note 2: If a tire is measured on a rim 1/2 in. narrower than shown above, add 0.2 in. to the size factor so obtained before comparing to the minimum size factor in this table.

Note 3: If a tire is measured on a rim 1/2 in. wider than shown above, subtract 0.2 in. from the size factor so obtained before comparing to the minimum size factor in this table.

Table 2C - Inflation Pressures, Rim, and Minimum Size Factors for Tire Tests (Radial Ply, Type A Tire)

Tire Size	Measuring Rim (TRA)	Tire Inflation, psi	Minimum Size Factor, in.	Tire Size	Measuring Rim (TRA)	Tire Inflation, psi	Minimum Size Factor, in.
165R13	4-1/2JJ	24	29.18	195R15	5-1/2JJ	24	34.22
175R13	4-1/2JJ	24	30.30	205R15	6JJ	24	35.20
185R13	5JJ	24	31.42	215R15	6JJ	24	36.00
195R13	5-1/2JJ	24	32.38	225R15	6-1/2JJ	24	36.94
155R14	4JJ	24	29.51	235R15	6-1/2JJ	24	37.75
165R14	4-1/2JJ	24	30.65				
175R14	5JJ	24	31.63				
185R14	5JJ	24	32.59				
195R14	5-1/2JJ	24	33.69				
205R14	6JJ	24	34.82				
215R14	6JJ	24	35.79				
225R14	6-1/2JJ	24	36.44				
165R15	4-1/2JJ	24	31.18				
175R15	5JJ	24	32.30				
185R15	5-1/2JJ	24	33.58				

Note 1: It is permissible to use existing J or JK rims in same widths as shown above.

Note 2: If a tire is measured on a rim 1/2 in. narrower than shown above, add 0.2 in. to the size factor so obtained before comparing to the minimum size factor in this table.

Note 3: If a tire is measured on a rim 1/2 in. wider than shown above, subtract 0.2 in. from the size factor so obtained before comparing to the minimum size factor in this table.

Table 2D - Inflation Pressures, Rim, and Minimum Size Factors for Tire Tests (Tires for Imported Cars)

Tire Size	Measuring Rim, in.	Tire Inflation, psi 4-Ply Rating	Minimum Size Factor, in.
"Super Ballon" Sizes			
5.20-10	3.50	24	24.84
5.20-12	3.50	24	26.79
5.60-12	4.00	24	27.83
5.20-13	3.50	24	27.72
5.60-13	4.00	24	28.92
5.90-13	4.00	24	29.74
6.40-13	4.50	24	31.26
6.70-13	4.50	24	32.14
5.20-14	3.50	24	28.89
5.60-14	4.00	24	29.94
5.90-14	4.00	24	30.76
6.40-14	4.50	24	32.19
5.20-15	3.50	24	29.75
5.60-15	4.00	24	30.87
5.90-15	4.00	24	31.77
"Low Section" Sizes			
5.00-12	3.50	24	25.62
5.50-12	4.00	24	26.93
6.00-12	4.50	24	28.33
5.00-13	3.50	24	26.64
5.50-13	4.00	24	27.95
7.25-13	5.00	24	32.51
7.50-13	5.50	24	33.22
5.50-15L	4.00	24	29.97
6.00-15L	4.50	24	31.29
6.50-15L	4.50	24	32.68
7.00-15L	5.00	24	33.85
"Super Low Section" Sizes			
145-10/5.95-10	4.00	24	24.76
125-12/5.35-12	3.50	24	24.68
135-12/5.65-12	4.00	24	25.53
145-12/5.95-12	4.00	24	26.69
155-12/6.15-12	4.50	24	27.36
135-13/5.65-13	4.00	24	26.53
145-13/5.95-13	4.00	24	27.61
155-13/6.15-13	4.50	24	28.44
165-13/6.45-13	4.50	24	29.52
175-13/6.95-13	5.00	24	30.34
185-13/7.35-13	5.50	24	31.41
135-14/5.65-14	4.00	24	27.54
145-14/5.95-14	4.00	24	28.54
155-14/6.15-14	4.50	24	29.45
125-15/5.35-15	3.50	24	27.69
135-15/5.65-15	4.00	24	28.53

Table 2D cont'd

Table 2D cont'd

Tire Size	Measuring Rim, in.	Tire Inflation, psi 4-Ply Rating	Minimum Size Factor, in.
145-15/5.95-15	4.00	24	29.54
155-15/6.35-15	4.50	24	30.45
175-15/7.15-15	5.00	24	32.42
235-15	6.50	24	38.26

Note 1: If a tire is measured on a rim 1/2 in. narrower than shown above, add 0.2 in. to the size factor so obtained before comparing to the minimum size factor in this table.

Note 2: If a tire is measured on a rim 1/2 in. wider than shown above, subtract 0.2 in. from the size factor so obtained before comparing to the minimum size factor in this table.

Table 2E - Inflation Pressures, Rim, and Minimum Size Factors for Tire Tests
(Radial Ply Tires for Imported Cars)

Tire Size	Measuring Rim, in.	Tire Inflation, psi 4-Ply Rating	Minimum Size Factor, in.
145 R 10 (145-10)	4.00	24	24.76
125 R 12 (125-12)	3.50	24	24.68
135 R 12 (135-12)	4.00	24	25.53
145 R 12 (145-12)	4.00	24	26.69
155 R 12 (155-12)	4.50	24	27.36
135 R 13 (135-13)	4.00	24	26.53
145 R 13 (145-13)	4.00	24	27.61
155 R 13 (155-13)	4.50	24	28.44
135 R 14 (135-14)	4.00	24	27.54
145 R 14 (145-14)	4.00	24	28.54
125 R 15 (125-15)	3.50	24	27.69
135 R 15 (135-15)	4.00	24	28.53
145 R 15 (145-15)	4.00	24	29.54
155 R 15 (155-15)	4.50	24	30.45

Note 1: If a tire is measured on a rim 1/2 in. narrower than shown above, add 0.2 in. to the size factor so obtained before comparing to the minimum size factor in this table.

Note 2: If a tire is measured on a rim 1/2 in. wider than shown above, subtract 0.2 in. from the size factor so obtained before comparing to the minimum size factor in this table.

Table 3 - Tire Endurance Test

Speed, mph	Inflation Pressure, psi 4-Ply Rating & Radial (Type A)	Inflation Pressure, psi 8-Ply Rating	Test Load (See Tables 5A, 5B, 5C, 5D or 5E) (Col. No.)	Hr	Total Miles
50	24*	32*	1	4	-
50	-	-	2	6	-
50	-	-	3	24	1700

* The test will be conducted without adjustment of inflation pressure. This permits normal pressure buildup.

flation pressure shall be adjusted to 30 psi for 4-ply ratings and 38 psi for 8-ply ratings.

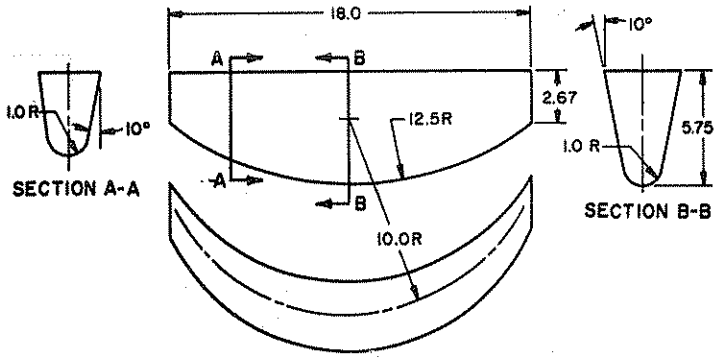
4.3.2 Equipment - The test wheel shall be a flat-faced steel wheel 67.23 in. in diameter and at least the same width as the cross-sectional diameter of the tire to be tested. The tire, while being tested, shall be located in an air space controlled at a temperature of 100 ± 5 F.

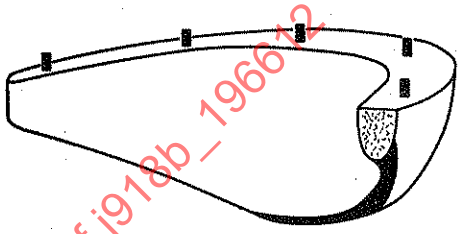
NOTE: Alternate diameter tests wheels may be used providing adequate correlation to 67.23 in. test wheel is provided.

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, the tire shall be allowed to cool to a temperature of 100 F. Inflation pressure shall 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.



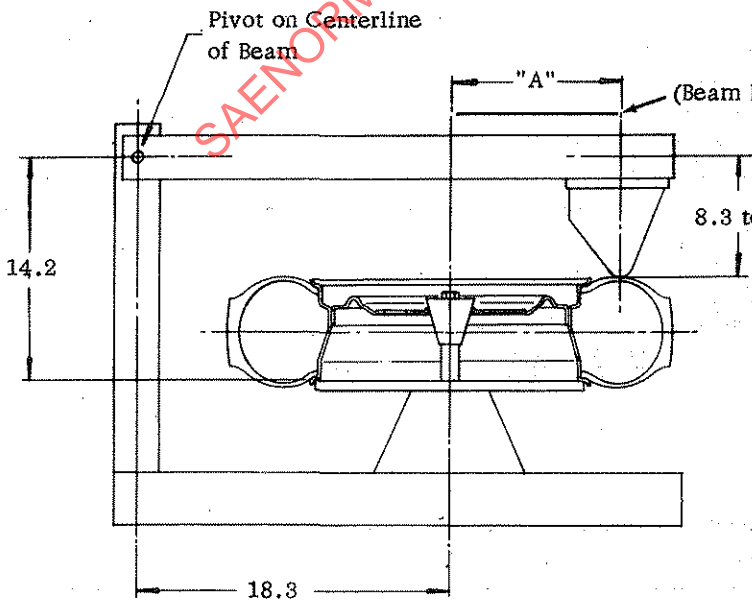


MATERIAL: Cast Aluminum #355
T-6 Condition
Finish - 50 Micro Inch

Fig. 2 - Block diagram

Table 4 - High Speed Performance

Speed, mph	Inflation Pressure, psi 4-Ply Rating & Radial (Type A)	8-Ply Rating	(See Tables 5A, 5B, 5C, 5D or 5E)	Hr	Total Miles
50	30	38	Col. No. 1	2	-
75	30	38		1/2	-
80	-	-		1/2	-
85	-	-		1/2	220



Wheel Size	Dim. "A"
15"	11.0
14"	10.5
13"	10.0
12"	9.5

Fig. 1 - Bead unseating test fixture