BSI

BS AU 144c : 1988
(Superseding BS AU 144b : 1977)
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British Standard Automobile Series : Specification for

Retreaded car and commercial vehicle tyres

Série Automobile
Pneumatiques rechapés pour automobiles et véhicules utilitaires — Spécifications

Normen der Kraftfahrzeugtechnik
Runderneuerte Reifen für Personenkraftwagen und Nutzfahrzeuge

Contents

Foreword

This British Standard has been prepared under the direction of the Automobile Standards Committee. It was first published in 1968, revised as BS AU 144a in 1970, and revised again in 1977 to reflect developments, in particular to require the raising of the speed capability of commercial vehicle tyres to a minimum of 60 mile/h (96 km/h) to align with the permitted speeds of such vehicles on the motorways in the UK.

In this revision, prepared at the request of the British Rubber Manufacturers' Association and the Retread Manufacturers' Association, the minimum speeds of 70 mile/h (112 km/h) for passenger car tyres and 60 mile/h (96 km/h) for commercial vehicle tyres have been deleted, being replaced by the requirement that retreaded tyres are marked with load indices (LI) or ply rating (PR) where applicable and speed symbols, and that the tyres comply with the associated loads and speeds.

Performance verification by rolling drum tests have been included for the first time for retreaded tyres, similar to those applicable to new tyres. The performance and rolling drum test requirements specified for retreaded passenger car tyres are technically identical with those of ECE regulation 30*, while the shortened 6 h drum test for commercial vehicle tyres is technically equivalent to the 47 h test of ECE regulation 54*, which is also permitted as an acceptable alternative test.

Criteria are included for the inspection and repair of tyres during retreading, and for inspection after the retreading process. Tyre acceptance criteria following a rolling drum test are also included.

NOTE 1. This standard will only become effective at such time as it is invoked by regulations, expected to be made by the Secretary of State for Transport.

NOTE 2. Upon publication of this revision, BSI Sales Department will respond to purchase orders for BS AU 144 by supplying copies of the 1988 edition. Copies of the 1977 edition may be obtained by quoting the number BS AU 144/77.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

1 Scope

This British Standard specifies requirements for the retreading of car and commercial vehicle pneumatic tyres for road vehicles primarily designed for use on the public highway and first used after 3 January 1933. It specifies inspection procedures for the tyre carcass before and during processing, repairing and processing details, rubber depth under the tread pattern, tread pattern information, and rotating drum verification tests. The requirements apply to both tubed and tubeless retreaded tyres.

The standard does not apply to:

(a) pre-1933 tyres as their design and construction may be unique and outside the range of tyres in current use, e.g. tyres used on vintage cars;

(b) temporary use spare tyres; or

(c) tyres with speed categories VR or ZR.

NOTE. The titles of the publications referred to in this standard are listed on the inside back page.

2 Definitions

For the purposes of this British Standard the following definitions apply.

NOTE. Figures 1 to 4 supplement the definitions given in this clause.

2.1 General definitions

2.1.1 retreading. Generic term for tyre reconditioning, including **2.1.1.1** to **2.1.1.3**, to extend the useful life of the tyre by the addition of new material. It covers the replacement of the tread rubber and may include the renovation of the sidewall rubber and the renewal of part or whole of the protective breaker or belt of a radial ply commercial vehicle tyre.

2.1.1.1 recapping. Process in which rubber is removed from the worn tread and over the shoulder and new rubber is then applied.

2.1.1.2 remoulding. Process in which rubber is removed as necessary and new rubber, extending from bead area to bead area, is applied.

2.1.1.3 top-capping. Process in which the worn tread rubber only is renewed.

2.1.2 cure. Conditions necessary to produce a given state of vulcanization.

2.1.3 rubber. Macromolecular material which has, or can be given, properties of:

(a) at room temperature, returning rapidly to the approximate shape from which it has been substantially distorted by a weak stress; and

(b) not being easily changed to any other permanent shape by the application of moderate heat and pressure.

2.1.4 repair. A permanent repair.

2.2 Definitions related to structure

2.2.1 diagonal (cross) ply tyre. Pneumatic tyre in which the ply cords extend to the beads and are laid at alternate angles substantially less than 90° to the centreline of the tread.

2.2.2 radial ply tyre. Pneumatic tyre in which the cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilized by an essentially inextensible circumferential belt.

2.2.3 bias-belted. Pneumatic tyre structure of diagonal (cross) ply type in which the carcass is restricted by a belt comprising two or more layers of substantially inextensible cord material laid at alternate angles smaller than those of the carcass.

* Available from HMSO

2.3 Definitions related to service

2.3.1 ply rating (PR). Index of tyre strength used to identify a given tyre with its recommended maximum permitted load when used for a specific service as given in BS AU 50 : Part 1.

NOTE. It does not necessarily represent the actual number of plies in a tyre.

2.3.2 service description. The combination of a tyre's load index or load indices and its speed symbol (see tables 1 and 2).

2.3.3 load-capacity index (also referred to as load index or LI). A numerical code associated with the maximum load a tyre can carry at the speed indicated by its speed symbol (see tables 1 and 2).

2.3.4 speed category (also referred to as speed symbol). A symbol indicating the speed at which a tyre can carry the load corresponding to its load index or indices (see tables 1 and 2).

2.3.5 free rolling tyre (FRT). A tyre restricted to use on trailers and semi-trailers.

2.3.6 special-use tyre. A tyre for mixed use, both on and off the road and/or at restricted speed.

2.4 Definitions related to main components

2.4.1 bead. The part of a pneumatic tyre which is of such shape and structure as to fit the rim and hold the tyre on it.

2.4.2 bead heel. That part of the bead which fills the angle formed by the junction of the rim flange and the bead seat.

2.4.3 bead toe. Innermost part of the bead opposite the heel.

2.4.4 belt (radial ply tyre). Layer(s) of material(s) underneath the tread, laid substantially in the direction of the tread centreline, that restricts the carcass in a circumferential direction.

2.4.5 breaker (diagonal ply tyre). Intermediate ply between carcass and tread (see also 'protective breaker' in **2.4.13**).

2.4.6 buffing. Preparation of the original tyre surface prior to the application of unvulcanized material.

2.4.7 carcass (casing). Rubber bonded cord structure of a tyre integral with the bead, which contains the inflation pressure.

2.4.8 chafer. Material in the bead area to protect the carcass against rim-chafing.

2.4.9 cord. Textile or non-textile strands (threads) used in various components of the tyre carcass, plies, belts, breakers, etc.

2.4.10 crown. Area lying between the shoulders of a tyre.

2.4.11 inner-lining. Layer of rubber, from bead toe to bead toe, on the inside of the carcass. In tubeless tyres it has air-retaining properties.

2.4.12 ply. Layer of rubber-coated parallel cords.

2.4.13 protective breaker (commercial vehicle radial ply tyre). Optional strip of ply material embodied within the pneumatic tyre between the tread and the belt to minimize damage to the belt.

2.4.14 sidewall. Part of a pneumatic tyre between the tread and the bead.

2.4.15 sidewall rubber. Rubber layer on the sidewall of the tyre and over the carcass, which may include ornamental or protective ribs and fitting lines.

2.4.16 shoulder. Transitional area between the sidewall and the tread.

2.4.17 tread. Part of a pneumatic tyre intended to come in contact with the road.

2.4.18 tread rubber. One of the following:

(a) camel-back. Tread compound extruded through a pre-determined die shape to give tread lengths of definite cross-sectional area.

(b) strip-wound. Tread compound extruded through a pre-determined die shape to form a ribbon feed which is wound on to a prepared carcass.

(c) direct extrusion. Tread compound extruded through a pre-determined die shape directly on to a prepared carcass, which is positioned to form one half of the die profile.

(d) pre-cured. Tread compound cured to form pattern and undertread prior to application to a prepared carcass.

2.4.19 tread wear indicators. Projections in the tread grooves designed to give a visual indication of the degree of wear of the tread.

2.4.20 tubeless tyre. Pneumatic tyre designed for use without an inner tube.

2.4.21 tyre fitting lines. Moulded lines on the outside of the upper bead area to facilitate obtaining concentricity when fitting.

2.5 Definitions related to rotating drum tests

2.5.1 rim. The rim on which a tyre is required to be fitted for testing.

2.5.2 chunking. Breaking away of pieces of rubber from the tread.

2.5.3 cord separation. Parting of the cords from their rubber coating.

2.5.4 ply separation. Parting of adjacent plies.

2.5.5 tread separation. Pulling away of the tread from the carcass.

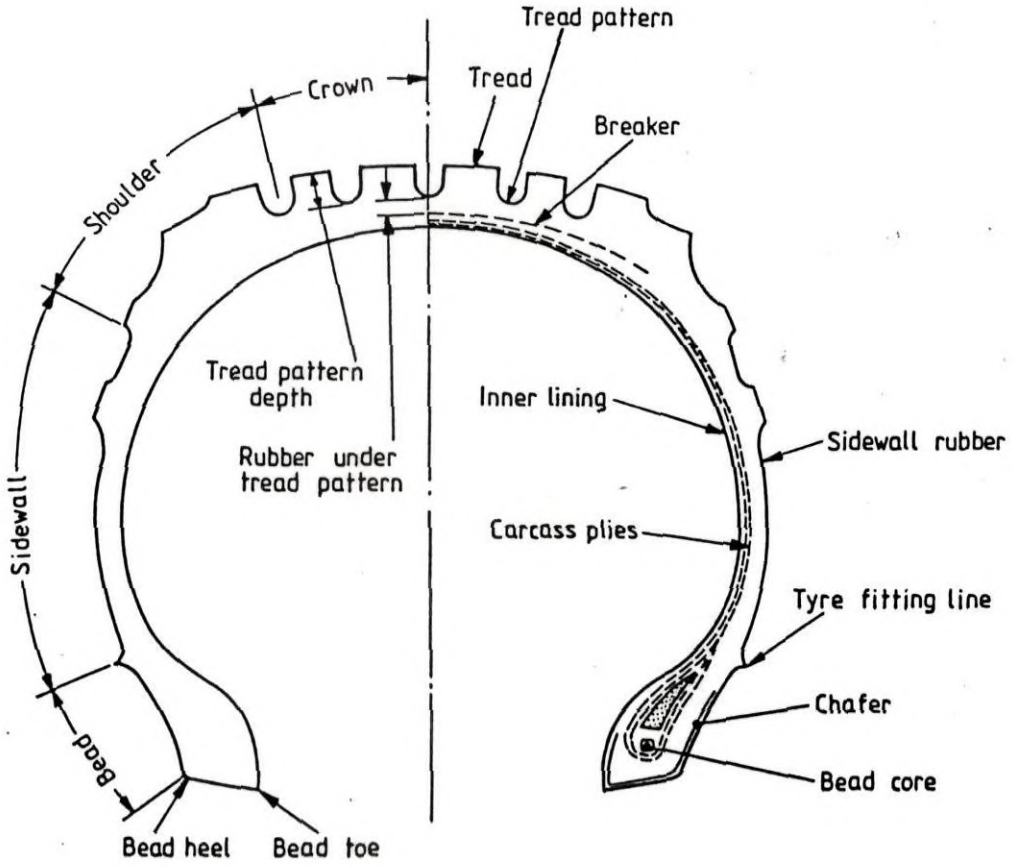

Figure 1. Typical section of diagonal ply car tyre (diagrammatic only)

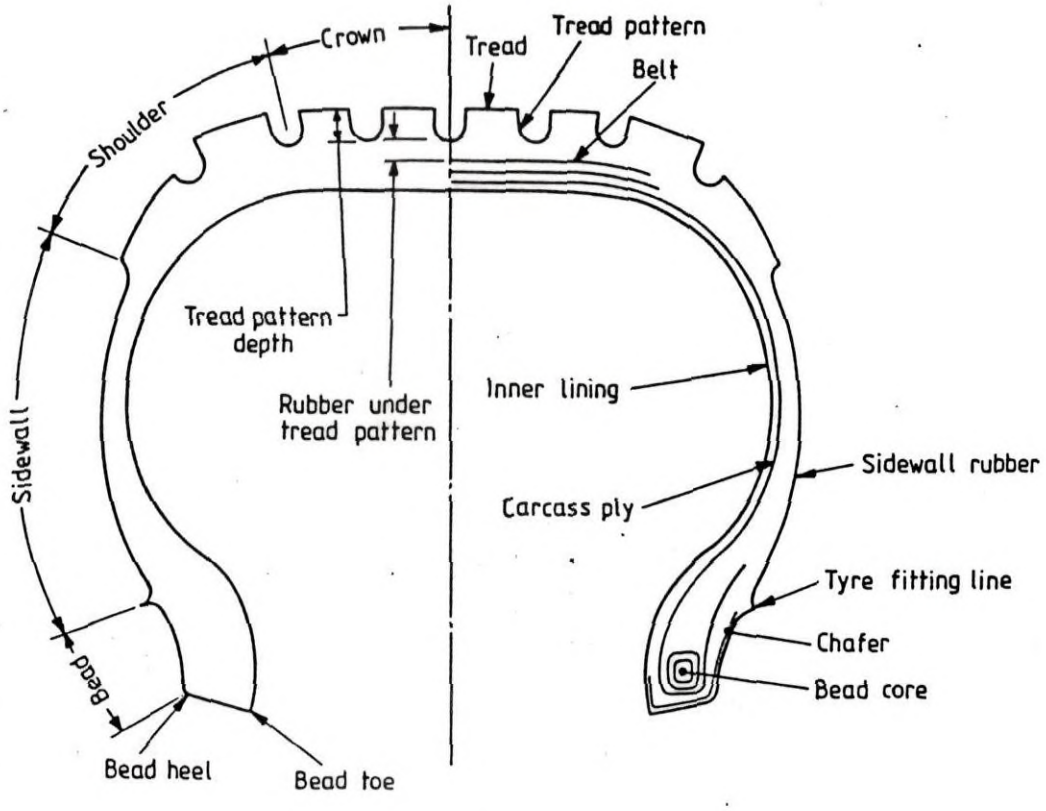

Figure 2. Typical section of radial ply car tyre (diagrammatic only)

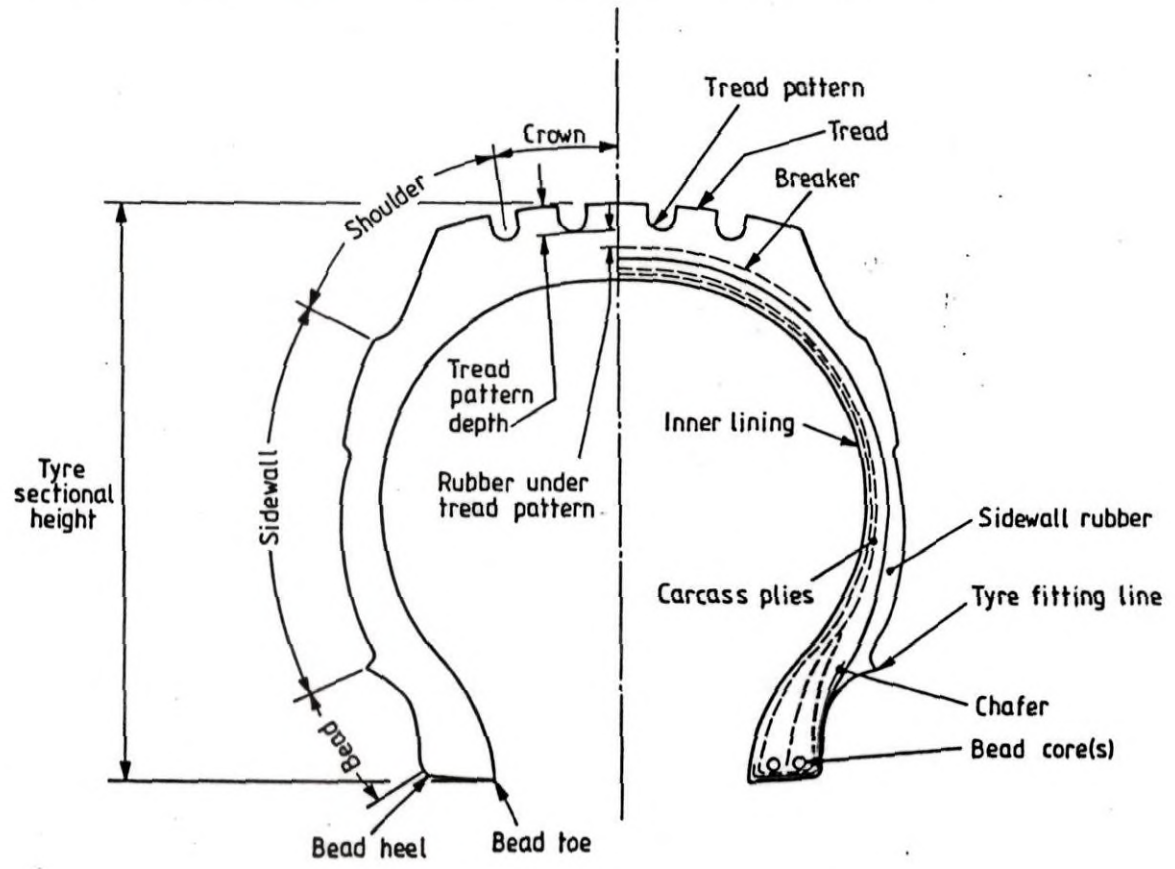

Figure 3. Typical section of diagonal ply commercial vehicle tyre (diagrammatic only)

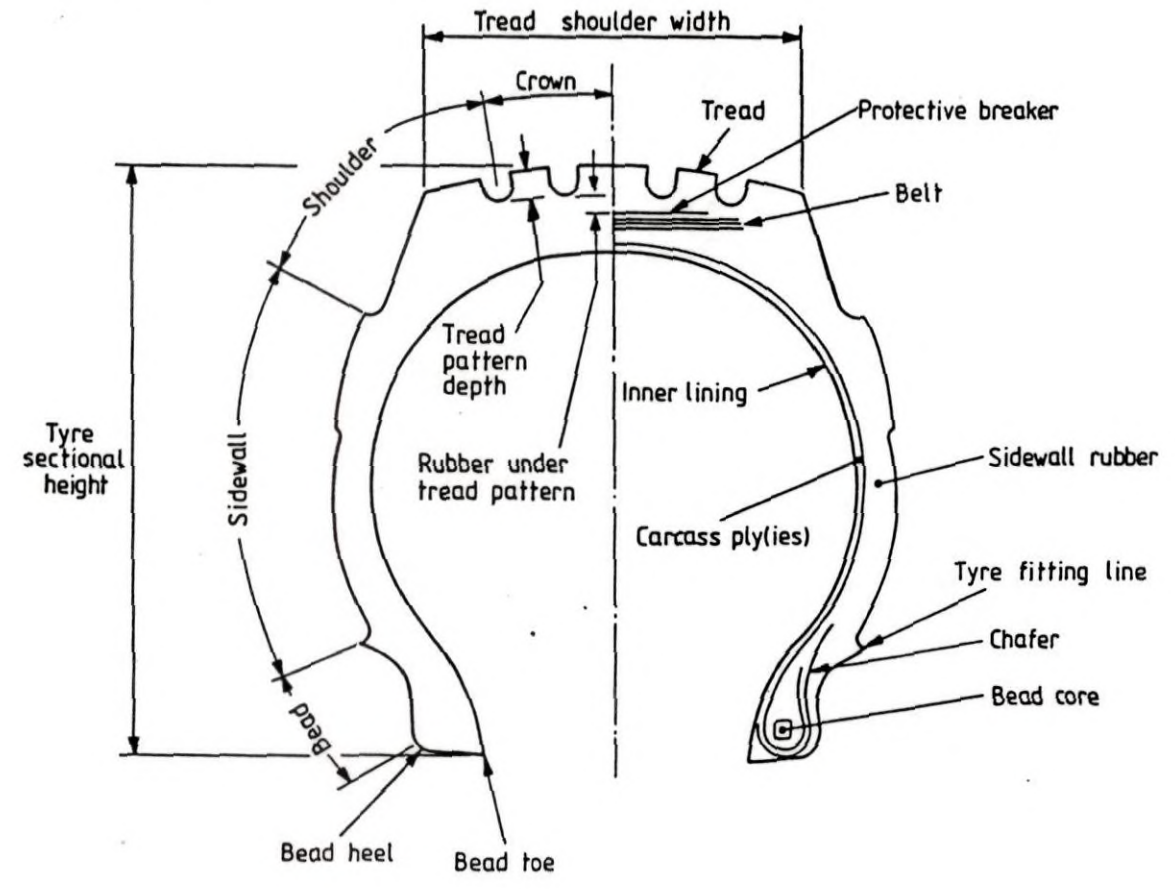

Figure 4. Typical section of radial ply commercial vehicle tyre (diagrammatic only)

3 Performance

3.1 Change to original service description

The service description of the original carcass shall not be increased for a retreaded tyre, other than in exceptional circumstances, when it is permissible for the load index or speed category to be increased by the retreader who shall be responsible for ensuring that such retreaded tyres comply with this standard (see table 1 for load indices and table 2 for speed categories).

3.2 Establishing original load/speed capacity

It shall be the responsibility of the retreader to establish the original load, speed and application of a carcass.

NOTE. It may be necessary for the retreader to contact the original tyre manufacturer or the Retread Manufacturers' Association* for details.

3.3 Performance tests

3.3.1 Tyres retreaded to comply with this standard shall be capable of completing the appropriate load/speed performance test in **3.3.2** to **3.3.7** and satisfying the acceptance criteria of clause **4**.

3.3.2 For car tyres marked with a service description the appropriate load/speed tests specified in appendix B shall be carried out.

3.3.3 For car diagonal ply tyres and bias-belted tyres without a service description, the load/speed tests in appendix B appropriate for:

(a) L speed symbol; and

(b) the appropriate ply rating;

shall be carried out.

3.3.4 For radial ply car tyres without a service description, the tests in appendix B for:

(a) P speed symbol; and

(b) the normal or reinforced load carrying capacity as appropriate;

shall be carried out.

3.3.5 For commercial vehicle tyres marked with a service description either:

(a) the appropriate tests in appendix B and table 5 for radial ply tyres; or

(b) the appropriate tests in appendix B and table 6 for diagonal and radial ply tyres;

shall be carried out.

3.3.6 For diagonal ply commercial vehicle tyres without a service description, the tests in appendix B and table 6 appropriate for the speed category with the load appropriate for the equivalent ply rating (PR) (see table 10), shall be carried out.

3.3.7 For radial ply commercial vehicle tyres without a service description either:

(a) the tests in appendix B and table 5, appropriate for the speed category with the load appropriate for the equivalent PR (see table 10); or

(b) the tests in appendix B and table 6, appropriate for the speed category with the load appropriate for the equivalent PR (see table 10);

shall be carried out.

4 Performance test acceptance criteria

After completion of the appropriate load/speed test in **3.3**, tyres shall not exhibit any tread separation, ply separation, cord separation, chunking, broken cords nor more than 3.5% growth on diameter.

5 Tyre dimensions

The maximum section width and maximum diameter of retreaded tyres before use shall not be greater than the maximum in-service section width and diameter given in BS AU 50 : Part 1 : Sections 1 and 2 or the *ETRTO Standards Manual*†.

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* Brampton Bridge House, 10 Queens Street, Newcastle, Staffordshire SD5 1ED.

† Available from the European Tyre and Rim Technical Organization, 32 Avenue Brugmann, Brussels, Belgium. Tel. 02 344 4059, telex 63935.

Table 1. Load-capacity index (LI)

LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
0	45	40	140	80	450	120	1400	160	4500	200	14000	240	45000
1	46.2	41	145	81	462	121	1450	161	4625	201	14500	241	46250
2	47.5	42	150	82	475	122	1500	162	4750	202	15000	242	47500
3	48.7	43	155	83	487	123	1550	163	4875	203	15500	243	48750
4	50	44	160	84	500	124	1600	164	5000	204	16000	244	50000
5	51.5	45	165	85	515	125	1650	165	5150	205	16500	245	51500
6	53	46	170	86	530	126	1700	166	5300	206	17000	246	53000
7	54.5	47	175	87	545	127	1750	167	5450	207	17500	247	54500
8	56	48	180	88	560	128	1800	168	5600	208	18000	248	56000
9	58	49	185	89	580	129	1850	169	5800	209	18500	249	58000
10	60	50	190	90	600	130	1900	170	6000	210	19000	250	60000
11	61.5	51	195	91	615	131	1950	171	6150	211	19500	251	61500
12	63	52	200	92	630	132	2000	172	6300	212	20000	252	63000
13	65	53	206	93	650	133	2060	173	6500	213	20600	253	65000
14	67	54	212	94	670	134	2120	174	6700	214	21200	254	67000
15	69	55	218	95	690	135	2180	175	6900	215	21800	255	69000
16	71	56	224	96	710	136	2240	176	7100	216	22400	256	71000
17	73	57	230	97	730	137	2300	177	7300	217	23000	257	73000
18	75	58	236	98	750	138	2360	178	7500	218	23600	258	75000
19	77.5	59	243	99	775	139	2430	179	7750	219	24300	259	77500
20	80	60	250	100	800	140	2500	180	8000	220	25000	260	80000
21	82.5	61	257	101	825	141	2575	181	8250	221	25750	261	82500
22	85	62	265	102	850	142	2650	182	8500	222	26500	262	85000
23	87.5	63	272	103	875	143	2725	183	8750	223	27250	263	87500
24	90	64	280	104	900	144	2800	184	9000	224	28000	264	90000
25	92.5	65	290	105	925	145	2900	185	9250	225	29000	265	92500
26	95	66	300	106	950	146	3000	186	9500	226	30000	266	95000
27	97.5	67	307	107	975	147	3075	187	9750	227	30750	267	97500
28	100	68	315	108	1000	148	3150	188	10000	228	31500	268	100000
29	103	69	325	109	1030	149	3250	189	10300	229	32500	269	103000
30	106	70	335	110	1060	150	3350	190	10600	230	33500	270	106000
31	109	71	345	111	1090	151	3450	191	10900	231	34500	271	109000
32	112	72	355	112	1120	152	3550	192	11200	232	35500	272	112000
33	115	73	365	113	1150	153	3650	193	11500	233	36500	273	115000
34	118	74	375	114	1180	154	3750	194	11800	234	37500	274	118000
35	121	75	387	115	1215	155	3875	195	12150	235	38750	275	121000
36	125	76	400	116	1250	156	4000	196	12500	236	40000	276	125000
37	128	77	412	117	1285	157	4125	197	12850	237	41250	277	128500
38	132	78	425	118	1320	158	4250	198	13200	238	42500	278	132000
39	136	79	437	119	1360	159	4375	199	13600	239	43750	279	136000

Table 2. Speed category

Speed symbol	Speed	
	km/h	mile/h approx.
F	80	50
G	90	56
J	100	62
K	110	68
L	120	75
M	130	81
N	140	87
P	150	93
Q	160	100
R	170	106
S	180	113
T	190	119
U	200	125
H	210	130
V	240	150
Z	>240	>150

6 Marking

6.1 General

Each tyre retreaded to comply with this standard shall be permanently and legibly marked between the rim fitting line and the tread edge with the information in (a) to (m) as applicable and the letter height shall be a minimum of 3 mm.

NOTE 1. Recommended minimum dimensions for markings letter heights are given in appendix A.

In no case shall any part of a service description remain on a retreaded tyre which is above the capability of that retreaded tyre.

(a) The number of this British Standard, i.e. BS AU 144c*.

(b) The retread manufacturer's name or other reference such that the processor can be readily identified.

NOTE 2. It is recommended that retreaders register their brand names with the Retread Manufacturers Association†.

(c) The tyre size designation.

* Marking BS AU 144c on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

† Brampton Bridge House, 10 Queens Street, Newcastle, Staffordshire SD5 1ED.

(d) In the case of radial ply tyres, the letter 'R', placed in front of the rim diameter marking and/or the word 'RADIAL'.

NOTE 3. The letter 'R' is preferred.

(e) In the case of bias-belted tyres, the letter 'B', placed in front of the rim diameter marking and, in addition, the words 'BIAS–BELTED'.

(f) The speed symbol (see table 2).

(g) The load capacity:

(1) for car tyres the load index (see table 1) except that tyres first produced without this index shall be exempt from this requirement;

(2) for commercial vehicle tyres the load index or indices in table 10, except for sizes shown in table 11 which it is permissible to mark with the ply rating only if the original tyre was so marked.

NOTE 4. For tyre sizes not shown in table 11, the load index equivalent to the ply rating is shown in table 10.

(h) The word 'REINFORCED' if the tyre is a reinforced tyre.

(i) The word 'TUBELESS' if the tyre is for use without an inner tube.

(j) The word 'RETREAD' or 'RETREADED' or where applicable 'REMOULD' or 'REMOULDED'.

(k) The letters 'FRT' if the tyre is a free rolling tyre.

(l) A date code by which the period of processing can be traced.

NOTE 5. The preferred code should consist of three digits; the first two digits identifying the week of the year and the last one representing the year of processing.

(m) For asymmetrical tyres the word 'ASYMMETRIC' or the words 'SIDE FACING OUTWARDS' shall be marked on the outer wall only.

6.2 Symmetrical and asymmetrical tyres

For symmetrical tyres the requirements of **6.1**(a) to **6.1**(k) inclusive shall be marked on both sidewalls, but it is permissible for the requirements of **6.1**(l) only to be marked on one sidewall.

For asymmetrical tyres the requirements of **6.1**(a) to **6.1**(l) inclusive shall be marked on at least the outer sidewall.

6.3 Snow and regroovable tyres

Sidewall identification markings for snow and regroovable retreaded tyres shall be selected from (a) or (b) as follows.

NOTE. The use of identification markings on the sidewalls is at the discretion of the retreader.

(a) In the case of snow tyres the letters 'M+S' or 'MS' or 'M & S'.

(b) For tyres which can be regrooved, the word 'REGROOVABLE', or the symbol Ⓤ, the circle being at least 20 mm in diameter.

7 Rubber under tread pattern

7.1 The mean depth of any new rubber under the tread pattern after retreading, when measured at the base of the tread pattern grooves in any radial plane, shall be not less than:

(a) car tyres: 1 mm, at no point shall it be less than 0.5 mm;

(b) commercial vehicle tyres:

(1) sizes below 9.00–20: 2 mm, at no point shall it be less than 1.5 mm;

(2) sizes 9.00–20 and above: 3 mm, at no point shall it be less than 2.5 mm.

7.2 The total depth of rubber under the tread pattern, after retreading diagonal ply tyres, shall be not less than 25 % of the tread pattern depth at the point measured.

Warning. Excessive depth of rubber (see **7.1** and **7.2**) under the tread pattern and around the shoulders will adversely affect the speed/performance capability of the retreaded tyre.

8 Tyre inspection before and during retreading

8.1 Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.

Initial inspection requirements and damage limitations are given in appendix C.

8.2 After buffing, and before the application of new rubber, each tyre shall be thoroughly re-examined to ensure its continued suitability for retreading. Inspection requirements and damage limitations are given in appendix D.

9 Tyre inspection after retreading

After curing, each tyre shall be visually examined to ensure that it is free from any defects which may affect its satisfactory service life.

Warning. It is essential that the Health and Safety Executive requirements in EH40* concerning rubber fume levels are observed.

10 Repair and tyres suitable for repair and retreading

10.1 All damage assessed to be detrimental to performance shall be repaired (see appendix E). Tyres with damage within the damage injury limitations in appendices F, G and H and repaired in accordance with appendix E and/or BS AU 159 shall be considered suitable for retreading (see **10.3**).

* Health and Safety Executive Guidance Note. *Occupational exposure limits.* Available from the Health and Safety Executive, Room 414, St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3QY.

10.2 Tyres exhibiting any of the damage given in appendix C and/or not satisfying the criteria in appendix D shall be rejected as unsuitable for retreading, except as allowed for in **10.3.**

10.3 It shall be permissible to repair and retread tyres in the following cases where the damage can be treated satisfactorily, and complying with the performance requirements of clause 3:

(a) tyres with damage greater than the injury limitations in appendices F, G and H; and/or

(b) tyres exhibiting any of the damage given in appendix C; and/or

(c) tyres not complying with appendix D.

11 Repair materials

11.1 The manufacturer or the supplier of repair materials, including patches, is responsible for the following:

(a) defining method(s) of application;

(b) defining limits of damage for which the materials are designed;

(c) ensuring that reinforced patches for tyres, if correctly applied in completed carcass repairs, are capable of withstanding a pressure not less than the following:

(i) car tyres: five times the highest inflation pressure, appropriate to the tyre size, specified in BS AU 50 : Part 1 : Section 1 or the *ETRTO Standards Manual**;

(ii) commercial vehicle tyres: three times the highest inflation pressure, appropriate to the tyre size, specified in BS AU 50 : Part 1 : Section 2 or the *ETRTO Standards Manual**;

Warning. The capability outlined in **11.1**(c) necessitates special test facilities for the patch manufacturer or supplier. It is safer to obtain test pressure hydraulically than pneumatically.

(d) ensuring that any repair material(s) are capable of flexing compatibly with the carcass when used in normal service, i.e. with the loads and pressures in BS AU 50 or the *ETRTO Standards Manual**;

(e) ensuring, in the case of a patch designed for use in tubed tyres, that when correctly fitted it does not damage the tube;

(f) ensuring the suitability of any other repair materials for the service intended.

11.2 The retreader shall be responsible for the correct application of the repair material using a compatible bonding system which ensures that the repair material retains its position and the repair retains its strength when the tyre is used in normal service, i.e. with the loads and pressures specified in BS AU 50 or the *ETRTO Standards Manual**.

12 Car tyre tread pattern information

If tread wear indicators are used, they shall be included in not less than six transverse rows, approximately equally spaced and situated in the principal grooves of the tread in a form such that they cannot be confused with the rubber ridges between the blocks of the tread.

However, in the case of tyres with nominal bead seat diameters of 12 in or less, four rows of tread wear indicators shall be accepted.

Tread wear indicators shall be $1.6^{+0.4}_{-0.25}$ mm in height.

13 Tyre fitting lines

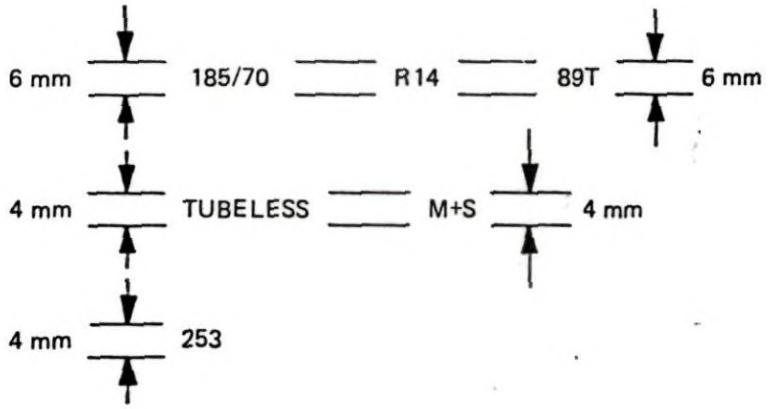
Where the tyre fitting lines (see figures 1 to 4) have been removed during the remoulding process, they shall be renewed, except in the case of recapping and top-capping when superficial (surface) repairs through these lines shall be permissible.

* Available from the European Tyre and Rim Technical Organization, 32 Avenue Brugmann, Brussels, Belgium. Tel. 02 344 4059 telex 63935.

Appendix A. Recommended minimum letter height dimensions for markings for car and commercial vehicle retreaded tyres

A.1 Car tyre recommended minimum letter heights

Car tyre recommended minimum letter heights should be as follows.



A.2 Commercial vehicle tyre recommended minimum letter heights

Commercial vehicle tyre recommended minimum letter heights should be as follows.

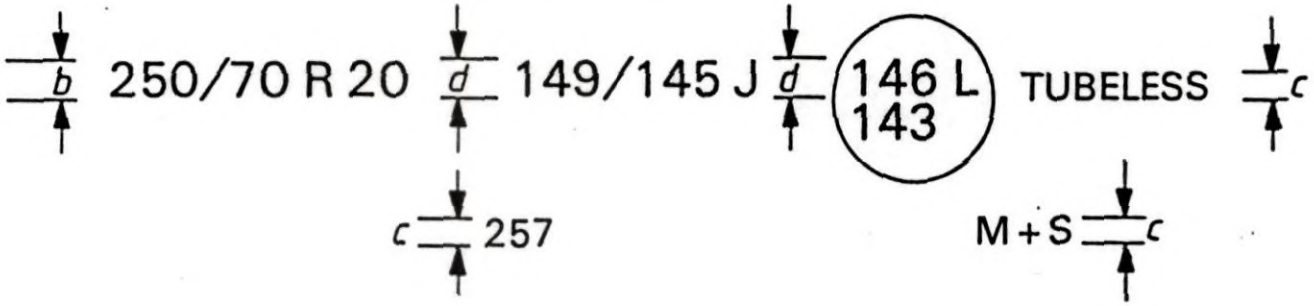


Table 3. Recommended minimum heights of markings

	Tyres of rim diameter < 20 in or < 508 mm or of section width < 235 mm or < 9 in	Tyres of rim diameter ≥ 20 in or ≥ 508 mm or of section width > 235 mm or > 9 in
	mm	mm
b	6	9
c	4	
d	6	

Appendix B. Load/speed performance test

B.1 Principle of test

The load/speed performance test is a very simple simulation of a tyre under load running on the road. It consists of an inflated tyre and wheel assembly, mounted on a free running axle, with the tyre pressed against a power driven rotating drum. Through the axle a force, related to the particular tyre's operating load, is applied to the drum which is then rotated at varying speeds for specified periods of time. At the end of the test if there is no damage to the tyre (as specified in clause 4) the tyre is considered to have passed the test.

The test is not carried out on every tyre, but is used for quality verification by selective testing.

B.2 Test equipment

The test machine shall be one with a means of imparting a constant radial force which rotates at variable, controlled speeds with respect to the tyre. A suitable form of machine is shown in figure 5, in which a tyre and wheel assembly is loaded radially against a rotating drum. The drum shall be 1.7 ± 0.017 m (1 %) or alternatively for car tyres only, 2.0 ± 0.02 m (1 %) in diameter with a smooth outer surface at least as wide as the test tyre tread.

B.3 Preparation of retreaded tyres for test

B.3.1 Mount the retreaded tyre on an appropriate recommended rim as specified in BS AU 50 : Part 1 : Sections 1 and 2 or the *ETRTO Standards Manual* *.

B.3.2 Use an inner tube and flap (as required) when testing tyres other than tubeless type tyres.

B.3.3 Inflate car retreaded tyres to the pressure specified in table 4.

B.3.4 Inflate commercial vehicle retreaded tyres to the pressure corresponding to the pressure index specified by the original tyre manufacturer. For tyres not marked with a pressure index the pressure appropriate for the load corresponding to the load index for single use shall be used. Tyre loads and pressures are given in BS AU 50 : Part 1 : Section 2, or the *ETRTO Standards Manual* *.

B.3.5 Condition the tyre and wheel assembly at test room temperature for not less than 3 h.

B.3.6 Adjust the tyre pressure to that specified in **B.3.3** or **B.3.4** as appropriate.

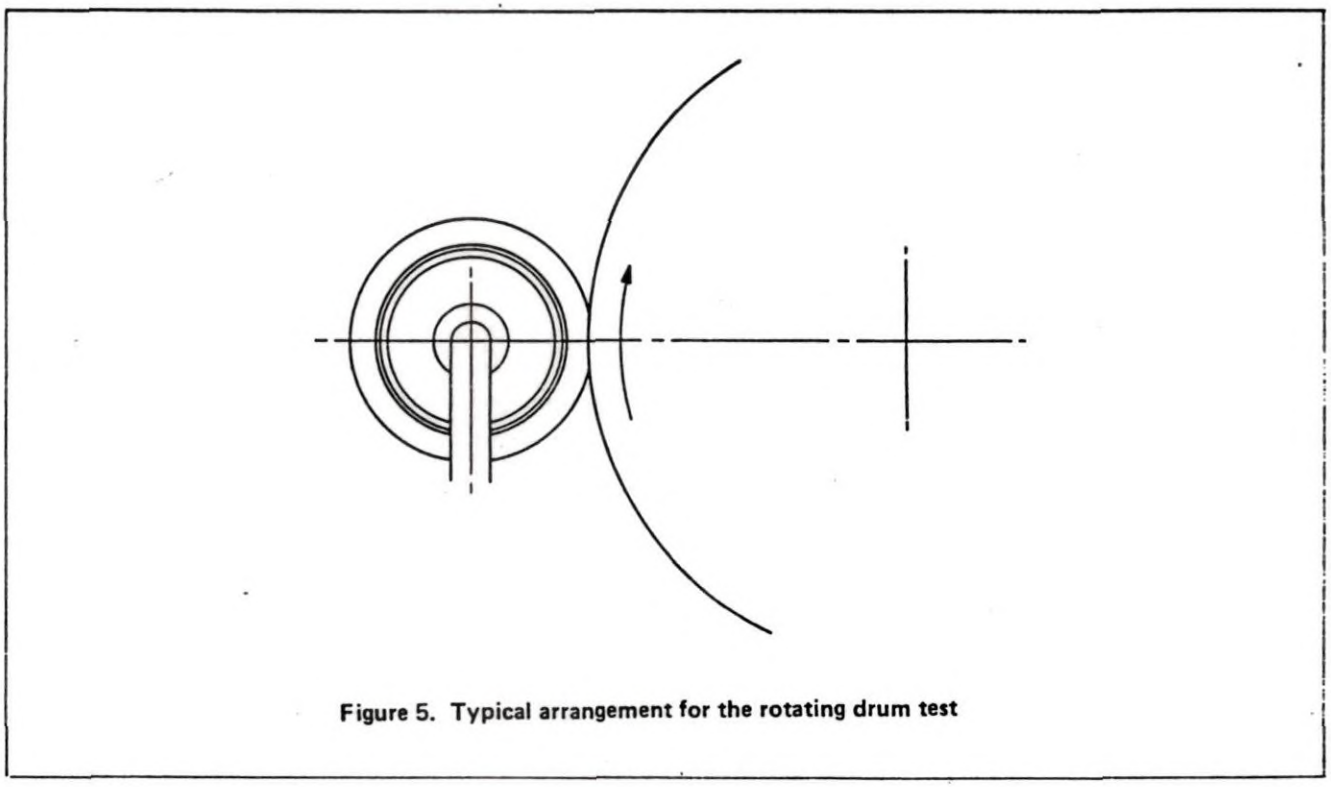


Figure 5. Typical arrangement for the rotating drum test

* Available from the European Tyre and Rim Technical Organization, 32 Avenue Brugmann, Brussels, Belgium. Te. 02 344 4059; telex 63935.

Table 4. Car tyre test inflation pressure

Tyre speed symbol	Diagonal (cross) ply tyres						Radial ply tyres				Bias-belted tyres			
	Ply rating						Normal		Reinforced		Normal		Reinforced	
	4		6		8									
	bar*	p.s.i	bar*	p.s.i	bar*	p.s.i	bar*	p.s.i	bar*	p.s.i	bar*	p.s.i	bar*	p.s.i
L, M, N	2.3	33	2.7	40	3.0	44	–	–	2.8	41	–	–	2.8	41
P, Q, R, S	2.6	38	3.0	44	3.3	48	2.6	38	3.0	44	2.6	38	3.0	44
T, U, H	2.8	41	3.2	45	3.5	51	2.8	41	3.2	45	2.8	41	3.2	45
V	3.0	44	3.4	49	3.7	54	3.0	44	–	–	–	–	–	–

* 1 bar = 10^5 Pa.

B.4 Rotating drum test for car tyres

B.4.1 Mount the tyre and wheel assembly on a test axle and press it against the outer face of the test drum.

B.4.2 Apply tyre test loads in accordance with (a) and (b) as follows.

(a) For tyres with speed symbols up to and including H apply a load to the test axle equal to 80 % of the load corresponding to the load index marked on the sidewall of the retreaded tyre, and carry out the rotating drum test in accordance with **B.4.3.**

(b) For tyres with speed symbol V apply a load to the test axle equal to 72.8 % of the load corresponding to the load index marked on the sidewall of the retreaded tyre, and carry out the rotating drum test in accordance with **B.4.3.**

B.4.3 Accelerate the tyre and wheel assembly at a constant rate to the initial test speed in 10 min.

The initial test speed shall be the maximum speed for the type of tyre less 40 km/h when a 1.70 m diameter drum is used or less 30 km/h when a 2 m diameter drum is used.

B.4.4 Increase the rotational speed in successive speed increments of 10 km/h, the duration at each speed step being 10 min, except at the last step which shall be 20 min at the maximum speed less 10 km/h when a 1.7 m diameter drum is used, or the maximum speed for the tyre when a 2 m diameter drum is used.

NOTE. The test programmes in **B.4** are identical with those specified in ECE regulation 30*.

B.5 Rotating drum test for commercial vehicle tyres

B.5.1 Mount the tyre and wheel assembly on the test axle and press it against the outer face of a 1.7 m diameter test drum.

B.5.2 Apply to the test axle a series of test loads expressed as a percentage of the load corresponding to the load index marked on the sidewall of the retreaded tyre. For radial ply tyres carry out either the test programme given in table 5 or the test programme given in table 6. For diagonal ply tyres carry out the test programme given in table 6.

Where the tyre has load indices for both single and twinned use, the load for single use shall be taken as the basis for test loads.

NOTE. The test programmes in table 6 are identical with the test programmes for radial and diagonal ply tyres for commercial vehicles in ECE regulation 54*.

B.6 General test requirements

B.6.1 The requirements in **B.6.2** to **B.6.4** shall apply to all tests.

B.6.2 The tyre pressure shall not be corrected throughout the test, and the test load shall be kept constant throughout each test stage.

B.6.3 During the test the temperature in the test room shall be not less than 20 °C.

B.6.4 The test programmes in **B.4** and **B.5** shall be carried out without interruption.

NOTE. Concerning the use of test tyres, it is recommended that a tyre which has been subjected to a rotating drum test should not be used on the road but should be discarded.

* Available from HMSO.

Table 5. Rotating drum test programmes for commercial vehicle radial ply tyres

Tyre load index (LI)	Tyre speed symbol	Test drum speed*	Load placed on the wheel as a percentage of the load corresponding to the load index	
			Duration of load increment	
		r/min	3 h	3 h
All indices	F	175		
	G	200		
	J	225		
	K	250	66 %	84 %
	L	275		
122 or more	M	300		
121 or less	M	300	75%	100 %
	N	325	75%	100 %

* Special-use tyres shall be tested at a speed equal to 85 % of the speed specified for equivalent normal tyres.

Table 6. Rotating drum test programmes for commercial vehicle radial and diagonal ply tyres

Tyre load index (LI)	Tyre speed symbol	Test drum speed*		Load placed on the wheel as a percentage of the load corresponding to the load index		
		Radial ply tyres	Diagonal (cross) ply tyres	Duration of load increment		
		r/min	r/min	7 h	16 h	24 h
122 or more	F	100	100			
	G	125	100			
	J	150	125			
	K	175	150	66 %	84 %	101 %
	L	200	–			
	M	225	–			
121 or less	F	100	100			
	G	125	125			
	J	150	150			
	K	175	175			
	L	200	175	70 %	88 %	106 %
				Duration of load increment		
				4 h	6 h	
	M	250	200	75 %	97 %	114 %
	N	275	–	75 %	97 %	114 %

* Special-use tyres shall be tested at a speed equal to 85 % of the speed specified for equivalent normal tyres.

Appendix C. Initial inspection before buffing and damage limitations

C.1 General

Before buffing each tyre shall be examined to establish its need for repair and its suitability for retreading. Tyres exhibiting any of the damage given in C.2 to C.6 shall be rejected as unsuitable for retreading. (See 10.3.)

C.2 Damage limitations common to all size and type of tyres

Damage limitations common to all size and type of tyres shall be as follows:

(a) extensive rubber cracking extending through to the carcass;

(b) carcass penetrations or damage that after preparation would be outside the injury limitations in appendices F to H;

(c) previous repairs to damage outside the injury limitations in appendices F to H;

(d) carcass break-up;

(e) appreciable oil or chemical attack;

(f) injuries too close together;

(g) damaged or broken bead core;

(h) substantial deterioration of the inner liner;

(i) severe damage caused by service in an underinflated condition.

C.3 Car tyre carcass damage limitations in addition to C.2

Car tyre carcass damage limitations in addition to C.2 shall be as follows:

(a) bead damage other than rubber or chafer damage;

(b) exposed cords due to tread wear or sidewall scuffing;

(c) non-repairable tread or sidewall rubber separation from the carcass;

(d) any carcass damage in the sidewall region.

C.4 Car radial ply tyre carcass damage limitations in addition to C.2

Car radial ply tyre carcasses with separation in the belt other than slight belt edge looseness shall be rejected as unsuitable for retreading.

C.5 Commercial vehicle diagonal ply tyre damage limitations in addition to C.2

Commercial vehicle diagonal ply tyre damage limitations in addition to C.2 shall be as follows:

(a) carcass ply separations;

(b) bead damage other than rubber or chafer damage as follows.

Not more than three areas, nor any area more than 25 mm long, nor any two areas less than 300 mm apart, nor any damage penetrating more than 25 % of the carcass plies.

(c) non-repairable tread or sidewall rubber separation from the carcass;

(d) radial sidewall cracking extending into the carcass;

(e) exposed carcass cords due to tread wear or sidewall scuffing outside the repair requirements given in appendix G;

(f) loose cords inside the tyre.

C.6 Commercial vehicle radial ply tyre damage limitations in addition to C.2

Commercial vehicle radial ply tyre damage limitations in addition to C.2 shall be as follows:

(a) belt ply separation except slight belt edge looseness unless belt ply replacement takes place;

NOTE. Nothing in (a) requires the replacement of the protective breaker which may be damaged without limitation or may be removed completely.

(b) severely permanently deformed or kinked (steel) carcass cords in the sidewall areas outside the injury limitations in appendix H;

(c) exposed carcass cords due to sidewall scuffing outside the injury limitations in appendix H;

(d) bead damage other than rubber or angled wire bead protector damage as follows:

Not more than five areas, nor any area more than 60 mm in circumferential length or 30 mm wide, nor any two areas less than 75 mm apart, nor more than four carcass cords damaged for a length of more than 5 mm in the area from the bead heel to the rim fitting line, limited to three areas per bead.

(e) non-repairable sidewall rubber separation from the carcass;

(f) severe and non-repairable circumferential cracking above the bead.

Appendix D. Inspection after buffing and damage limitations

D.1 General

After buffing each tyre shall be examined to ensure its continued suitability for retreading in accordance with the criteria in appendix C and the additional criteria and damage limitations in **D.2** to **D.9**.

D.2 Surface finish

The entire surface to be re-rubbered shall have been prepared without scorching. The buffed surface texture shall not contain deep buffing lacerations, which affords only minimal adhesion.

D.3 Contour

The contour of the prepared area shall suit the tread to be applied or the matrix to be used.

D.4 Cord ends

All loose cord ends shall be trimmed back to the carcass.

D.5 Sidewall buffing damage limitations

Other than localized damage to an overlap joint there shall be no buffing damage to the carcass in the sidewall area outside the injury limitations in appendices F, G and H.

D.6 Belt damage limitations for radial ply car tyres

Buffing damage to the belt of radial ply car tyres shall be limited to localized damage of the outermost layer only. Slight belt edge looseness is permissible.

D.7 Buffing damage limitations for diagonal ply car tyres

D.7.1 Buffing damage to diagonal ply car tyres shall comply with **D.7.2** to **D.7.3**.

D.7.2 For two ply construction, there shall be no damage to the carcass.

D.7.3 For two ply plus breaker construction in tubeless type tyres, there shall be no damage to the carcass or breaker.

D.7.4 For two ply plus breaker construction in tubed type tyres, localized damage to the breaker is permitted.

NOTE. Carcasses rejected under **D.7.3** may be suitable under **D.7.4**.

D.7.5 For four ply or more construction in tubeless type tyres, no damage to the carcass or breaker shall be permitted.

D.7.6 For four ply or more construction in tube type tyres, damage shall be limited to the outermost ply in the crown area.

NOTE. Carcasses rejected under **D.7.5** may be suitable under **D.7.6**.

D.8 Crown area buffing damage limitations for commercial vehicle diagonal ply tyres

For commercial vehicle diagonal ply tyres damage shall not extend beyond the outermost carcass ply in the crown area. It shall be assumed that the first ply encountered is a carcass ply unless a breaker can be positively identified. If a breaker is fitted localized damage is permissible.

D.9 Belt buffing damage limitations for commercial vehicle radial ply tyres

For commercial vehicle radial ply tyres, localized damage to the belt is permissible. For larger damage it is permissible for the complete belt or sections of the belt to be replaced.

Appendix E. Repairs and curing

E.1 General

All injuries shall be repaired in such a manner that all loose and noticeably oxidized material is removed, care being taken to avoid contamination.

E.2 Limits of repairs

After preparation for repair, no injury shall exceed the injury limitations in tables 7, 8 and 9, unless the requirements of **10.3** are satisfied.

E.3 Height of bulge at repair to commercial vehicle radial ply tyres

The area of a sidewall or shoulder reinforced repair, on a commercial vehicle radial ply tyre, may bulge slightly when the tyre is fitted and inflated to the recommended operating pressure. Reinforced patches with physical properties that restrict the height of the bulge to not more than 4 mm shall be used.

E.4 Repairs to belt or breaker of commercial vehicle radial ply tyres

Where the belt plies of commercial vehicle radial ply tyres are exposed due to wear or through damage extending beyond the injury limits specified in table 9 they shall be replaced before retreading. Where a protective breaker is fitted, and can be positively identified as such and it alone is damaged, it is permissible to remove it and it need not be renewed.

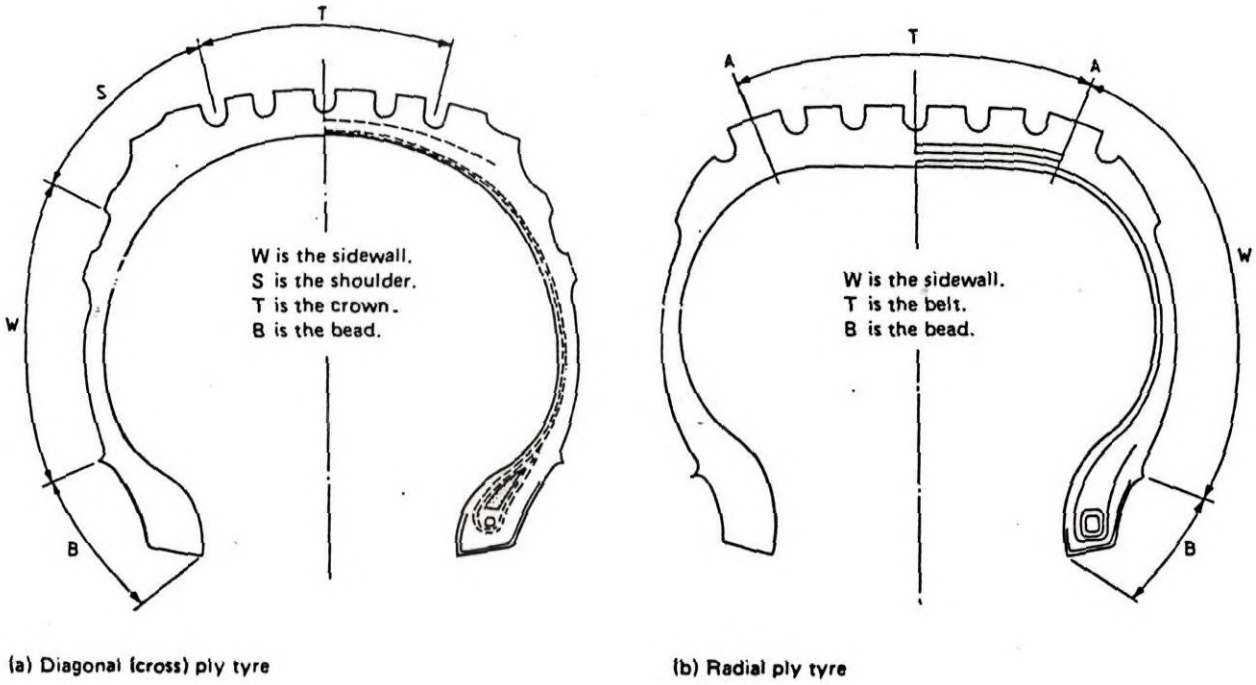
E.5 Time lapse before curing

The processed tyre shall be cured as soon as practicable after the completion of all repairs and building-up operations.

E.6 Curing

The tyre shall be cured for the length of time and at the temperatures and internal pressure appropriate to the particular compound(s) and processing equipment used.

Appendix F. Repairs to car tyres



(a) Diagonal (cross) ply tyre

(b) Radial ply tyre

Figure 6. Repairable and non-repairable areas for diagonal and radial ply car tyres

Table 7. Injury limitations: car tyres (after preparation)

Speed symbol	Maximum size of damage measured at base of injury			Maximum number of reinforced repairs*
	Crown, T and belt, T	Shoulder, S	Sidewall, W and bead, B	
	mm	mm		
Up to and including 'T' symbol	15	6	Nil	2
Above 'T' symbol	Nil	Nil	Nil	Nil

* This includes any satisfactory existing repairs.

F.1 Repair patch information: area T (see figure 6)

For penetrations up to 6 mm a rubber only repair is permissible. For carcass damage over 6 mm a reinforced rapair patch shall be used.

F.2 Limits on repairs (see table 7)

F.2.1 Reinforced repairs

To minimize balance problems, there shall be only one reinforced repair in any one quarter of the tyre circumference.

F.2.2 Rubber repairs

There shall be no limit to the number of rubber only repairs, provided that the rubber patches do not overlap.

F.2.3 Outer ply repairs

It is permissible to repair localized damage to the outermost belt ply of radial ply car tyres with rubber only in the area T (see figure 6), for damage up to 15 mm diameter for tyres up to and including T speed symbol rating and up to 10 mm diameter for tyres above T speed symbol rating.

F.2.4 Reinforced patch

Cross ply patches shall be used on diagonal (cross) ply tyres.

In radial ply tyres a patch shall be used with reinforcing cords running in one direction only, and applied with the cords parallel to the carcass plies.

NOTE. Cross ply type patches are not permitted on radial ply tyres due to the difficulty of locating the belt edges within which the patch has to be confined and correctly aligned.

F.2.5 Repairs near points A (see figure 6(b))

Up to and including T speed symbol rating tyres, in the area T within 15 mm of point A, the permissible repairable damage size shall be less than 50 % of the limits shown in table 7.

Appendix G. Repairs to diagonal (cross) ply commercial vehicle textile tyres

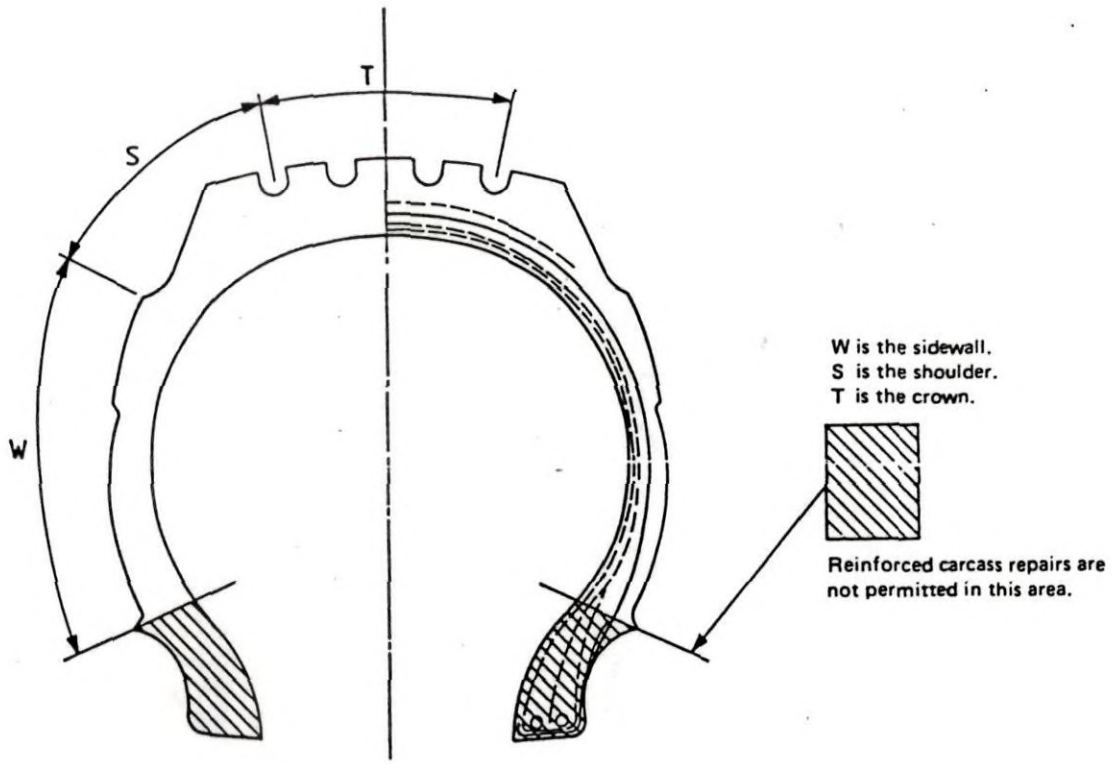


Figure 7. Repairable and non-repairable areas for diagonal (cross) ply commercial vehicle textile tyres

Table 8. Injury limitations: diagonal (cross) ply commercial vehicle textile tyres (after preparation)

Nominal tyre section size/size code, or equivalent	Number of carcass plies damaged, for repair of:			Maximum size of damage measured at base of injury (class A repair)		Minimum distance from bead toe to damage measured internally
	Class C	Class B	Class A	Crown and shoulder, T and S	Sidewall, W	
				mm	mm	mm
Up to and including 8.25, B	1	2 or 3	4 or more	35	20	90
9.00, C, 10, 10.00, D, 11	1 or 2	3 or 4	5 or more	45	25	110
11.00, E, 12, 12.00, F	Up to 3	4 or 5	6 or more	55	30	130
13.00 and above	Up to 3	4 to 6	7 or more	65	35	150

G.1 Limits on repairs (see table 8)

G.1.1 General

Repair patches shall not overlap.

G.1.2 Reinforced repairs

The maximum number of reinforced repairs, including any satisfactory existing repairs, shall be four per tyre, of which only one shall be in the sidewall area (see figure 7).

G.1.3 Rubber repairs

There shall be no limit to the number of rubber only repairs, i.e. class C and minor penetration repairs.

G.2 Repair classification (see table 8)

G.2.1 General

The types of repair for classes of carcass ply damage and minor penetrations shall be as given in G.2.2 to G.2.5.

G.2.2 Class C repairs

Class C repairs shall be made using rubber only, without size limitation, to any part of the tyre, including any bead damage permitted in C.5(b).

G.2.3 Minor penetrations

G.2.3.1 Rubber only repair patches shall be used for damage up to 6 mm diameter.

G.2.3.2 Rubber plug-patch combination shall be used for crown penetrations up to 10 mm diameter.

G.2.4 Class B repairs

Reinforced repair patches shall be used. Carcass damage up to 50 % of the ply structure is permitted to exceed the maxima shown in table 8 for class A repairs by 50 %.

G.2.5 Class A repairs

Reinforced repair patches shall be used for carcass damage that exceeds the limitations of class B repairs up to the maxima shown in table 8.

For tyres of 8 PR and above, with an original speed capability greater than 60 mile/h (100 km/h), no class A repairs shall be carried out in the sidewalls and the maximum permitted damage for shoulder class A repairs shall be limited to 50 % of the maxima shown in table 8.

NOTE. Where breaker plies exist and can be identified as such, they may be disregarded when counting ply damage to assess repair classification.

Appendix H. Repairs to radial ply commercial vehicle tyres

H.1 Limits on repairs (see table 9)

H.1.1 General

Repair patches shall not overlap.

H.1.2 Reinforced repairs

The maximum number of reinforced (class A) repairs, including any satisfactory existing repairs, shall be as shown in table 9.

H.1.3 Rubber repairs

There shall be no limit to the number of rubber only repairs, i.e. class B, class C and minor penetration repairs.

H.2 Repair classification (see table 9)

H.2.1 Class C repairs

A surface rubber repair shall be used for the following:

(a) any rubber damage;

(b) any bead damage as allowed in C.6(d);

(c) damage up to 20 mm diameter in any belt ply except that belt ply which is adjacent to the carcass ply or plies;

(d) damage up to 35 mm diameter when confined to the outermost belt ply only.

H.2.2 Class B repairs

A surface rubber repair and internal rubber only repair patch shall be used for the following:

(a) any penetration damage up to 6 mm through the ply or plies;

(b) any penetration damage up to 10 mm through the area T using a combination plug-patch unit;

(c) any penetration damage or tear of rubber between cords of the radial carcass, up to 10 mm in length, in the sidewall area W, without damage to the carcass cords, except that two cords are permitted to have the spiral wrapping filament broken.

H.2.3 Class A repairs

Reinforced repair patches shall be used for carcass damage that exceeds the limitations for class B repairs up to the maxima shown in table 9.

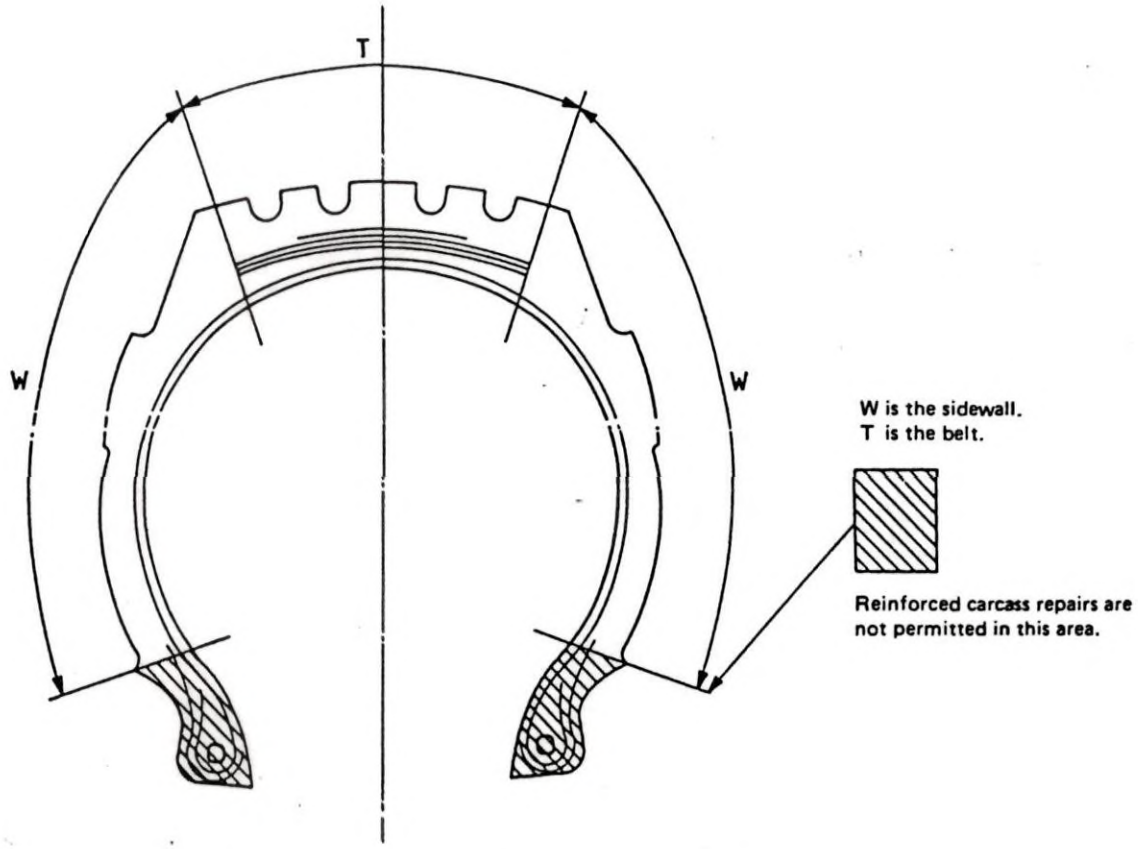


Figure 8. Repairable and non-repairable areas for radial ply commercial vehicle tyres

Table 9. Injury limitations: radial ply commercial vehicle tyres (after preparation)

Nominal tyre section size/size code, or equivalent	Maximum size of damage measured at base of injury (class A repair)			Maximum number of class A repairs*	Minimum distance from bead toe to damage measured internally
	Sidewall, W		Belt, T		
	Across ply cords	Along ply cords			
	mm	mm	mm		mm
Up to and including 7.00	20 or 10	100 120	25	2	60
Over 7.00, up to 10.00, D, including 9, 10, 11	25 or 20 or 10	90 120 140	40	4	65
11.00, E, 12 and above	25 or 20 or 10	90 120 140	40	4	70

* This includes any satisfactory existing repairs.

Table 10. Tyre sizes and ply ratings with equivalent load indices

Radial ply tyres

Tyre size designation	Load indices	Tyre size designation	Load indices	Tyre size designation	Load indices
145 R 12C 6PR	81/79	5.60 R 12C 6PR	83/81	245/70 R 19.5	133/131
145 R 12C 8PR	86/84	6.40 R 13C 8PR	96/94	245/70 R 19.5	140/138
145 R 13C 6PR	83/81	6.70 R 13C 6PR	94/93	265/70 R 19.5	136/134
145 R 13C 8PR	88/86	6.70 R 13C 8PR	99/98	265/70 R 19.5	143/141
145 R 15C 8PR	91/89	6.70 R 14C 8PR	101/99	285/70 R 19.5	140/137
155 R 12C 6PR	83/81	6.70 R 15C 8PR	103/102	285/70 R 19.5	147/144
155 R 13C 6PR	85/83	6.70 R 15C 10PR	108/107	285/70 R 19.5	148/144
155 R 14C 6PR	88/86	6.50 R 14C 6PR	93/91	305/70 R 19.5	146/143
165 R 13C 6PR	91/89	6.50 R 14C 8PR	98/96	305/70 R 19.5	146/144
165 R 13C 8PR	94/92	7.50 R 14C 8PR	102/101	255/70 R 22.5	136/133
165 R 14C 6PR	93/91	6.00 R 16C 8PR	98/97	255/70 R 22.5	140/137
165 R 14C 8PR	97/95	6.00 R 16C 10PR	103/101	275/70 R 22.5	140/137
165 R 15C 6PR	94/92	6.50 R 16C 8PR	104/102	275/70 R 22.5	146/143
165 R 15C 8PR	97/95	6.50 R 16C 10PR	108/107	275/70 R 22.5	146/144
175 R 13C 6PR	94/92	7.00 R 16C 8PR	108/106	295/70 R 22.5	146/143
175 R 13C 8PR	97/95	7.00 R 16C 10PR	113/112	305/70 R 22.5	149/146
175 R 14C 6PR	96/94	7.50 R 16C 6PR	108/106	315/70 R 22.5 16PR	149/145
175 R 14C 8PR	99/98	7.50 R 16C 8PR	112/110	205/75 R 17.5	121/120
175 R 16C 6PR	98/96	9.00 R 16C	120/118	215/75 R 17.5	124/123
175 R 16C 8PR	101/99	7 R 17.5C	108/107	215/75 R 17.5	133/132
185 R 13C 6PR	97/95	8 R 17.5C	113/112	215/75 R 17.5	135/133
185 R 13C 8PR	100/98	17 R 380C 8PR	103/102	225/75 R 17.5	126/125
185 R 14C 6PR	99/97	17 R 15C 8PR	103/102	235/75 R 17.5	130/128
185 R 14C 8PR	102/100	17 R 400C 8PR	103/102	235/75 R 17.5	141/140
185 R 15C 6PR	100/98	19 R 400C 8PR	112/110	295/75 R 22.5	146/143
185 R 15C 8PR	103/102	7 R 19.5	113/112	295/75 R 22.5	149/145
185 R 16C 6PR	101/99	8 R 17.5	117/116	315/75 R 22.5 16PR	154/149
185 R 16C 8PR	104/102	8 R 19.5	123/122	305/75 R 24.5	154/149
195 R 14C 6PR	102/100	8 R 22.5	128/127	315/75 R 24.5	154/149
195 R 14C 8PR	106/104	8.5 R 17.5	121/120	275/80 R 22.5	146/143
195 R 16C 6PR	104/102	9 R 17.5	123/121	275/80 R 22.5	148/144
195 R 16C 8PR	107/105	9 R 19.5	130/128	295/80 R 22.5	146/143
205 R 14C 6PR	105/103	9 R 22.5 14PR	133/131	295/80 R 22.5	149/145
205 R 14C 8PR	109/107	9.5 R 17.5	126/124	295/80 R 22.5	150/146
205 R 16C 6PR	106/104	9.5 R 17.5	129/127	295/80 R 22.5	152/146
205 R 16C 8PR	110/108	9.5 R 17.5	139/137	315/80 R 22.5	149/145
215 R 14C 6PR	108/106	9.5 R 17.5	143/141	315/80 R 22.5	154/149
215 R 14C 8PR	112/110	9.5 R 19.5	134/131	295/80 R 24.5	149/145
215 R 16C 6PR	110/108	10 R 17.5	130/128	295/80 R 24.5	150/146
215 R 16C 8PR	113/111	10 R 17.5	134/132	385/65 R 22.5	158
155/70 R 12C	93/91	10 R 19.5	137/134	385/65 R 22.5	160
165/75 R 14C	97/95	10 R 22.5 14PR	140/137	425/65 R 22.5	165
165/75 R 16C	98/96	11 R 22.5 16PR	146/143	445/65 R 22.5	168
175/75 R 14C	99/98	11 R 22.5 16PR	146/144	365/70 R 22.5	160
175/75 R 16C	109/99	11 R 22.5	148/144	345/75 R 22.5	149
185/75 R 14C	102/100	12 R 22.5 16PR	149/145	6.50 R 20 10PR	115/113
185/75 R 16C	104/102	12 R 22.5	150/146	7.00 R 16 12PR	117/116
195/75 R 14C	106/104	13 R 22.5 18PR	154/149	7.00 R 20 12PR	120/118
195/75 R 16C	104/102	15 R 22.5 18PR	157	7.50 R 16 12PR	121/120
195/75 R 16C	107/105	16.5 R 19.5 20PR	161	7.50 R 20 10PR	123/122
205/75 R 14C	109/107	16.5 R 22.5 20PR	165	7.50 R 20 12PR	128/127
205/75 R 16C	110/108	18 R 19.5 20PR	165	8.25 R 15 20PR	140/138
215/75 R 14C	112/110	18 R 22.5 20PR	168	8.25 R 16 14PR	128/126
215/75 R 16C	113/111	10/70 R 22.5 14PR	140/137	8.25 R 17 14PR	130/128
225/75 R 15C	110/108	11/70 R 22.5 14PR	144/141	8.25 R 20 12PR	130/128
225/75 R 16C	116/114	11/70 R 22.5 16PR	146/143	8.25 R 20 14PR	133/131
225/75 R 16C	118/116	11/70 R 22.5 16PR	146/144	9.00 R 16 14PR	134/131
225/75 R 16C	121/119	12/70 R 22.5	149/145	9.00 R 20 12PR	136/133
225/75 R 15C	118/116	12/70 R 22.5 16PR	149/146	9.00 R 20 14PR	140/137

Table 10. Tyre sizes and ply ratings with equivalent load indices (concluded)

Radial ply tyres

Tyre size designation	Load indices	Tyre size designation	Load indices	Tyre size designation	Load indices
10.00 R 15 14PR	135/132	14/80 R 20 18PR	157	205/70 R 15	124/122
10.00 R 20 12PR	137/134	14/80 R 24	161	205/80 R 15	124/122
10.00 R 20 14PR	142/139	14.75/80 R 20	163	10.5 R 20 MPT 8PR	123
10.00 R 20 16PR	146/143	15.5/80 R 20	164	10.5 R 20 MPT 10PR	128
10.00 R 22 16PR	148/144	365/80 R 20	160	12.5 R 20 MPT 12PR	132
11.00 R 20 14PR	146/143	5.00 R 8	100/98	12.5 R 20 MPT 14PR	136
11.00 R 20 16PR	149/145	6.00 R 9	109/108	12.5 R 20 MPT 16PR	139
11.00 R 22 16PR	150/146	6.50 R 10	117/115	12.5 R 20 MPT 20PR	144
11.00 R 24 16PR	151/147	7.00 R 12	125/123	14.5 R 20 MPT 10PR	132
12.00 R 20 16PR	150/146	7.50 R 15	135/133	14.5 R 20 MPT 16PR	141
12.00 R 20 18PR	154/149	8.25 R 15 14PR	130/128	14.5 R 20 MPT 18PR	143
12.00 R 20 20PR	157/153	8.25 R 15 18PR	142/141	14.5 R 20 MPT	149
12.00 R 24 18PR	156/153	10.00 R 15 18PR	148/145	14.5 R 24 MPT 16PR	144
13.00 R 20 18PR	158	15 x 4½ R 8	88/86	385/55 R 18 MPT 14PR	134
13.00 R 20 20PR	161	16 x 6 R 8	95/93	385/55 R 18 MPT 16PR	138
14.00 R 20 18PR	160/157	18 x 7 R 8	100/98	525/65 R 20.5	173
14.00 R 20 22PR	164/160	21 x 8 R 9	106/104	615/65 R 20.5	176
12/80 R 20 16PR	149/145	23 x 9 R 10	111/110		
13/80 R 20 18PR	153/149	27 x 10 R 12	121/120		

Diagonal ply tyres

Tyre size designation	Load indices	Tyre size designation	Load indices	Tyre size designation	Load indices
7.00 - 14C 6PR	94/93	7.50 - 20 12PR	128/127	14.00 - 20 22PR	164
7.00 - 14C 8PR	100/99	8.25 - 15 14PR	130/128	14.00 - 24 18PR	164
7.50 - 14C 6PR	98/96	8.25 - 15 18PR	142/141	15.00 - 20 20PR	166
6.70 - 13C 6PR	94/93	8.25 - 16 12PR	125/124	15.00 - 20 22PR	169
6.70 - 13C 8PR	99/98	8.25 - 16 14PR	128/126	15.00 - 20 24PR	172
6.70 - 14C 6PR	96/94	8.25 - 20 12PR	130/128	7.50 - 18 MPT 6PR	110
6.70 - 14C 8PR	101/99	8.25 - 20 14PR	133/131	10.50 - 18 MPT 6PR	119
6.70 - 15C 6PR	98/96	9.00 - 16 12PR	132/128	10.50 - 18 MPT 8PR	122
6.70 - 15C 8PR	103/102	9.00 - 20 12PR	136/133	10.50 - 20 MPT 6PR	120
6.00 - 16C 6PR	95/92	9.00 - 20 14PR	140/137	10.50 - 20 MPT 8PR	123
6.50 - 16C 6PR	98/97	10.00 - 20 14PR	142/139	10.50 - 20 MPT 10PR	128
6.50 - 20C 8PR	110/108	10.00 - 20 16PR	146/143	10.50 - 20 MPT 12PR	131
7.00 - 16C 6PR	102/100	11.00 - 20 14PR	146/143	12.50 - 18 MPT 6PR	121
7.50 - 16C 10PR	116/114	11.00 - 20 16PR	149/145	12.50 - 18 MPT 8PR	125
8.25 - 16C 10PR	120/119	12.00 - 20 16PR	150/146	12.50 - 18 MPT 10PR	128
9.00 - 16C 8PR	119/117	12.00 - 20 18PR	154/149	12.50 - 20 MPT 10PR	129
9.00 - 16C 10PR	122/120	12.00 - 24 16PR	153/149	12.50 - 20 MPT 12PR	132
6.50 - 17LC 8PR	99/97	12.00 - 24 18PR	156/153	14.50 - 20 MPT 10PR	132
7.00 - 15 12PR	126/125	12.00 - 20 20PR	157/153	14.50 - 20 MPT 12PR	136
7.00 - 16 12PR	117/116	12.00 - 24 20PR	160/156	14.50 - 20 MPT 18PR	143
7.00 - 20 12PR	120/118	12.00 - 24 22PR	163/159	405/70 - 20 MPT 10PR	137
7.50 - 16 12PR	121/120	14.00 - 20 18PR	160	405/70 - 20 MPT 14PR	145
7.50 - 20 10PR	123/122	14.00 - 20 20PR	161	405/70 - 24 MPT 14PR	148

Table 11. Tyre sizes where ply rating only is permitted to be marked (see 6.1 (g) (2))

10.00–20 16PR and/or D20	18 x 7 8PR	23 x 5 10PR
10.00R20 16PR and/or DR20	27 x 6 8PR	600–9 10PR
11R 22.5 16PR and/or DR22.5	700–12 12PR	700–12 14PR
11/70R 22.5 16PR	750–15 14PR	750–14 16PR
11.00–20 16PR and/or E20	825–15 14PR	
11.00R20 16PR and/or ER20	825–15 18PR	
12R 22.5 16PR and/or ER22.5	10.00–15 18PR	
12/70R 22.5 16PR		

Publications referred to

BS AU 50 Tyres and wheels
Part 1 Tyres
Section 1 Car tyres
Section 2 Commercial vehicle tyres

BS AU 159 Specification for repairs to tyres for motor vehicles used on the public highway

*ECE regulation 30. Uniform provisions concerning the approval of pneumatic tyres for motor vehicles and their trailers

*ECE regulation 54. Uniform provisions concerning the approval of pneumatic tyres for commercial vehicles and their trailers

†EH40 Health and Safety Executive Guidance Note. *Occupational exposure limits*

‡*ETRTO Standards Manual*

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* Available from HMSO.

† Available from the Health and Safety Executive, Room 414, St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3QY

‡ Available from the European Tyre and Rim Technical Organization, 32 Avenue Brugmann, Brussels, Belgium. Tel. 02 344 4059. telex 63935.

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Committees responsible for this British Standard

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Automobile Association
British Rubber Manufacturers' Association
Bus and Coach Council
Consumer Policy Committee of BSI
Department of Transport
National Tyre Distributors' Association
Retread Manufacturers' Association
Road Haulage Association Ltd.
Society of Motor Manufacturers and Traders Ltd.

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