



COMMONWEALTH OF AUSTRALIA

AUSTRALIAN DESIGN RULE 23B

FOR

NEW PNEUMATIC PASSENGER CAR TYRES

As Endorsed by the
Australian Transport Advisory Council

The intention of this Australian Design Rule is to specify standards of strength, construction and standard pressure/load relationships for tyres of particular size designations to facilitate the choice of tyres for passenger cars and derivatives thereof.

The Australian Transport Advisory Council has recommended to Commonwealth, State and Territory Governments that all motor vehicles specified below, except those tyres on passenger car derivatives, forward control passenger vehicles, and multi-purpose passenger cars which are labelled as suitable for light trucks by the designation L.T. or similar, shall comply with Australian Design Rule 23B - New Pneumatic Passenger Car Tyres.

VEHICLE CATEGORY	RULE AMENDMENT	
	MANUFACTURED ON OR AFTER	
	23B	
Passenger Cars		
Forward Control Passenger Vehicles up to 8 seats	1 Jan 1986	
9 seats	1 Jan 1986	
Other Passenger Cars	1 Jan 1986	
Passenger Car Derivatives	1 Jan 1986	
Multi-Purpose Passenger Cars	1 Jan 1986	
Omnibuses up to 3.5 tonnes GVM		
up to 12 seats	1 Jan 1987	
over 12 seats	N/A	
up to 4.5 tonnes GVM	N/A	
over 4.5 tonnes GVM	N/A	
Motorcycles	N/A	
Mopeds	N/A	
Specially Constructed Vehicles	N/A	
Other Vehicles not listed above		
up to 4.5 tonnes GVM	N/A	
over 4.5 tonnes GVM	N/A	

N/A - Not Applicable
GROSS VEHICLE MASS - Abbreviated to 'GVM'

Issued By: Department of Transport
PO Box 594
CIVIC SQUARE ACT 2608
AUSTRALIA

Issued: February 1984

AUSTRALIAN DESIGN RULE NO. 23B - NEW PNEUMATIC PASSENGER CAR TYRES

- 23B.1 Definitions
- 23 .1.1 'Administrator' - means the Australian Motor Vehicle Certification Board or a person to whom the Board has delegated, by instrument in writing revocable at will, the powers and functions of the Administrator under this rule.
- 23B.1.2 'Asymmetrical Tyre' - means a tyre which, through tread pattern or construction, is required to be fitted to a vehicle such that one particular sidewall faces outwards.
- 23B.1.3 'Bead' - means that part of the tyre usually made of steel wires, wrapped or reinforced by ply cords, that is shaped to fit the rim.
- 23B.1.4 'Bead Separation' - means a breakdown of bond between components in the bead area.
- 23B.1.5 'Belt' - means a layer or layers of cord or other reinforcement under the tread to stiffen the tyre structure.
- 23B.1.6 'Belt Separation' - a parting of rubber compound between belt layers or between belts and plies.
- 23B.1.7 'Bias-Belted Tyre' - means a pneumatic tyre in which the cords in the tyre carcass are laid at alternate angles which are substantially less than 90 degrees to the centreline of the tread. In addition a cord reinforcing belt is incorporated into the tyre under the tread such that its cords make an included angle with the tyre centreline not greater than the same angle made by the carcass cords.
- 23B.1.8 'Carcass' - means the tyre structure, except tread and sidewall rubber.
- 23B.1.9 'Chunking' - means the breaking away of pieces of the tread.
- 23B.1.10 'Cord' - means the strands forming the plies and/or belt in the tyre.
- 23B.1.11 'Cord Separation' - means cord parting away from adjacent rubber compounds.
- 23B.1.12 'Diagonal-Ply Tyre' (includes tyres previously known as Cross-Ply or Bias-Ply) - means a pneumatic tyre in which the cords in the tyre carcass are laid at alternate angles which are substantially less than 90 degrees to the centreline of the tread.
- 23B.1.13 'Groove' - means the space between two adjacent tread ribs.
- 23B.1.14 'Load Capacity Index' - is a numerical code associated with the maximum load rating assigned to the tyre (Table 2 refers).

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- 23B.1.15 'Maximum Load Rating' - means the maximum load which the tyre is rated to carry.
- 23B.1.16 'Measuring Rim' - means any rim with a rim width as specified for the design or measuring rim for a particular tyre size designation, and with the bead seat and flange dimensions for that rim, as shown in one or more of the following documents or, in case of obsolete sizes no longer listed, in any editions of the following documents prior to the dates listed:
- (i) the Tyre and Rim Standards Manual of the Tyre and Rim Association of Australia, 1983 Edition,
 - (ii) the 1983 Tire and Rim Association Inc. Year Book
 - (iii) the Japan Automobile Tire Manufacturers Association Year Book, 1983 Edition,
 - (iv) the Japanese Industrial Standards (JIS - D4202) dated 1977, and (JIS - D4218) dated 1975
 - (v) the European Tyre and Rim Technical Organisation (E.T.R.T.O.) Data Book dated 1983.
- 23B.1.17 'Nominated Standard' - means any one of the standards documents referenced in Clause 23B.1.16.
- 23B.1.18 'Overall Width' - means the linear distance between the exteriors of the sidewalls of an inflated tyre, including elevations due to labelling, decorations, or protective bands or rib.
- 23B.1.19 'Ply' - means a layer of rubber-coated substantially parallel cords forming a tyre body.
- 23B.1.20 'Ply Separation' - means a parting of rubber compound between adjacent plies.
- 23B.1.21 'Pneumatic Tyre' - means a mechanical device made of rubber, chemicals, fabric and steel or other materials, which when mounted on an automotive rim provides the traction and contains the gas or fluid that sustains the load.
- 23B.1.22 'Radial Ply Tyre' - means a pneumatic tyre in which the ply cords extend to the bead and are laid at an angle of substantially 90° to the centreline of the tread, the carcass being stabilized by a circumferential belt comprising two or more layers of substantially inextensible cord material.
- 23B.1.23 'Rim' - means a support for a tyre or a tyre and tube assembly upon which the tyre beads are seated.

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- 23B.1.24 'Section Width' - means a linear distance between the exteriors of the sidewalls of an inflated tyre, excluding elevations due to labelling, decoration, or protective bands.
- 23B.1.25 'Service Description' - means the combination of 'Load Capacity Index' and 'Speed Category' symbols as defined in Clause 23B.1.14 and Clause 23B.1.29.
- 23B.1.26 'Sidewall' - means that portion of a tyre between the tread and the bead.
- 23B.1.27 'Size Factor' - means the sum of the section width and the outer diameter of a tyre determined on the measuring rim.
- 23B.1.28 'Specified Design Section Width' - means the width specified in the Nominated Standard for a new tyre of that size designation and type when inflated on its measuring rim.
- 23B.1.29 'Speed Category' - means the category assigned to a tyre by a tyre manufacturer which denotes the maximum vehicle speed for which the tyre is rated (Table 4 refers).
- 23B.1.30 'Test Rim' - means any rim conforming to the dimensions of the measuring rim for the particular tyre size designation and type.
- 23B.1.31 'Test Wheel Speed' - means the peripheral speed of the steel test wheel.
- 23B.1.32 'Tread' - means the portion of a tyre that comes into contact with the road.
- 23B.1.33 'Tread Separation' - means pulling away of the tread from the tyre carcass.
- 23B.1.34 'Treadwear Indicator' - means an indicator incorporated into the tread of a tyre which gives a visual indication when the tread has worn down to leave a pre-determined minimum groove depth.

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- 23B.1.35 'Tyre carcass construction symbol' - relates to the type of carcass construction used in the manufacture of the tyre, viz:-
- D - Diagonal-Ply
 - B - Bias-Belted
 - R - Radial Ply
- 23B.2 Requirements
- 23B.2.1 Size and Construction
- 23B.2.1.1 The tyre manufacturer shall specify the Nominated Standard with which the tyre design complies in respect to maximum load, inflated dimensions, design or measuring rim and alternative rim fitments.
- 23B.2.1.2 The Administrator may accept a tyre, rim or tyre and rim combination not incorporated in a Nominated Standard referred to in Clause 23B.1.16.
- 23B.2.2 Performance Requirements
- 23B.2.2.1 General
- Each tyre shall conform to each of the following:-
- (a) It shall meet the requirements specified in Clause 23B.2.2.2 for its size designation, type, load and speed categories or service description.
 - (b) It shall incorporate at least four treadwear indicators approximately equally spaced, each of which provides for a visual indication when the tread in the vicinity of the indicator has a groove depth of 1.60 ± 0.40 , - 0.25 mm.
- 23B.2.2.2 Test Requirements
- 23B.2.2.2.1 Test Sample
- Three tyres having identical characteristics when described according to requirements of Clause 23B.2.3 shall comprise a test sample:
- (a) one tyre shall be used for physical dimensions, resistance to bead unseating, and strength, in sequence;
 - (b) a second tyre shall be used for tyre endurance; and
 - (c) a third tyre for high speed performance.

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23B.2.2.2.2 In the appropriate tests, pressures shall be established within 1 psi or 10 kPa (as appropriate) of the values specified for each appropriate test.

23B.2.2.2.3 Physical Dimensions

Each tyre shall conform to each of the following when measured in accordance with Clause 23B.3.1:

- (a) its actual section width and overall width shall not exceed by more than 7% the section width specified in the Nominated Standard for its size designation and type.
- (b) its size factor shall be at least as large as the minimum size factor specified in the Nominated Standard for its size designation and type. If the Nominated Standard does not specify a minimum size factor, this shall be calculated as:

$$\text{Min. size factor} = 0.97 (SW + 2SH) + D_R$$

where D_R = nominal rim diameter

SW = specified section width*

SH = $\frac{1}{2}$ (specified outer diameter* - nominal rim diameter)

* in the Nominated Standard

23B.2.2.2.4 Resistance to bead unseating

(For Tubeless Tyres only)

When tested in accordance with Clause 23B.3.2 the applied force required to unseat the tyre bead at the point of contact shall not be less than:

- (a) 6,670N for tyres with a Specified Design Section Width of less than 6.3 inches or 160 mm.
- (b) 8,890N for tyres with a Specified Design Section Width of 6.3 inches, or 160 mm or more but less than 8 inches or 205 mm.
- (c) 11,120N for tyres with a Specified Design Section Width of 8 inches or 205 mm or more.

23B.2.2.2.5 Tyre Strength

Each tyre shall meet the requirements for minimum breaking energy specified in Table 3 when tested in accordance with Clause 23B.3.3.

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23B.2.2.2.6 Tyre Endurance

After completion of the laboratory test wheel endurance test specified in Clause 23B.3.4 no tyre shall have tread, ply, cord, belt or bead separation, chunking, or broken cords.

23B.2.2.2.7 High Speed Test

The tyre will be deemed to satisfy the High Speed Test requirement of this rule if it is covered by a Type Approval Certificate in accordance with the "United Nations Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts", Geneva, 20 March 1958, Addendum 29: Regulation No. 30/02 annexed to the agreement.

Alternatively after completion of the laboratory high speed test specified in 23B.3.5 no tyre shall have bead, ply, cord, belt or bead separation, chunking or broken chords.

23B.2.3 Labelling Requirements

Each tyre shall be conspicuously labelled on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres with each of the following permanently moulded in letters and figures at least 3.8mm high and depth at least 0.25 mm if below the background surface or 0.4 mm if above the background surface.

- (a) Tyre size designation, which includes the speed category symbol as determined from Table 4 either within the size designation and or adjacent to the size designation as part of the service description, and tyre carcass construction symbol for radial ply or bias-belted tyres and optionally, in the case of diagonal-ply tyres.
- (b) The maximum load rating for the tyre expressed in pounds, followed by the word 'pounds' or the abbreviation 'lbs' or the maximum load rating for the tyre expressed in kilograms followed by the word 'kilogram' or the abbreviation 'kg' or the load capacity index symbol adjacent to the size designation as part of the Service Description. Tyres shall be labelled unambiguously in respect to maximum load rating.
- (c) Identification of manufacturer by:
 - (1) Name; or
 - (2) Brand Name and an approved code mark.
- (d) The word 'tubeless' if applicable.
- (e) The word 'radial' if applicable.

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- (f) The words 'bias-belted' if applicable.
- (g) The Date Code consisting of three digits, the first two nominating the week of the year and the third digit the year of manufacture on at least one sidewall of the tyre.
- (h) In the case of assymmetrical tyres, a clear indication which side of the tyre is to face outwards when fitted to the vehicle.

 23B.3 Test Procedure

 23B.3.1 Physical Dimensions

Determine tyre physical dimensions under uniform ambient conditions as follows:

- (a) (i) Mount the tyre on a test rim and inflate it to the pressure specified for measurement in the Nominated Standard,
 or, if no pressure is specified for measurement:-
 (ii) Mount the tyre on a test rim and inflate it to the pressure designated for its maximum load in the Nominated Standard reduced by 60 kPa or 8 psi as appropriate.
- (b) Condition it at ambient room temperature for at least 24 hours.
- (c) Readjust pressure to that specified in (a)(i) or (a)(ii) as appropriate.
- (d) Caliper the section width and overall width at 6 points approximately equally spaced around the tyre circumference.
- (e) Record the average of these measurements as the section width and overall width, respectively.
- (f) Determine tyre outer diameter by measuring the maximum circumference of the tyre and dividing this dimension by TT.

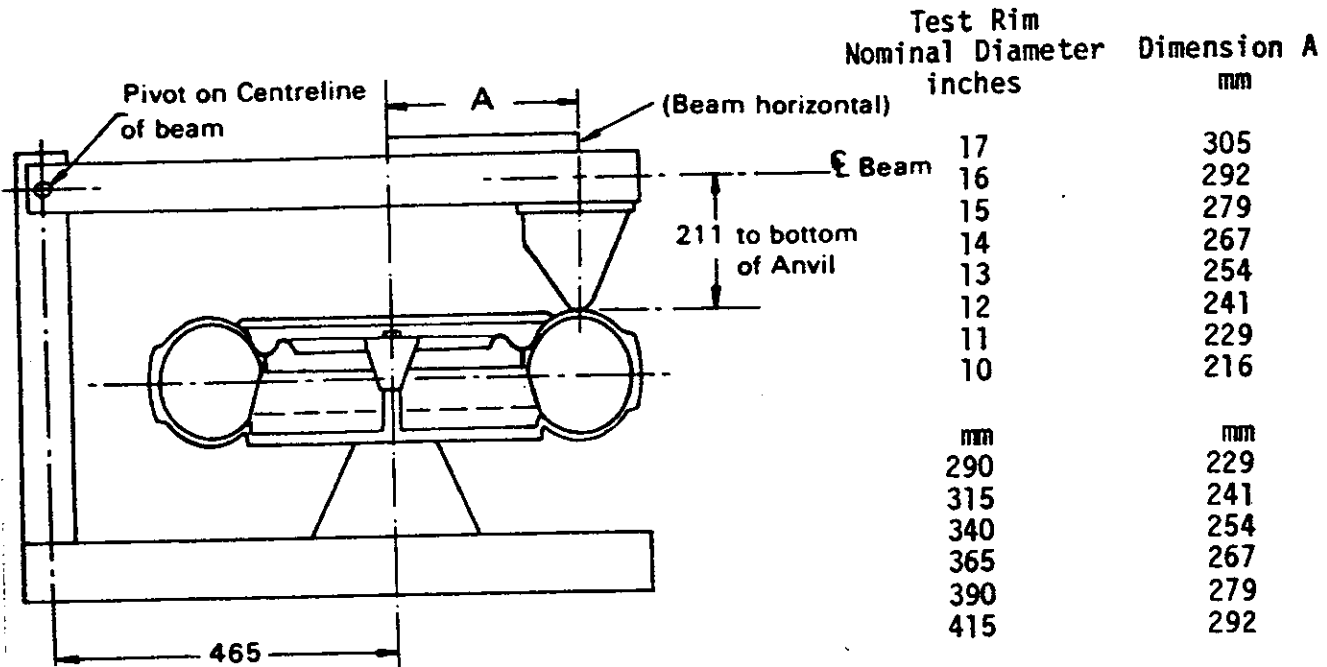
 23B.3.2 Tubeless Tyre Bead Unseating Resistance

 23B.3.2.1 Preparation of Tyre Test Rim Assembly

23B.3.2.1.1 Wash the tyre, dry it at the beads, and mount it without lubrication or adhesive on a clean, painted test rim.

23B.3.2.1.2 Adjust the inflation to the applicable pressure specified in 23B.3.1(a)(ii) at ambient room temperature.

23B.3.2.1.3 Mount the tyre and test rim in the fixture shown in Figure 1, and force either of the standard blocks shown in Figure 2 against the tyre sidewall as required by the geometry of the fixture, or by any other approved test procedure. 1*



Note - Dimensions in mm

Figure 1 - Bead Unseating Fixture

23B.3.2.2 Test Procedure

23B.3.2.2.1 Apply a load through the block to the tyre outer sidewall at a distance no less than that specified in Figure 1 for the applicable test rim at a rate of 50±10 mm per minute, with the load arm substantially parallel to the tyre and rim assembly at time of engagement.

23B.3.2.2.2 Increase the load until the bead unseats or the applicable value specified in Clause 23B.2.2.2.4 is reached.

23B.3.2.2.3 This test shall be repeated at least four times at locations approximately equally spaced around the tyre circumference.

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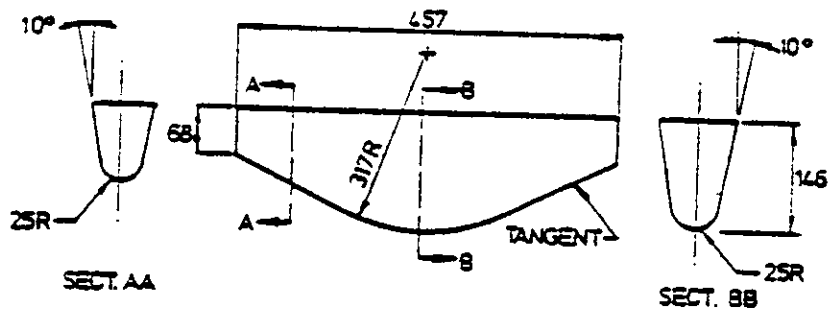
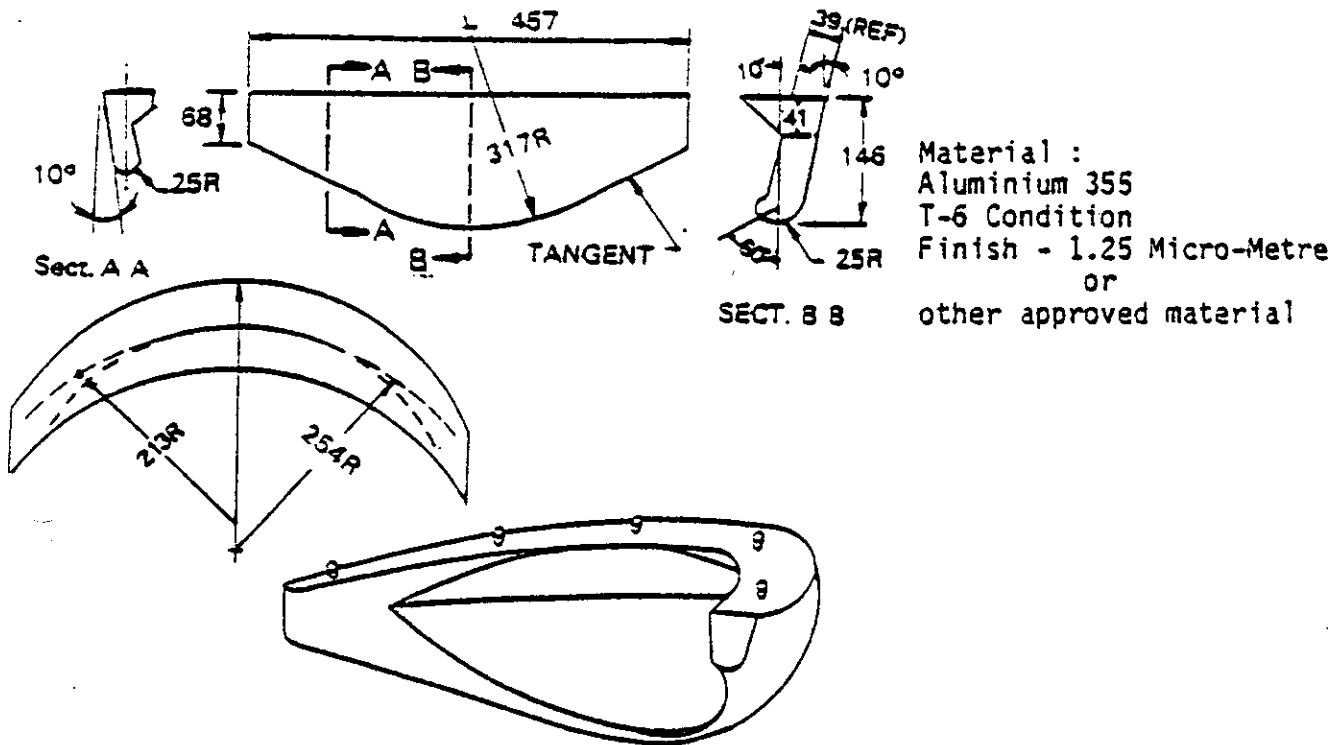


Figure 2 - Diagrams of Bead Unseating Blocks
 (Dimensions in mm)

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23B.3.3 Tyre Strength23B.3.3.1 Preparation of Tyre

23B.3.3.1.1 Mount the tyre on a test rim and inflate it to the applicable pressure specified in Clause 23B.3.1(a)(ii).

23B.3.3.1.2 Condition it at test room temperature for at least 3 hours.

23B.3.3.1.3 Readjust its pressure to that specified in Clause 23B.3.1 (a)(ii).

23B.3.3.2 Test Procedure

23B.3.3.2.1 Force a cylindrical steel plunger with a hemispherical end and a diameter of 19 ± 1.6 mm perpendicularly into the tread as near to the centreline as possible, avoiding penetration into the tread groove, at the rate of 50 ± 10 mm per minute.

23B.3.3.2.2 Record the force and penetration at the moment of breaking at each of five test points approximately equally spaced around the circumference of the tyre. If the tyre fails to break before the plunger is stopped on reaching the rim, and the required minimum breaking energy is not achieved, then the required minimum breaking energy is deemed to have been achieved at that point.

23B.3.3.2.3 Compute the breaking energy for each test point by means of the following formula:

$$W = \frac{F \times P}{2000}$$

where

W = Energy, J
 F = Force, N
 P = Penetration, mm

23B.3.3.2.4 Determine the breaking energy value for the tyre by computing the average of the five values obtained in accordance with Clause 23B.3.3.2.3.

23B.3.4 Tyre Endurance23B.3.4.1 Preparation of Tyre

23B.3.4.1.1 Mount a new tyre on a test rim and inflate it to the applicable pressure specified in Clause 23B.3.1 (a)(ii).

23B.3.4.1.2 Condition the tyre assembly at a temperature not less than 35°C for at least three hours.

- 23B.3.4.1.3 Readjust tyre pressure to that specified in Clause 23B.3.1 (a)(ii) immediately before testing.
- 23B.3.4.2 Test Procedure
- 23B.3.4.2.1 Mount the tyre and test rim assembly on a test axle and press it against a flat-faced steel test wheel of an outside diameter not greater than 1.71m and at least as wide as the section width of the tyre to be tested, or an approved equivalent test wheel.
- 23B.3.4.2.2 During the test the ambient temperature at a distance of not less than 150 mm and not more than 1 m from the tyre shall be at least 35°C. No provision shall be made for cooling the tyre during the test.
- 23B.3.4.2.3 Conduct the test at not less than 80 km/h test speed with loads and test periods not less than those shown in the following schedule:-

Test Periods	(i) for 4 hours	(ii) for 6 hours	(iii) for 24 hours
Test Loads as Percentage of Maximum Load Rating	85.0%	90.0%	100%

- 23B.3.5 High Speed Test
- 23 .3.5.1 Preparation of Tyre
- 23B.3.5.1.1 Mount the tyre on a test rim and inflate it to a pressure equal to the pressure specified in the Nominated Standard for its maximum load plus an increase no greater than that specified in Table 1 for its speed category.
- 23B.3.5.1.2 Condition the tyre assembly at a temperature not less than 35°C for at least three hours.
- 23B.3.5.1.3 Readjust the tyre pressure to that specified in Clause 23B.3.5.1.1 immediately before testing.
- 23B.3.5.2 Test Procedure
- 23B.3.5.2.1 Mount the tyre and test rim assembly on a test axle and press it against a flat-faced steel test wheel of an outside diameter not greater than 1.71m, and at least as wide as the section width of the tyre to be tested or an approved equivalent test wheel with a load not less than 80 percent of the maximum load rating of the tyre.

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- 23B.3.5.2.2 During the test the ambient temperature at a distance of not less than 150 mm and not more than 1 m from the tyre shall be at least 35°C. No provisions shall be made for cooling the tyre during the test.
- 23B.3.5.2.3 Operate the equipment to bring the test wheel speed from zero up to the initial test wheel speed in a period of at least 10 minutes.
- 23B.3.5.2.4 The initial test wheel speed is equal to the maximum speed shown in Table 1 as corresponding to the tyre's speed category symbol, less 40 km/h.
- 23B.3.5.2.5 The initial test wheel speed for tyres of speed category 'V' is 170 km/h.
- 23B.3.5.2.6 Operate the equipment with the test wheel speed not less than the initial test speed for at least 10 minutes, then at not less than the initial test speed plus 10 km/h for at least a further 10 minutes, then at not less than the initial test speed plus 20 km/h for at least a further 10 minutes and finally at not less than the initial test speed plus 30 km/h for at least a further 20 minutes.

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TABLE 1 - MAXIMUM PRESSURE INCREASE - HIGH SPEED TEST

Speed Category	Rim Diameter	Maximum Speed km/h	Pressure Increase	
			Diagonal & Bias-Belted. kPa	Radial Ply kPa
(-) or unmarked	A L L	170 (for radial ply only)	refer below	30
L	R	120	NIL	NIL
M	I	130	10	NIL
N	M	140	20	NIL
P		150	30	10
Q	D	160	40	20
R	I	170	50	30
S	A	180	60	40
T	M	190	70	50
U	E	200	80	60
H	T	210	90	70
V	E R S	Over 210	90	70
(-) or unmarked	10" Rim Diameter	120	NIL	
	12" Rim Diameter	135	15	
	13" Rim Diameter and over	150	30	

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TABLE 2

LIST OF LOAD-CAPACITY-INDEX SYMBOLS

LI	kg	LI	kg	LI	kg	LI	kg
0	45	40	140	80	450	120	1400
1	46.2	41	145	81	462		
2	47.5	42	150	82	475		
3	48.7	43	155	83	487		
4	50	44	160	84	500		
5	51.5	45	165	85	515		
6	53	46	170	86	530		
7	54.5	47	175	87	545		
8	56	48	180	88	560		
9	58	49	185	89	580		
10	60	50	190	90	600		
11	61.5	51	195	91	615		
12	63	52	200	92	630		
13	65	53	206	93	650		
14	67	54	212	94	670		
15	69	55	218	95	690		
16	71	56	224	96	710		
17	73	57	230	97	730		
18	75	58	236	98	750		
19	77.5	59	243	99	775		
20	80	60	250	100	800		
21	82.5	61	257	101	825		
22	85	62	265	102	850		
23	87.5	63	272	103	875		
24	90	64	280	104	900		
25	92.5	65	290	105	925		
26	95	66	300	106	950		
27	97.5	67	307	107	975		
28	100	68	315	108	1000		
29	103	69	325	109	1030		
30	106	70	335	110	1060		
31	109	71	345	111	1090		
32	112	72	355	112	1120		
33	115	73	365	113	1150		
34	118	74	375	114	1180		
35	121	75	387	115	1215		
36	125	76	400	116	1250		
37	128	77	412	117	1285		
38	132	78	425	118	1320		
39	136	79	437	119	1360		

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TABLE 3

Minimum Breaking Energy Values (Joule)

	PRESSURES SPECIFIED IN kPa		PRESSURES SPECIFIED IN psi		
	Test inflation pressure	180 kPa	220 kPa	24 psi	28 psi
Energy (Joules)	295	585	295	440	585
For tyres with test inflation pressure other than those specified in the Table, the required breaking energy value is given by the formulae shown opposite.	B.E. (Joules) = $7.35 \times (P-140)$ where P = test pressure in kPa		B.E. (Joules) = $36.7 \times (P-16)$ where P = test pressure in p.s.i.		

For rayon diagonal ply or rayon bias-belted tyres the required energy value is to be reduced by 36.5%.

For tyres with Specified Design Section Width less than 160 mm (or 6.30 inches) the required energy value is to be reduced (or further reduced) by 25.0%.

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TABLE 4 - SPEED CATEGORY FOR TYRE

SPEED CATEGORY SYMBOL	L	M	N	P	Q	R	S	T	U	H	V
Maximum Vehicle Speed for which tyre is rated (km/h)	120	130	140	150	160	170	180	190	200	210	over 210

For tyres marked with a '-' or in the absence of any of the above symbols the speed category shall be as follows:

	km/h
Diagonal or Bias-Belted 10 inch Rim Diameter	120
12 inch Rim Diameter	135
13 inch Rim Diameter and over	150
Radial Ply All Rim Diameters	170