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#### 1958 Agreement:

Consideration of draft amendments to existing

UN Regulations submitted by GRBP

## **Proposal for the 01 series of amendments to UN Regulation No. 109 (Retreaded tyres for commercial vehicles and their trailers)**

### **Submitted by the Working Party on Noise and Tyres\***

The text reproduced below was adopted by the Working Party on Noise and Tyres (GRBP) at its seventy-ninth session (ECE/TRANS/WP.29/GRBP/77, para. 20). It is based on ECE/TRANS/WP.29/GRBP/2024/3 as amended by GRBP-79-26 and GRBP-79-27. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration at their June 2024 sessions.

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\* In accordance with the programme of work of the Inland Transport Committee for 2024 as outlined in proposed programme budget for 2024 (A/78/6 (Sect. 20), table 20.5), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



# Uniform provisions concerning the approval for the production of retreaded pneumatic tyres for commercial vehicles and their trailers

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## 1. Scope

This Regulation covers the production of retreaded pneumatic tyres <sup>\*/</sup> <sup>\*\*/</sup> designed primarily for vehicles of category M2, M3, N, O3 and O4 <sup>1/</sup> <sup>2/</sup>. However, it does not apply to the production of:

- 1.1. Retreaded tyres with a nominal speed category symbol below eighty (80) km/h;
- 1.2. Tyres originally produced without speed symbols and/or load indices;
- 1.3. Tyres originally produced without UN Regulation No. 54 type approval.

## 2. Definitions

For the purpose of this Regulation (see also figure in Annex 9):

- 2.1. "*Range of retreaded tyres*" means a range of retreaded tyres as quoted in paragraph 4.1.5.
- 2.2. "*Retreader*" means the person or body who is responsible to the Type Approval Authority (TAA) for all aspects of the type-approval under this Regulation and for ensuring the conformity of production.
- 2.3. "*Tyre Manufacturer*" means the person or body who was responsible to the TAA having granted the original type approval of new tyres and for ensuring the conformity of production under the applicable Regulation for new tyres.
- 2.4. "*Material manufacturer / material supplier*" means the person or body who provides to the retreader the retreading or repair materials.
- 2.5. "*Brand name/trademark*" means the identification of the brand or trademark as defined by the retreader and marked on the sidewall(s) of the tyre. The brand name/trademark may be the same as that of the retreader.
- 2.6. "*Trade description/commercial name*" means an identification of a range of tyres as given by the retreader. It may coincide with the brand name/trademark.
- 2.7. "*Structure*" of a tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:
  - 2.7.1. "*Diagonal*" or "*Bias-ply*" describes a tyre structure 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;
  - 2.7.2. "*Radial*" or "*radial-ply*" describes a tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilised by an essentially inextensible circumferential belt.
- 2.8. Category of use:
  - 2.8.1. "*Normal tyre*" is a tyre intended for normal road use only.
  - 2.8.2. "*Special use tyre*" means a tyre intended for mixed use, both on- and off-road or for other special duty. These tyres are primarily designed to initiate and maintain the vehicle in motion in off-road conditions.
  - 2.8.3. "*Snow tyre*" means a tyre whose major features including tread pattern are primarily designed to achieve in mud and/or snow conditions a performance better than that of a normal tyre with regard to its ability to initiate and control vehicle motion.

<sup>\*/</sup> For the purpose of this Regulation "tyres" means "pneumatic tyres".

<sup>\*\*/</sup> Retreaded tyres are refurbished tyres after retreading process

<sup>1/</sup> As defined in the Consolidated Resolution on the Construction of Vehicles R.E.3

<sup>2/</sup> This Regulation defines requirements for tyres as a component. It does not limit their installation on any categories of vehicles.

- 2.9. "Bead" means the part of a tyre which is of such shape and structure as to fit the rim and hold the tyre on it.
- 2.10. "Cord" means the strands forming the fabric of the plies in the tyre.
- 2.11. "Ply" means a layer of "rubber" coated parallel cords.
- 2.12. "Belt" applies to a radial ply or bias belted tyre and means a layer or layers of material or materials underneath the tread, laid substantially in the direction of the centre line of the tread to restrict the carcass in a circumferential direction.
- 2.13. "Breaker" applies to a diagonal ply tyre and means an intermediate ply between the carcass and tread.
- 2.14. "Protective breaker" applies to a radial ply tyre and means an optional intermediate ply between the tread and the belt to minimize damage to the belt.
- 2.15. "Chaffer" means material in the bead area to protect the carcass against chafing or abrasion by the wheel rim.
- 2.16. "Carcass" means that part of a tyre other than the tread and the rubber sidewalls which, when inflated, bears the load.
- 2.17. "Tread" means that part of a tyre which comes into contact with the ground, protects the carcass against mechanical damage and contributes to ground adhesion.
- 2.18. "Sidewall" means the part of a tyre between the tread and the area designed to be covered by the rim flange.
- 2.19. "Lower area of the sidewall" means the area included between the line of maximum section width of the tyre and the area designed to be covered by the edge of the rim.
- 2.20. "Tread groove" means the space between two adjacent ribs and/or blocks in the tread pattern.
- 2.21. "Section width (*S*)" means the linear distance between the outside of the sidewalls of an inflated tyre, excluding elevations due to labelling (marking), decoration or protective bands or ribs.
- 2.22. "Overall width" means the linear distance between the outside of the sidewalls of an inflated tyre, including labelling (marking), decoration or protective bands or ribs.
- 2.23. "Section height (*H*)" means a distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter.
- 2.24. "Nominal aspect ratio (*R<sub>a</sub>*)" means one hundred times the number obtained by dividing the number expressing the nominal section height by the number expressing the nominal section width, both dimensions being in the same units.
- 2.25. "Outer diameter (*D*)" means the overall diameter of an inflated, newly retreaded tyre.
- 2.26. "Tyre size designation" means, except in the case of types of tyre for which the tyre-size designation is shown in the first column of the tables in Annex 5 to this Regulation, a designation showing:
- 2.26.1. The nominal section width (*S*<sub>1</sub>).
- 2.26.2. The nominal aspect ratio or, depending on the tyre design type, the nominal outer diameter expressed in mm;
- 2.26.3. An indication of the structure placed in front of the rim diameter marking as follows:
- 2.26.3.1. on diagonal (bias-ply) tyres, a dash "-" or the letter "D";
- 2.26.3.2. on radial-ply tyres, the letter "R";

2.26.4. A conventional number "d" (the "d" symbol) denoting the nominal rim diameter of the rim and corresponding to its diameter expressed either in codes (numbers below 100) or in millimetres (numbers above 100). Numbers corresponding to both types of measurements may be used together in the designation;

2.26.4.1. The values of the "d" symbols expressed in millimetres are shown below:

<i>Nominal Rim Diameter Code – "d" symbol</i>	<i>Value of the "d" symbol expressed in mm</i>
8	203
9	229
10	254
11	279
12	305
13	330
14	356
15	381
16	406
17	432
18	457
19	483
20	508
21	533
22	559
24	610
25	635
26	660
28	711
30	762
32	813
34	864
36	914
38	965
40	1016
42	1067
14.5	368
16.5	419
17.5	445
19.5	495
20.5	521
22.5	572
24.5	622
26.5	673
28.5	724
30.5	775

2.26.5. An indication of the tyre to rim fitment configuration when it differs from the standard configuration and is not already expressed by the symbol "d" denoting the nominal rim diameter code.

2.26.6. The prefix "LT" before the nominal section width, or the suffix "C" or "LT" after the rim diameter marking or, if applicable, after the tyre to rim fitment configuration; notwithstanding the foregoing, instead of a prefix or a suffix to the tyre-size designation "LT" may be placed after the service description.

- 2.26.6.1. This marking is optional in the case of tyres fitted on 5° drop centre rims, suitable for single and dual fitment, having a load-capacity index in single lower or equal to 121 and destined for the equipment of motor vehicles.
- 2.26.6.2. This marking is mandatory in the case of tyres fitted on 5° drop centre rims, suitable for single fitment only, having a load-capacity index higher or equal to 122 and destined for the equipment of motor vehicles.
- 2.26.7. The suffix "CP" after the rim diameter marking, or, if applicable, after the tyre to rim fitment configuration; this marking is mandatory in the case of tyres fitted on 5° drop centre rims, having a load-capacity index in single lower or equal to 121 and specifically designed for the equipment of motor caravans.
- 2.26.8. Optionally the suffix "MPT" after the rim diameter marking for tyres specifically designed for the equipment of multi-purpose commercial vehicles.
- 2.26.9. Optionally the prefix "ST" before the nominal section width for tyres specifically designed for the equipment of special trailers.
- 2.27. "*Nominal rim diameter (d)*" means the diameter of the rim on which a tyre is designed to be mounted.
- 2.28. "*Rim*" means the support, either for a tyre-and-tube assembly or for a tubeless tyre, on which the tyre beads are seated.
- 2.28.1. "*Tyre to rim fitment configuration*" means the type of rim to which the tyre is designed to be fitted. In the case of non-standard rims this will be identified by a symbol applied to the tyre, for example, "A".
- 2.29. "*Measuring rim*" means the rim specified as a 'measuring rim width' or 'design rim width' for a particular tyre size designation in any edition of one or more of the International Tyre Standards.
- 2.30. "*Test rim*" means any rim specified as approved or recommended or permitted in one of the International Tyre Standards for a tyre of that size designation and type.
- 2.31. "*International Tyre Standard*" means any one of the following standard documents:
- (a) The European Tyre and Rim Technical Organisation (ETRTO)<sup>3/</sup>: 'Standards Manual';
  - (b) The European Tyre and Rim Technical Organisation (ETRTO)<sup>3/</sup>: 'Previous Standard Data';
  - (c) The Tire and Rim Association Inc. (TRA)<sup>4/</sup>: 'Year Book';
  - (d) The Japan Automobile Tire Manufacturers Association (JATMA)<sup>5/</sup>: 'Year Book';
  - (e) The Tyre and Rim Association of Australia (TRAA)<sup>6/</sup>: 'Standards Manual';
  - (f) The Associação Latino Americana de Pneus e Aros (ALAPA)<sup>7/</sup>: 'Manual de Normas Técnicas';
  - (g) The Scandinavian Tyre and Rim Organisation (STRO)<sup>8/</sup>: 'Data Book'.

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The tyre standards can be obtained from the following addresses:

<sup>3/</sup> ETRTO, Avenue d'Auderghem 22-28 - B 1040 Brussels, Belgium

<sup>4/</sup> TRA, 175 Montrose West Avenue, Suite 150, Copley, Ohio, 44321 USA

<sup>5/</sup> JATMA, 9th Floor, Toranomon Building No. 1-12, 1-Chome Toranomon Minato-ku, Tokyo 105, Japan

<sup>6/</sup> TRAA, Suite 1, Hawthorn House, 795 Glenferrie Road, Hawthorn, Victoria, 3122 Australia

<sup>7/</sup> ALAPA, Avenida Paulista 2444-12° Andar, conj. 124, CEP, 01310-300 São Paulo, S.P. Brazil

<sup>8/</sup> STRO, Älggatan 48 A, Nb, S-216 15 Malmö, Sweden

- 2.32. "*Chunking*" means the breaking away of pieces of rubber from the tread.
- 2.33. "*Cord separation*" means the parting of the cords from their rubber coating.
- 2.34. "*Ply separation*" means the parting of adjacent plies.
- 2.35. "*Tread separation*" means the pulling away of the tread from the carcass.
- 2.36. "*Service description*" means the association of the load index or indices with a speed category symbol (for example, 164M or 121/119S); the service description may include either one or two load indices which indicate the load the tyre can carry in single or in single and dual operation.
- 2.37. "*Load-capacity index*" means a number which indicates the load the tyre can carry at the speed corresponding to the associated speed symbol and when operated in conformity with the requirements governing utilization specified by the original tyre manufacturer or the retreader.

The list of load indices and their corresponding loads is given in Annex 4.

- 2.38. "*Speed category*" means:
- 2.38.1. The speeds, indicated by a symbol, at which the tyre can carry the load indicated by the associated load index.
- 2.38.2. The symbols of speed categories are as shown in the table below:

<i>Speed category symbol</i>	<i>Corresponding speed (km/h)</i>
E	70
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210

- 2.39. "*Additional service description*" means an additional service description, marked within a circle, to identify a special type of service (load-capacity index or indices and speed category symbol) to which the retreaded tyre is also allowed to operate in addition to the applicable load variation with speed (see Annex 8).
- 2.40. "*Table load-capacity variation with speed*" means:  
 The table, in Annex 8, showing as a function of the load-capacity indices and nominal-speed-category symbols the load variations which a tyre can withstand when used at speeds different from that conforming to its nominal-speed-category symbol. The load variations do not apply in the case of the additional service description obtained when the provisions of paragraph 6.6.1.2. are applied.
- 2.41. "*Retreading production unit*" means a site or group of localized sites where finished retread tyres are produced.
- 2.42. "*Retreading*" means the generic term for refurbishing a used tyre by replacing the worn tread with new material. It may also include renovation of the

outermost sidewall surface (e.g. ASP) and replacement of the crown plies or the protective breaker. It covers the following process methods:

- 2.42.1. "Top capping" - replacement of the tread;
- 2.42.2. "Re-capping" - replacement of the tread and with the new material extending over part of the sidewall; <sup>2/</sup>
- 2.42.3. "Bead to bead" - replacement of the tread and renovation of the sidewall including all or part of the lower area of the tyre. <sup>2/</sup>
- 2.43. "Casing" is the worn tyre comprising carcass and remaining tread and sidewall material.
- 2.44. "Buffing" is the process of removing old material from the casing to prepare the surface for the new material.
- 2.45. "Repair" is the remedial work carried out to damaged casings within recognised limits.
- 2.46. "Tread material" is a material in a condition suitable for replacing the worn tread. It can be in several forms for example:
  - 2.46.1. "Camel-back" - pre-cut lengths of material which has been extruded to give the required cross section profile and subsequently fitted cold to the prepared casing. The new material must be cured;
  - 2.46.2. "Strip-wound" - a ribbon of tread material which is directly extruded and wound on to the prepared casing and built up to the required cross sectional contour. The new material must be cured;
  - 2.46.3. "Direct extrusion" - tread material extruded to give the required cross sectional profile and directly extruded on to the prepared casing. The new material must be cured;
  - 2.46.4. "Pre-cured" - a previously formed and cured tread applied to the prepared casing. The new material must be bonded to the casing.
- 2.47. "Sidewall veneer" is a material used to cover the sidewalls of the casing thereby allowing the required markings to be formed. This material can also be used to protect the outside of the tyre against abrasion in service. In this case the protective rubber layer is called ASP (additional sidewall protection).
- 2.48. "Cushion gum" is a material used as a bonding layer between new tread and casing and for repairing minor damage.
- 2.49. "Cement" is an adhesive solution to hold new materials in place prior to the curing process.
- 2.50. "Cure" is the term used to describe the change in physical properties of the new material which is brought about usually by the application of heat and pressure for a set period of time under controlled conditions.
- 2.51. Class C2 tyres: Tyres identified by a load-capacity index in single formation lower or equal to 121 and a speed category symbol higher or equal to "N";
- 2.52. Class C3 tyres: Tyres identified by:
  - (a) A load-capacity index in single formation higher or equal to 122 or;
  - (b) A load-capacity index in single formation lower or equal to 121 and a speed category symbol lower or equal to "M".
- 2.53. "Tyre for use in severe snow conditions" means a snow tyre or a special use tyre whose major features including tread pattern are specifically designed to

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<sup>2/</sup> Including the process method used in applying of ASP.



be used in severe snow conditions and that fulfils the requirements of paragraph 6.1. of UN Regulation No. [XXX].

- 2.54. "*Traction tyre*" means a tyre in class C2 or C3 bearing the inscription TRACTION and intended to be fitted primarily to the drive axle(s) of a vehicle to maximize force transmission in various circumstances.
- 2.55. "*Professional off-road tyre*" is a special use tyre primarily used for service in severe off-road conditions.
- 2.56. "*Tread depth*" means the depth of the principal grooves.
- 2.56.1. "*Principal grooves*" means the wide circumferential grooves positioned in the central zone of the tyre tread, which, in the case of passenger and light truck (commercial) tyres, have the treadwear indicators located in the base.
- 2.57. "*Void to fill ratio*" means the ratio between the area of voids in a reference surface and the area of this reference surface calculated from the mould drawing.
- 2.58. "*Supplier of the tread used for retreading process*" means the person or body who is responsible to the Type Approval Authority for all aspects of the type-approval under UN Regulation No. [XXX].
- 2.59. "*Tread used for retreading process*" means either a pre-cured tread or the specification of the major features of the tread used for mould cure process.

### 3. Markings

- 3.1. An example of the arrangement of retreaded tyre markings is shown in Annex 3 to this Regulation.
- 3.2. Retreaded tyres shall display on both sidewalls in the case of symmetrical tyres and at least on the outer sidewall in the case of asymmetrical tyres:
  - 3.2.1. The retreader's name or the brand name / trademark;
  - 3.2.2. The trade description/commercial name (see paragraph 2. of this Regulation). However, the trade description is not required when it coincides with the brand name/trademark.
  - 3.2.3. The tyre-size designation as defined in paragraph 2.;
  - 3.2.4. An indication of the structure as follows:
    - 3.2.4.1. On diagonal (bias-ply) tyres; no indication, or the letter "D" placed in front of the rim diameter marking;
    - 3.2.4.2. On radial-ply tyres; the letter "R" placed in front of the rim-diameter marking and optionally the word "RADIAL";
  - 3.2.5. The service description as defined in paragraph 2.36.
  - 3.2.6. If applicable, one additional service description surrounded by a circle in case the provisions of paragraph 6.6.1.2. are applied.
  - 3.2.7. The word "TUBELESS" if the tyre is designed for use without an inner tube.
  - 3.2.8. The inscription M+S or MS or M.S. or M & S if the tyre is classified in the category of use "snow tyre" or if the tyre is classified in the category of use "special use tyre" when declared by the tyre manufacturer at paragraph 4.1.5.3.1. as complying also with the definition given in paragraph 2.8.3.
    - 3.2.8.1. The "Alpine" symbol (3-peak-mountain with snowflake) if the snow tyre or the special use tyre is classified as tyre for use in severe snow conditions.  
  
The "Alpine" symbol ("3-peak-mountain with snowflake") shall conform to the symbol described in Annex 7, Appendix 1 to UN Regulation No. 117.

- 3.2.9. The date of retreading in the form of a group of four digits, the first two showing the week number and the second two showing the year in which the tyre was retreaded. The date code can cover a period of production from the week indicated by the week number up to and including the week number plus three. For example, the marking "2503" could indicate a tyre which was retreaded in weeks 25, 26, 27 or 28 of the year 2003.
- The date code may be marked on one sidewall only.
- 3.2.10. In the case of tyres which can be regrooved, the symbol "Ⓡ" in a circle at least 20 mm in diameter, or the word "REGROOVABLE", on to each sidewall.
- 3.2.11. An indication, by means of the "PSI" index (as explained in Annex 7, Appendix 2 to this Regulation) or in kilopascals (kPa), of the inflation pressure to be adopted for the load/speed endurance tests. This indication may be placed on one sidewall only.
- 3.2.12. The term "RETREAD". At the request of the retreader, the same term in other languages may also be added.
- 3.2.13. The inscription "MPT" (or alternatively "ML" or "ET") and/or "POR" if the tyre is classified in the category of use "special use tyre". In addition, they may also bear the inscription M+S or M.S or M&S.
- "ET" means Extra Tread, "ML" stands for Mining and Logging, "MPT" means Multi-Purpose Truck and "POR" means Professional Off-Road.
- 3.2.14. Tyres retreaded using the "bead to bead" process as defined in paragraph 2.42.3., or any process in which the sidewall material is renewed, shall have the identification referred to in paragraph 2.26.5., placed only immediately after the rim diameter marking referred to in paragraph 2.26.4.
- 3.2.15. The inscription "LT" after the service description, if it is not marked as part of the tyre size designation; tyres whose tyre-size designation includes the suffix "C" or "CP" may be marked with the additional inscription "LT" away from the tyre-size designation.
- 3.2.16. The inscription "FRT" (free rolling tyre) in the case of tyres designed for the equipment of trailer axles and axles of motor vehicles other than front steer and drive axles.
- 3.2.17. The inscription "TRACTION" if the tyre is classified as traction;<sup>10/</sup>
- 3.3. Prior to approval tyres shall exhibit a free space sufficiently large to accommodate an approval mark as referred to in paragraph 5.8. and as shown in Annex 2 to this Regulation.
- 3.4. Following approval, the markings referred to in paragraph 5.8. and as shown in Annex 2 to this Regulation shall be affixed in the free space referred to in paragraph 3.3. This marking may be affixed to one sidewall only.
- 3.4.1. In the case of retreaded tyre classified as "snow tyre for use in severe snow conditions" and or as "traction tyre", the approval mark referred to in paragraph 5.4 to the Regulation No. [XXX] and shown in its Annex 2 shall be affixed in addition.

<sup>10/</sup> Minimum height of marking: refer to dimension C in Annex 3 of this Regulation.

- 3.5. The markings referred to in paragraph 3.2. and the approval mark prescribed in paragraphs 3.4. and 5.8. shall be clearly legible. They shall be raised above or sunk below the tyre surface or shall be permanently marked on to the tyre.
- 3.5.1. [Reserved]
- 3.5.2. In the case that the date of retreading as defined in paragraph 3.2.9. is not moulded, it shall be applied not later than 5 working days after the completion of the retreading process at the facility concerned.
- 3.6. As far as any of the original manufacturer's specifications are still legible after the tyres have been retreaded, they shall be regarded as specifications of the retreader for the retreaded tyre. If these original specifications do not apply after retreading they shall be completely removed.
- 3.7. The original "E" or "e" approval mark and approval number and any other subsequent retreading production unit's approval mark and number, if no longer applicable, shall be removed.

## 4. Application for approval

The following procedures are applicable to the approval of a tyre retreading production unit:

- 4.1. The application for approval of a retreading production unit shall be submitted by the retreader or by his duly accredited representative. It shall specify:
- 4.1.1. An outline of the structure of the company producing the retreaded tyres;
- 4.1.2. A brief description of the quality management system, which ensures the effective control of the tyre retreading procedures to meet the requirements of this Regulation.
- 4.1.3. The brand name(s)/trademark(s) to be applied to the retreaded tyres produced.
- 4.1.4. The trade description(s)/commercial name(s) (see paragraph 2.) which could be applied to the retreaded tyres produced.
- 4.1.5. The following information in relation to the range of tyres to be retreaded:
- 4.1.5.1. The range of tyre sizes;
- 4.1.5.2. The structure of tyres (diagonal (bias-ply) or radial);
- 4.1.5.3. The category of use of tyres (normal, snow or special use tyres);
- 4.1.5.3.1. For the tyres belonging to the category of use "special use tyre" those which may bear the inscription M+S or M.S or M&S.
- 4.1.5.3.2. The list of tyres classified as tyre for use in severe snow conditions and/or as traction tyre.
- 4.1.5.3.2.1. For retreaded tyres produced by using either pre-cured tread or mould cure process with the same tread pattern covered by paragraph 6.4.4.1. the list shall clearly identify the tyres in order to make the relevant link with the list(s) quoted in paragraph 6.4.4.1. b). The following table is an example:

<i>Tyre Size Designation, Load indexes, Speed symbol</i>	<i>TM1</i>	<i>TM2</i>	<i>TM3</i>
215/75 R 17.5 126/124 M	TPM1/TPR1, TA1	-	TPM2/TPR2, TA2
235/75 R 17.5 132/130 M	TPM1/TPR1, TA1	-	-
265/70 R 17.5 138/136 M	-	TPM3/TPR3, TA3	TPM4/TPR4, TA4
245/70 R 19.5 136/134 M	-	-	-
12 R 22.5 152/148 K	-	TPM5/TPR5, TA5	-

Notes:

TM: Brand name/trademark of the Pre-Cured Tread Manufacturer

TPM: Trade description/commercial name of the Tread Pattern by the pre-cured tread Manufacturer

TPR: Trade description/commercial name of the Tread Pattern by the Retreader if different of TPM

TA: Number of the approval granted according to UN Regulation No. [XXX] to the type of retreaded tyre produced by using either a pre-cured tread or mould cure process with a tread having the same major features including tread pattern.

- 4.1.5.3.2.2. For retreaded tyres produced by using either mould cure process or pre-cured tread with the same tread pattern(s) as a new type of tyre covered by paragraph 6.4.4.2., the list shall clearly identify the tyres in order to make the relevant link with the list(s) quoted in paragraph 6.4.4.2. (b). The following table is an example:

<i>Tyre Size Designation, Load indexes, Speed symbol</i>	<i>TM1</i>	<i>TM2</i>	<i>TM3</i>
215/75 R 17.5 126/124 M	TPM1/TPR1, TA1	-	TPM2/TPR2,TA2
235/75 R 17.5 132/130 M	TPM1/TPR1, TA1	-	-
265/70 R 17.5 138/136 M	-	TPM3/TPR3, TA3	TPM4/TPR4, TA4
245/70 R 19.5 136/134 M	-	-	-
12 R 22.5 152/148 K	-	TPM5/TPR5, TA5	-

Notes:

TM: Brand name/trademark of the Tyre Manufacturer

TPM: Trade description/commercial name of the Tread Pattern by the Tyre Manufacturer

TPR: Trade description/commercial name of the Tread Pattern by the Retreader

TA: Number of the approval granted according to UN Regulation No. [XXX] to the type of retreaded tyre produced by using the pre-cured tread or mould cure process with a tread having the same major features including tread pattern of new tyres approved according to UN Regulation No. 117.

- 4.1.5.3.2.3. For retreaded tyres produced by using mould cure process with a tread pattern covered by paragraph 6.4.4.3. the list shall clearly identify the tyres in order to make the relevant link with the list(s) quoted in paragraph 6.4.4.3. b). The following table is an example:

<i>Tyre Size Designation, Load indexes, Speed symbol</i>	<i>TPR1</i>	<i>TPR2</i>	<i>TPR3</i>
215/75 R 17.5 126/124 M	TA1	-	TA3
235/75 R 17.5 132/130 M	TA1	-	-
265/70 R 17.5 138/136 M	-	TA2	TA3
245/70 R 19.5 136/134 M	-	-	-
12 R 22.5 152/148 K	-	TA2	-

Notes:

TPR: Trade description/commercial name of the Tread Pattern by the Retreader

TA: Number of the approval granted according to UN Regulation No. [XXX] to the type of retreaded tyre produced by using mould cure process

- 4.1.5.4. the system of retreading and the method of application of the new materials to be used, as defined in paragraphs 2.42. and 2.46.;
- 4.1.5.5. the maximum speed symbol of the tyres to be retreaded;
- 4.1.5.5.1 The speed category symbol E can be used only for the additional service description.
- 4.1.5.6. the maximum load index of the tyres to be retreaded;

- 4.1.5.7. the nominated International Tyre Standard to which the range of tyres conform.
- 4.2. At the request of the Type Approval Authority, the Retreader shall submit samples of tyres for test or copies of test reports from the technical services, communicated as given in paragraph 12. of this Regulation.

## **5. Approval**

- 5.1. To retread tyres requires the approval of the retreading production unit by the approval authorities in accordance with the requirements of this Regulation. The Approval Authority shall take the necessary measures as described in this Regulation in order to ensure that the tyres retreaded in the respective production unit will meet with the requirements stated in this Regulation. The retread production unit shall be fully responsible for ensuring that the retreaded tyres will meet the requirements of this Regulation and that they will perform adequately in normal use.
- 5.2. In addition to the normal requirements for the initial assessment of the tyre retreading production unit, the Approval Authority shall be satisfied that the procedures, operation, instructions and specification documentation provided by material suppliers are in a language readily understood by the tyre retreading production unit operatives.
- 5.3. The Approval Authority shall ensure that the procedures and operations documentation for each production unit contains specifications, appropriate to the repair materials and processes used, of the limits of repairable damage or penetrations to the tyre carcass, whether such damage is existing or is caused during the processes of preparation for retreading.
- 5.4. Before granting approval the authority must be satisfied that retreaded tyres conform to this Regulation and that the tests have been successfully carried out on at least five and not necessarily more than 20 samples of retreaded tyres representative of the range of tyres produced by the retreading production unit when prescribed according to paragraphs 6.5. and 6.6.
- 5.5. In the case of each failure being recorded during tests, two further samples of the same specification tyre shall be tested. If either or both of these second two samples fail, then a final submission of two samples shall be tested. If either one or both of the final two samples fail, then the application for approval of the retreading production unit shall be rejected.
- 5.6. If all the requirements of this Regulation are met, then approval shall be granted and an approval number shall be assigned to each retreading production unit approved. The first two digits of this number shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The approval number shall be preceded by "109R" signifying that the approval applies to a tyre retreaded as prescribed in this Regulation.
- The same authority shall not assign the same number to another production unit covered by this Regulation.
- 5.7. Notice of approval or of extension, refusal or withdrawal of approval or of production definitely discontinued pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation.
- 5.8. There shall be affixed conspicuously to every retreaded tyre conforming to this Regulation, in the space referred to in paragraph 3.3. and in addition to the markings prescribed in paragraph 3.2., an international approval mark consisting of:

- 5.8.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which granted approval <sup>11/</sup>; and
- 5.8.2. An approval number as described in paragraph 5.6.
- 5.9. Annex 2 to this Regulation gives an example of the arrangements of the approval mark.

## **6. Requirements**

- 6.1. Tyres shall not be accepted for first retread unless they have been type approved and bear either an "E" or "e" mark.
- 6.2. Conditions before retreading
  - 6.2.1. Tyres shall be clean and dry before inspection.
  - 6.2.2. Before buffing, each tyre shall be thoroughly examined both internally and externally to ensure its suitability for retreading.
  - 6.2.3. Tyres where damage is visible which has resulted from overload or underinflation shall not be retreaded.
  - 6.2.4. Tyres showing any of the following damage shall not be accepted for retreading:
    - 6.2.4.1. General
      - (a) non repairable rubber cracking extending through to the carcass;
      - (b) carcass break up;
      - (c) appreciable oil or chemical attack;
      - (d) damaged or broken bead core;
      - (e) previous repairs of damage outside specified injury limits - see paragraph 5.3.
    - 6.2.4.2. Conditions outside specified limits of repairability - see paragraph 5.3:
      - (a) carcass penetrations or damage after preparation for repair;
      - (b) multiple damage too close together;
      - (c) substantial deterioration of inner liner;
      - (d) bead damage;
      - (e) exposed carcass cords;
      - (f) loose cords;
      - (g) belt ply separation;
      - (h) permanently deformed or kinked (steel) carcass cords;
      - (i) circumferential cracking above the bead;
      - (j) corroded steel cord or bead wire.
- 6.3. Preparation
  - 6.3.1. After buffing, and before the application of new material, each tyre shall be thoroughly re-examined, at least externally, to ensure its continued suitability for retreading.

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<sup>11/</sup> As defined in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3)

- 6.3.2. The entire surface to which new material is to be applied shall have been prepared without overheating. The buffed surface texture shall not contain deep buffing lacerations or loose material.
- 6.3.3. Where precured material is to be used the contours of the prepared area shall meet the requirements of the material manufacturer.
- 6.3.4. Damage caused during buffing must not exceed defined limits of repair, see paragraph 5.3., and must be repaired.
- 6.3.5. Buffing damage to diagonal ply tyres 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.
- 6.3.6. Localized buffing damage to the belt of radial tyres is permissible. For larger damage it is permissible for the complete belt or sections of the belt to be replaced. Where a protective breaker is fitted, and can be positively identified as such, if it is damaged it is permissible to remove it and it need not be renewed.
- 6.3.7. Exposed steel parts shall be treated as soon as possible with appropriate material as defined by the material manufacturer of that appropriate material.
- 6.4. Retreading
- 6.4.1. The retreader must ensure that either the material manufacturer or the supplier of repair materials, including patches, is responsible for the following:
- (a) defining method(s) of application and storage, if requested by the retreader, in the national language of the country in which the materials are to be used;
  - (b) defining limits of damage for which the materials are designed, if requested by the retreader, in the national language of the country in which the materials are to be used;
  - (c) ensuring that reinforced patches for tyres, if correctly applied in carcass repairs, are suitable for the purpose;
  - (d) Ensuring that the patches are capable of withstanding twice the maximum inflation pressure as given by the original tyre manufacturer;
  - (e) ensuring the suitability of any other repair materials for the service intended.
- 6.4.2. The retreader shall be responsible for the correct application of the repair material and for ensuring that the repair is free from any defects which may affect the satisfactory service life of the tyre.
- 6.4.3. The area surrounding a reinforced repair to a sidewall or shoulder of a radial ply tyre may bulge slightly when the tyre is fitted and inflated to the recommended operating pressure. Reinforced repair materials with physical properties that restrict the height of the bulge to not more than 4 mm shall be used.
- 6.4.4. The retreader shall ensure that either the material manufacturer or the supplier of tread and sidewall material issues specifications concerning the conditions of storage and use of the material in order to guarantee the material's qualities. If requested by the retreader, this information shall be in the national language of the country in which the materials are to be used.
- 6.4.4.1. For retreaded tyres produced by using pre-cured tread or by using mould cure process- with the same tread pattern not covered by paragraph 6.4.4.2. and type approved pursuant to UN Regulation No. [XXX], the retreader shall ensure that the -manufacturer(s) or the supplier(s) of the tread(s) used for retreading process -provides to the Type Approval Authority (TAA) and the Technical

Service issuing the approval according to this Regulation and optionally to the retreader:

- (a) A copy of the UN Regulation No. [XXX] certificate(s), as issued by the relevant Type Approval Authority.
- (b) The list(s) of tyre sizes annexed to the UN Regulation No. [XXX] certificate(s). The list(s) shall include at least the tyres defined in paragraph 4.1.5.3.2.1.;
- (c) The drawing(s) of the tread pattern(s) covered by the UN Regulation No. [XXX] certificate(s) including the major features with respect to the snow performance;
- (d) A copy of the last report of the Conformity of Production as required in UN Regulation No. [XXX].

6.4.4.2. For retreaded tyres produced by using either mould cure process or pre-cured tread with the same major features including tread pattern(s) as a new type of tyre approved –pursuant to UN Regulation No. 117 having fulfilled the requirements about minimum snow performance in severe snow conditions, the retreader shall ensure that the manufacturer of the new tyre type provides to the Type Approval Authority (and the Technical Service) issuing the approval according to this UN Regulation and optionally to the retreader:

- (a) a copy of the Regulation No. [XXX] certificate(s), as issued by the relevant Type Approval Authority based on the UN Regulation No. 117 certificate(s);
- (b) The list(s) of tyre sizes annexed to the UN Regulation No.[XXX] certificate(s). The list(s) shall include at least the tyres defined in paragraph 4.1.5.3.2.3.;
- (c) The drawing(s) of the tread pattern(s) covered by the UN Regulation No 117 certificate(s) including the major features with respect to the snow performance;
- (d) A copy of the last report of the Conformity of Production as required in UN Regulation No. 117.

6.4.4.3. For retreaded tyres produced by using mould cure process not covered by paragraphs 6.4.4.1. or 6.4.4.2. and type approved pursuant to UN Regulation No. [XXX] the retreader shall provide to the Type Approval Authority (TAA) and the Technical Service issuing the approval according to this Regulation:

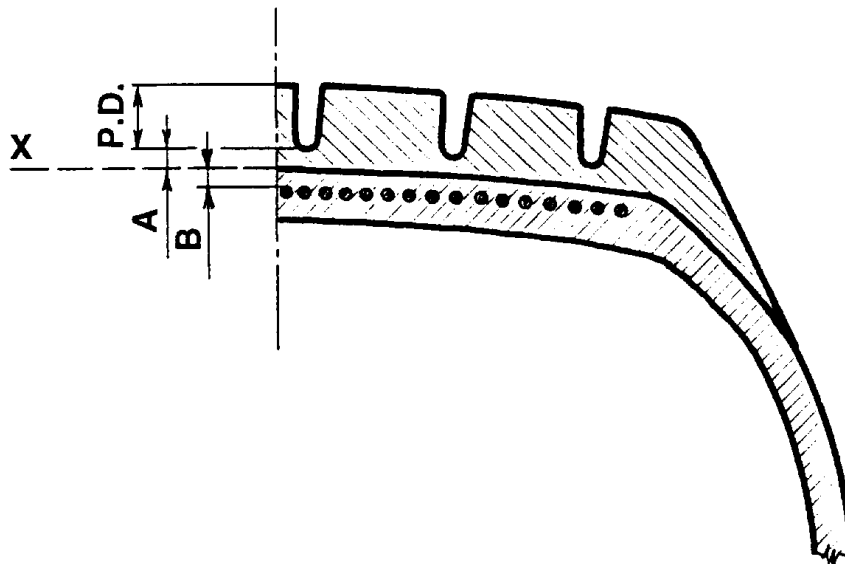
- (a) A copy of the UN Regulation No. [XXX] certificate(s), as issued by the relevant Type Approval Authority;
- (b) The list(s) of tyre sizes annexed to the UN Regulation No. [XXX] certificate(s). The list(s) shall include at least the tyres defined in paragraph 4.1.5.3.2.4.;
- (c) The drawing(s) of the tread pattern(s) including the major features with respect to the snow performance;
- (d) A copy of the last report of the Conformity of Production as required in UN Regulation No. [XXX].

6.4.4.4. For retreaded tyres produced by using pre-cured tread type approved pursuant to UN Regulation No. [XXX], the retreader shall ensure the packaging of the pre-cured tread bear the sticker with the approval marking till it is open and start to be used for the retreading process unless the approval marking is displayed on the tread shoulder.

6.4.5. The retreader must ensure that the repair material and/or compound is documented in a manufacturer's or supplier's certificate. The material compound must be suitable for the intended use of the tyre.



- 6.4.6. The processed tyre shall be cured as soon as possible after the completion of all repairs and building-up operations and at the latest according to the material manufacturer's specifications.
- 6.4.7. The tyre shall be cured for the length of time and at the temperature and pressure, appropriate to, and specified for, the materials and processing equipment used. The dimensions of the mould must be appropriate to the thickness of the new material and the size of the buffed tyre.
- 6.4.8. The thickness of original material after buffing and the average thickness of any new material under the tread pattern after retreading shall be as given in paragraphs 6.4.8.1. and 6.4.8.2.
- 6.4.8.1. For radial ply tyres (mm):
- |                        |                                  |
|------------------------|----------------------------------|
| $3 \leq (A+B) \leq 13$ | (minimum 3.0mm; maximum 13.0 mm) |
| $A \geq 2$             | (minimum 2.0 mm)                 |
| $B \geq 0$             | (minimum 0.0 mm)                 |



- P.D. = Pattern depth
- X = Buff line
- A = Average thickness of new material under pattern
- B = Minimum thickness of original material above belt after buffing

- 6.4.8.2. For diagonal (Bias-ply) tyres:
- The thickness of original material above the breaker shall be  $\geq 0.80$  mm;
- The average thickness of new material above the buffed casing line shall be  $\geq 2.00$  mm;
- The combined thickness of original and new material beneath the base of the grooves of the tread pattern shall be  $\geq 3.00$  mm and  $\leq 13.00$  mm.
- 6.4.9. The service description of a retreaded tyre shall not show either a higher speed symbol or a higher load index than that of the original, first life, tyre unless approval has been granted to the manufacturer of the original, first life, tyre for that same carcass to be used at the revised service description.
- Information that an original, first life, carcass has been upgraded in this way shall be made freely available by an Approval Authority to any retreading production unit and shall be communicated to other parties to the 1958

Agreement (see Article 5 of the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the basis of these Prescriptions - document E/ECE/324-E/ECE/TRANS/505/Rev.3).

The standard form shown in Annex 9 to UN Regulation No. 54 shall be used to communicate this information.

- 6.4.10. Upgrading of the service description as given in paragraph 6.4.9. shall only be permitted:
- (a) for the first retread of an original, first life tyre;
  - (b) for a used casing, if the traceability of the carcasses to be retreaded is guaranteed. The speed symbol or load index used for retreading shall then not exceed the conditions mentioned in the standard form in Annex 9 of UN Regulation No. 54 for these carcasses.
  - (c) for a used casing, if the traceability of the carcasses to be retreaded is not guaranteed till the original, first life, tyre, the speed symbol or the load index shall then not be raised above that shown on the used casing.

The retreader shall demonstrate to the approval authority the traceability of retreaded carcasses.

Tyres which have been previously retreaded shall not have either the speed symbol or the load index raised above that shown on the used casing.

#### 6.5. Inspection

- 6.5.1. After curing, whilst a degree of heat is retained in a tyre, each retreaded tyre shall be examined to ensure that it is free from any apparent defects. During or after retreading, the tyre shall be inflated to at least 150 kPa (1.5 bar) for examination. When the tyre presents a visible defect, it has to be subjected to a specific examination to determine the appropriate action on the tyre. Other methods more adapted than visual inspection which do not require tyre inflation can also be used with the agreement of the Approval Authority.
- 6.5.2. Before, during or after retreading the tyre shall be checked at least once for the integrity of its structure by means of a suitable inspection method.
- 6.5.3. For the purposes of quality control a number of retreaded tyres shall be subjected to destructive or non-destructive testing or examination. The quantity of tyres checked and the results shall be recorded.
- 6.5.4. After retreading, the dimensions of the retreaded tyre, when measured in accordance with Annex 6 to this Regulation, must conform either to dimensions calculated according to the procedures in paragraph 7. or to those given in Annex 5 to this Regulation. Note that:
- (a) the maximum outer diameter of a retreaded tyre may be up to 1.5 per cent greater than the maximum outer diameter of the same tyre size designation permitted by UN Regulation No. 54;
  - (b) and the maximum section width of a radial retreaded tyre may be up to 1.5 per cent greater than the maximum section width of the same tyre size designation permitted by UN Regulation No. 54.

#### 6.6. Load/speed endurance test:

- 6.6.1. Tyres retreaded to comply with this Regulation shall be capable of meeting the load/speed endurance test as specified in Annex 7 to this Regulation.
- 6.6.1.1. In case of retreaded tyre following the load/speed combinations given in the table in Annex 8, the endurance test prescribed in paragraph 6.6.1. above need not be carried out for load and speed values other than the nominal values.

- 6.6.1.2. In case of retreaded tyre which has an additional service description, the endurance test prescribed in paragraph 6.6.1. above shall also be carried out on a second tyre of the same size, structure and tread pattern at the additional load/speed combination and the applicable inflation pressure. At the option of the retreader, one test at the highest load index, the highest speed symbol and the lowest test inflation pressure indicated may be submitted.
- 6.6.1.2.1. Tyres marked with an additional service description for which the load-capacity represents a difference in load not greater than 2 per cent with respect to a load/speed combination applicable to the nominal speed category symbol (see Annex 8) can be exempted from performing an additional load/speed test, provided that the speed category of the additional service description differs from the speed category of the nominal service description and that there is no second test inflation pressure marked for the additional service description.
- 6.6.2. A retreaded tyre which after undergoing the load/speed endurance test does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords shall be deemed to have passed the test.
- 6.6.3. Except for tyres with radial structure, the outer diameter of the tyre, measured six hours after the load/speed endurance test, must not differ by more than 3.5 per cent.

## 7. Specifications

- 7.1. Tyres retreaded to comply with this Regulation shall conform to the following dimensions:

- 7.1.1. Section width:

- 7.1.1.1. The section width shall be calculated by the following formula:

$$S = S_1 + K (A - A_1)$$

where:

S : is the actual section width rounded to the nearest millimetre and measured on the test rim;

S<sub>1</sub>: is the value of the 'Design Section Width', referred to the measuring rim, as quoted in the International Tyre Standard specified by the retreader for the tyre size in question;

A : is the width of the test rim in millimetres;

A<sub>1</sub>: is the width in millimetres of the measuring rim as quoted in the International Tyre Standard specified by the retreader for the tyre size in question;

K : is a factor and shall be taken to equal 0.4.

- 7.1.1.1.1. In the case of tyres identified by the tyre to rim fitment configuration symbol "A" (see paragraph 2.26.4.1.) the factor "K" shall be 0.6.

- 7.1.2. Outer diameter:

- 7.1.2.1. The theoretical outer diameter of a retreaded tyre shall be calculated by the following formula:

$$D = d + 2H$$

where:

D: is the theoretical outer diameter in millimetres;

d: is the conventional number defined in paragraph 2.26. in millimetres;

H: is nominal section height rounded to the nearest millimetre and is equal to S<sub>n</sub> multiplied by 0.01 Ra

where:

$S_n$ : is the nominal section width in millimetres;

$R_a$ : is the nominal aspect ratio.

All of the above symbols are as quoted in the tyre size designation as shown on the sidewall of the tyre in conformity with the requirements of paragraph 3.2.3. and as defined in paragraph 2.26.

- 7.1.2.2. However, for tyres whose designation is given in the first column of the tables in 5 to Regulation No. 54, the outer diameter shall be that given in those tables.
- 7.1.2.3. In the case of tyres identified by the tyre to rim fitment configuration symbol "A" (see paragraph 2.26.4.), the outer diameter shall be that specified in the tyre size designation shown on the sidewall of the tyre.
- 7.1.3. Method of measuring retreaded tyres:
- 7.1.3.1. The dimensions of retreaded tyres shall be measured in accordance with the procedures given in Annex 6 to this Regulation.
- 7.1.4. Section width specifications:
- 7.1.4.1. The actual overall width may be less than the section width or widths determined in paragraph 7.1.1.
- 7.1.4.2. It may exceed the value by 5.5 per cent in the case of radial-ply tyres and 8 per cent in the case of diagonal (bias-ply) tyres. However, for tyres intended for dual mounting (twinning) listed in column A of the following table, the overall width of the tyre may exceed the value determined pursuant to paragraph 7.1.1. above taking into account the tolerances listed in column B. Other different specific tolerances are listed in Annex 5 Part II in footnotes of the relevant tables. The respective limits shall be rounded to the nearest millimetre.

A	B
Radial metric tyres with nominal section width exceeding 305 mm and aspect ratio higher than 60	3.5%
Radial tyres listed in Annex 5 Part I with section width exceeding 305 mm	3.5%
Diagonal metric tyres with nominal section width exceeding 305 mm	4%
Diagonal tyres listed in Annex 5 Part I with section width exceeding 305 mm	4%

- 7.1.4.3. In the case of tyres identified by the tyre to rim fitment configuration symbol "A" (see paragraph 2.26.4.), the overall width of the tyre, in the lower area of the tyre, equals the nominal width of the measuring rim (see paragraph 2.), plus 27 mm.
- 7.1.4.4. For retreaded C3 radial tyres an additional sidewall protective rubber layer (ASP) may be applied to a maximum of 8 mm greater than the overall width of the same tyre size description permitted by Regulation No. 54 provided that:
- This rubber layer is applied to one sidewall only;
  - The sidewall concerned is marked with the wording "ASP" and the wording "OUTSIDE", both markings with a minimal height of 8 mm;
  - The maximum allowed speed rating is index J (100 km/h);
  - In case of a dual mounting (twinning) only one tyre with ASP is allowed and has to be mounted on the outer wheel position.
- 7.1.5. Outer diameter specifications
- 7.1.5.1. The actual outer diameter of a retreaded tyre must not be outside the values of  $D_{min}$  and  $D_{max}$  obtained by the following formulae:

$$D_{\min} = d + 2 \cdot H_{\min}$$

$$D_{\max} = 1.015 \cdot [d + 2 \cdot H_{\max}]$$

where

$$H_{\min} = H \cdot a \text{ rounded to the nearest mm}$$

$$H_{\max} = H \cdot b \text{ rounded to the nearest mm}$$

7.1.5.1.1. For sizes not given in the tables in Annex 5 to this Regulation, "H" and "d" are as defined in paragraph 7.1.2.1.

7.1.5.1.2. For sizes referred to in paragraph 7.1.2.2. and for tyres identified by the tyre to rim fitment configuration symbol "A" (see paragraph 2.26.4.), the nominal section height "H" is equal to:

$$H = 0.5(D - d), \text{ rounded to the nearest millimetre}$$

where "D" and "d" are as defined in paragraph 7.1.2.1.

7.1.5.1.3. The coefficient "a" = 0.97

7.1.5.1.4. The coefficient "b" is:

	<i>Radial tyres</i>	<i>Diagonal (bias-ply) and bias belted tyres</i>
for normal use tyres	1.04	1.07
for special use tyres	1.06	1.09

7.1.5.2. For snow tyres the maximum outer diameter (Dmax) calculated in paragraph 7.1.5.1. may be exceeded by not more than 1 per cent.

7.2. In order to be classified as a "special use tyre" a tyre shall have a block tread pattern in which the blocks\* are larger and more widely spaced than for normal tyres and have the following characteristics:

(a) For C2 tyres: a tread depth  $\geq 11$  mm and void to fill ratio  $\geq 35$  per cent;

(b) For C3 tyres: a tread depth  $\geq 16$  mm and void to fill ratio  $\geq 35$  per cent.

\* blocks may be shaped as lugs and cleats.

7.3. In order to be classified as a 'professional off-road tyre', a tyre shall have all of the following characteristics:

(a) For C2 tyres:

(i) a tread depth  $\geq 11$  mm and

(ii) a void-to-fill ratio  $\geq 35$  per cent and

(iii) a speed category of  $\leq 160$  km/h.

(b) For C3 tyres:

(i) a tread depth  $\geq 16$  mm and

(ii) a void-to-fill ratio  $\geq 35$  per cent and

(iii) a speed category of  $\leq 110$  km/h.

## **8. Modifications and extension of approval**

- 8.1. Every modification concerning a retreading production unit amending any of the information given by the retreading production unit in the Application for Approval, see paragraph 4, shall be notified to the Approval Authority which approved the retreading production unit. That authority may then either:
  - 8.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the retreading production unit still meets the requirements; or
  - 8.1.2. Require a further investigation of the approval.
- 8.2. Confirmation of, or refusal of, approval, specifying the modifications, shall be communicated by the procedure specified in paragraph 5.7. to the Parties to the Agreement which apply this Regulation.
- 8.3. The Competent Authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

## **9. Conformity of production**

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.3), with the following requirements:

- 9.1. The retreading production unit approved according to this Regulation shall conform to the requirements set out in paragraph 6;
- 9.2. The holder of the approval shall ensure that, at least the following number of tyres, representative of the range being produced, is checked and tested as prescribed in this Regulation:

0.01 per cent of the total annual production but in any case not less than 2 tyres and not necessarily more than 10 tyres during each year of production, and spread throughout that year;
- 9.3. If the requirements of paragraph 9.2. are carried out by or under the control of the Type Approval Authority, the results may be used as part of, or instead of, those prescribed in paragraph 9.4;
- 9.4. The authority which has approved the retreading production unit may at any time verify the conformity control methods applied in each production facility. For each production facility, the Type Approval Authority shall take samples at random and at least the following number of tyres, representative of the range being produced, shall be checked and tested as prescribed in this Regulation:

0.01 per cent of the total annual production but in any case not less than 2 and not necessarily more than 10 during each and every production year;
- 9.5. The tests and checks of paragraph 9.4. may replace those required in paragraph 9.2.

## **10. Penalties for non-conformity of production**

- 10.1. The approval granted in respect of a retreading production unit pursuant to this Regulation may be withdrawn if the requirements of paragraph 9 are not complied with or if the retreading production unit or the retreaded tyres produced by that retreading production unit have failed to meet the requirements prescribed in paragraph 9.

- 10.2. If a Party to the Agreement which applies this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties to the 1958 Agreement applying this Regulation, by means of a communication form conforming to the model shown in Annex1 to this Regulation.

## **11. Production definitely discontinued**

The authority which granted the approval of the retreading production unit shall be informed if operations and manufacture of retreaded tyres approved within the scope of this Regulation cease. On receipt of this information the authority shall communicate this information to the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model shown in Annex1 to this Regulation.

## **12. Names and addresses of technical services responsible for conducting approval tests, of test laboratories, and of Type Approval Authorities.**

- 12.1. The Contracting Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and, where applicable, of the approved test laboratories and of Type Approval Authorities which grant approval and to which forms certifying approval or extension of approval or refusal of approval or withdrawal of approval or production definitely discontinued, issued in other countries, are to be sent.
- 12.2. The Contracting Parties to the 1958 Agreement which apply this Regulation may designate laboratories of tyre manufacturers or retreading production units as approved test laboratories.
- 12.3. Where a Contracting Party to the 1958 Agreement applies paragraph 12.2. above, it may, if it so desires, be represented at the tests by one or more persons of its choice.

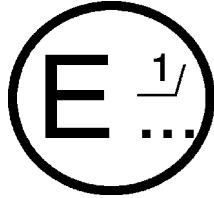
## **13. Transitional provisions**

- 13.1. As from the official date of entry into force of the 01 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept type approvals under this Regulation as amended by the 01 series of amendments.
- 13.2. Contracting Parties applying this Regulation shall continue to accept type approvals of, and to grant extensions of approvals to, the retreading production units to the preceding series of amendments to this Regulation which are not affected by the changes introduced by the 01 series of amendments.
- 13.3. As from 1 September 2025, Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued according to the preceding series of amendments, first issued after 1 September 2025.
- 13.4. Until 1 September 2028, Contracting Parties applying this Regulation shall accept type approvals and shall grant extensions to type approvals issued according to the preceding series of amendments, first issued before 1 September 2025.

# Annex 1

## Communication

(maximum format: A4 (210 x 297 mm))



Issued by:

Name of Type Approval Authority:

.....  
 .....  
 .....

- concerning: <sup>2/</sup>
- Approval granted
  - Approval extended
  - Approval refused
  - Approval withdrawn
  - Production definitely discontinued

of a retreading production unit pursuant to UN Regulation No. 109.

Approval No.: .....

Extension No.:.....

1. Retreader's name and address: .....
2. Name and address of retreading production unit: .....
3. If applicable, name and address of retreader's representative: .....
4. Summarized description as defined in paragraphs 4.1.3., 4.1.4 and 4.1.5. of this Regulation:
  - 4.1 Brand name(s)/trademark(s)<sup>3/</sup> .....
  - 4.2 Trade description(s)/ Commercial name(s)<sup>3/</sup>.....
  - 4.3 Information in relation to the range of tyres as defined in paragraphs 4.1.5. of this Regulation  
:.....
5. Technical service and, where applicable, test laboratory approved for purposes of approval or verification of conformity: .....
6. Date of report issued by that service: .....
7. Number of report issued by that service: .....
8. Reason(s) of extension (if applicable):.....
9. Any remarks:.....
10. Place:.....
11. Date:.....
12. Signature .....
13. Annexed to this communication is a list of documents in the approval file deposited at the Approval Authority which has considered this approval and which can be obtained upon request.

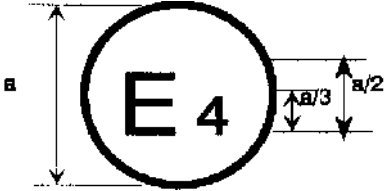
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<sup>1/</sup> Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).  
<sup>2/</sup> Delete that which does not apply.  
<sup>3/</sup> A list of brand name(s)/trademark(s) or Trade description(s)/ Commercial name(s) may be annexed to this communication.



**Annex 2**

**Arrangement of approval mark**



**109 R - 012439** a = 12 mm min

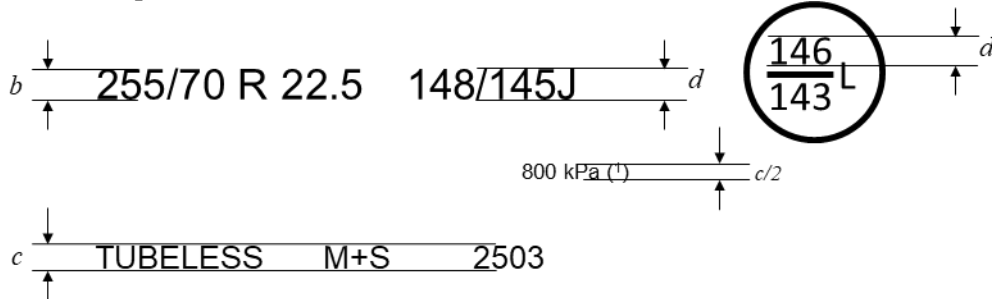
The above approval mark affixed to a retreaded tyre shows that the retreading production unit concerned has been approved in the Netherlands (E4) under approval number 109R012439, meeting the requirements of 01 series of amendments to this Regulation.

The approval number must be placed close to the circle and either above or below the "E" or left or right of that letter. The digits of the approval number must be on the same side of the "E" and face in the same direction. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with other symbols.

### Annex 3

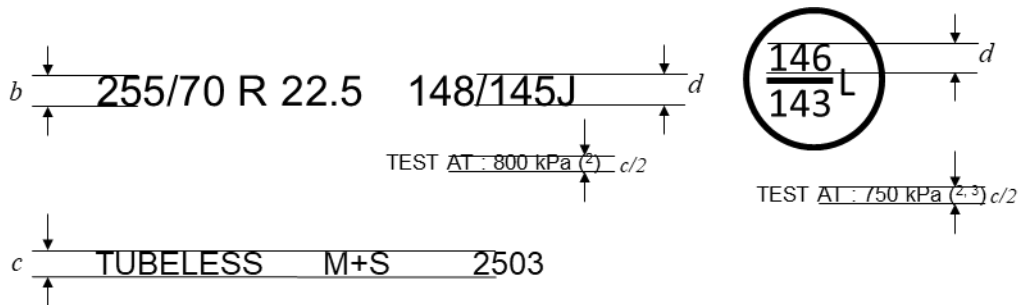
#### Arrangement of retread tyre markings

1. **Example 1:**



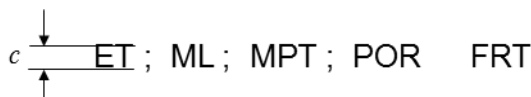
- (1) PSI marking instead of kPa is allowed for tyres first type approved before 1 January 2018. The kPa marking may be preceded by "TEST AT : " or, alternatively, by "TEST INFL : " or the symbol "@".

**Example 2:**



- (2) "TEST AT : " may be replaced by "TEST INFL : " or the symbol "@" or be omitted.  
 (3) The indication of a second inflation pressure for the additional service description is optional. If there is no indication, the same test inflation applies to both load/speed combinations.

Dimensional requirements for further markings (4):



- (4) For "ML" and "MPT" being part of the tyre size designation marking the minimum dimension *b* applies.

	<i>Minimum heights of markings (mm)</i>
b	6
c	4
d	6

The above example defines a retreaded tyre:

- Having a nominal section width of 255;
- Having a nominal aspect ratio of 70;
- Of radial-ply structure (R);
- Having a nominal rim diameter of 572 mm, for which the code is 22.5;

- Having load capacities of 3150 kg (single) and 2900 kg (twinned or dual), corresponding respectively to the load indices 148 and 145 shown in Annex 4 to this Regulation;
- Having a nominal speed symbol J (reference speed 100 km/h);
- Able to be used additionally at 120 km/h (speed category symbol L); with a load capacity of 3000 kg (single) and 2725 kg (twinned or dual), corresponding respectively to the load indices 146 and 143 shown in Annex 4 to this Regulation;
- Intended to be used without an inner tube ("TUBELESS") and of Snow type (M+S);
- Retreaded in the weeks 25, 26, 27 or 28 of the year 2003.
- Requiring to be inflated to 800 kPa for both load/speed endurance tests in Example 1 and 800 kPa for the load/speed endurance test according to the main load/speed combination and 750 kPa for the test according to the additional load/speed combination in Example 2.

2. In the particular case of tyres having a tyre to rim fitment configuration "A", the marking shall be in the form of the following example:

235-700 R 450A

where:

235 is the nominal section width in mm

700 is the outer diameter expressed in mm

R is an indication of the structure of the tyre – see paragraph 3.1.3. of this Regulation

450 is the nominal diameter of the rim expressed in mm

A is the tyre to rim fitment configuration.

The marking of the load index, speed category date of manufacture and other markings, shall be as given in example 1 above.

3. The positioning and order of the markings constituting the tyre designation shall be as follows:

- (a) The size designation as defined in paragraph 2. of this Regulation shall be grouped as shown in the above examples: 255/70 R 22.5 or 235-700 R 450 A.
- (b) The service description comprising the load index (indices) and the speed symbol(s) shall be placed immediately after the tyre size designation as defined in paragraph 2. of this Regulation.
- (c) The symbol "TUBELESS" and "M+S" may be at a distance from the size-designation symbol.
- (d) The word "RETREAD" may be at a distance from the size-designation symbol.
- (e) If paragraph 3.2.6. of this Regulation is applied, the additional service description, comprising the load indices and speed symbol, shall be shown inside a circle near the nominal service description appearing on the tyre sidewall.
- (f) If there are two indications for the test inflation pressure, they must be placed in such a way that it is clear which pressure indication belongs to which load/speed combination.

## Annex 4

## List of load indices and corresponding load capacities

Load index (LI) and load capacity - kg													
LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
0	45	40	140	80	450	120	1 400	160	4 500	200	14 000	240	45 000
1	46.2	41	145	81	462	121	1 450	161	4 625	201	14 500	241	46 250
2	47.5	42	150	82	475	122	1 500	162	4 750	202	15 000	242	47 500
3	48.7	43	155	83	487	123	1 550	163	4 875	203	15 500	243	48 750
4	50	44	160	84	500	124	1 600	164	5 000	204	16 000	244	50 000
5	51.5	45	165	85	515	125	1 650	165	5 150	205	16 500	245	51 500
6	53	46	170	86	530	126	1 700	166	5 300	206	17 000	246	53 000
7	54.5	47	175	87	545	127	1 750	167	5 450	207	17 500	247	54 500
8	56	48	180	88	560	128	1 800	168	5 600	208	18 000	248	56 000
9	58	49	185	89	580	129	1 850	169	5 800	209	18 500	249	58 000
10	60	50	190	90	600	130	1 900	170	6 000	210	19 000	250	60 000
11	61.5	51	195	91	615	131	1 950	171	6 150	211	19 500	251	61 500
12	63	52	200	92	630	132	2 000	172	6 300	212	20 000	252	63 000
13	65	53	206	93	650	133	2 060	173	6 500	213	20 600	253	65 000
14	67	54	212	94	670	134	2 120	174	6 700	214	21 200	254	67 000
15	69	55	218	95	690	135	2 180	175	6 900	215	21 800	255	69 000
16	71	56	224	96	710	136	2 240	176	7 100	216	22 400	256	71 000
17	73	57	230	97	730	137	2 300	177	7 300	217	23 000	257	73 000
18	75	58	236	98	750	138	2 360	178	7 500	218	23 600	258	75 000
19	77.5	59	243	99	775	139	2 430	179	7 750	219	24 300	259	77 500
20	80	60	250	100	800	140	2 500	180	8 000	220	25 000	260	80 000
21	82.5	61	257	101	825	141	2 575	181	8 250	221	25 750	261	82 500
22	85	62	265	102	850	142	2 650	182	8 500	222	26 500	262	85 000
23	87.5	63	272	103	875	143	2 725	183	8 750	223	27 250	263	87 500
24	90	64	280	104	900	144	2 800	184	9 000	224	28 000	264	90 000
25	92.5	65	290	105	925	145	2 900	185	9 250	225	29 000	265	92 500
26	95	66	300	106	950	146	3 000	186	9 500	226	30 000	266	95 000
27	97.5	67	307	107	975	147	3 075	187	9 750	227	30 750	267	97 500
28	100	68	315	108	1 000	148	3 150	188	10 000	228	31 500	268	100 000
29	103	69	325	109	1 030	149	3 250	189	10 300	229	32 500	269	103 000
30	106	70	335	110	1 060	150	3 350	190	10 600	230	33 500	270	106 000
31	109	71	345	111	1 090	151	3 450	191	10 900	231	34 500	271	109 000
32	112	72	355	112	1 120	152	3 550	192	11 200	232	35 500	272	112 000
33	115	73	365	113	1 150	153	3 650	193	11 500	233	36 500	273	115 000
34	118	74	375	114	1 180	154	3 750	194	11 800	234	37 500	274	118 000
35	121	75	387	115	1 215	155	3 875	195	12 150	235	38 750	275	121 500
36	125	76	400	116	1 250	156	4 000	196	12 500	236	40 000	276	125 000
37	128	77	412	117	1 285	157	4 125	197	12 850	237	41 250	277	128 500
38	132	78	425	118	1 320	158	4 250	198	13 200	238	42 500	278	132 000
39	136	79	437	119	1 360	159	4 375	199	13 600	239	43 750	279	136 000

## Annex 5

### **Tyre size designation and dimensions**

(in accordance with UN Regulation No. 54)

For this information refer to annex 5 to UN Regulation No. 54

Note that with reference to paragraph 6.5.4. of this Regulation, the outer diameter of a retreaded tyre, and the section width of a radial retreaded tyre, may in all cases be greater than that shown in the tables in Annex 5 to Regulation No. 54, but by no more than 1.5 per cent.

The overall section width of a retreaded radial tyre with an ASP may in all cases be greater than that shown in the tables of Annex 5 to Regulation No. 54, but by no more than 8 mm.

## **Annex 6**

### **Method of measuring tyres**

1. The tyre shall be mounted on the test rim specified by the retreader and inflated to the nominal inflation pressure quoted in the nominated International Tyre Standard (see paragraph 4.1.4.7. of this Regulation) in relation to the maximum load carrying capacity for that size and load index.
2. The tyre, fitted to the appropriate rim, shall be conditioned to the ambient temperature of the laboratory for at least 24 hr save as otherwise required by paragraph 6.6.3. of this Regulation.
3. The pressure shall be re-adjusted to the value in paragraph 1 of this annex.
4. The overall width is measured at six equally spaced points around the tyre, account being taken of the thickness of the protective ribs or bands. The highest measurement obtained is taken as the overall width.
5. The outer diameter shall be calculated from a measurement of the maximum circumference of the inflated tyre.

## Annex 7

### Procedure for load/speed endurance tests

(in principle in accordance with UN Regulation No. 54)

1. Preparing the tyre
  - 1.1. Mount a retreaded tyre on the test rim specified by the retreader.
  - 1.2. Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.
  - 1.3. Inflate the tyre to the pressure corresponding to the indication on the sidewall as specified in paragraph 3.2.11. of this Regulation.
  - 1.4. Condition the tyre and wheel assembly at test-room temperature for not less than 3 hours.
  - 1.5. Readjust the tyre pressure to that specified in paragraph 1.3. of this annex.
2. Test Procedure
  - 2.1. Mount the tyre and wheel assembly on the test axle and press it against the outer face of a smooth surfaced power-driven test drum of at least  $1.70\text{ m} \pm 1$  per cent diameter having a surface at least as wide as the tyre tread.
  - 2.2. Apply to the test axle a series of test loads equal to a percentage of the load indicated in Annex 4 to this Regulation, corresponding to the load index indicated on the tyre, and in accordance with the test programme below. Where the tyre has load indices for operation in both single and twin or dual formation the load corresponding to the load index for single operation shall be used for the test.
    - 2.2.1. In the case of tyres with a speed capacity greater than 150 km/h (speed symbol "Q" and above, plus "H") the test procedure shall be as given in paragraph 3. of this annex.
    - 2.2.2. For all other tyres the test procedure is as shown in Appendix 1 to this annex.
  - 2.3. Endurance Test Programme - See also Appendix 1 to this annex.
    - 2.3.1. The tyre pressure shall not be corrected throughout the test and the test load shall be kept constant throughout each of the three test stages.
    - 2.3.2. During the test the temperature of the test room shall be maintained at between 20°C and 30°C unless the tyre manufacturer or retreader agrees to the use of a higher temperature.
  - 2.4. The endurance test programme shall be carried out without interruption.
3. Load/speed test programme for tyres having a speed capability greater than 150 km/h (speed symbol "Q" and above, plus "H").
  - 3.1. This programme applies to:
    - 3.1.1. All tyres having a load index in single fitment equal to or less than 121;
    - 3.1.2. Tyres having a load index in single fitment equal to or greater than 122 and having the additional marking "C" or "LT" referred to in paragraph 3.2.15. of this Regulation.
  - 3.2. The load on the wheel and tyre shall be the following percentage of that corresponding to the load index of the tyre:
    - 3.2.1. 90 per cent when tested on a drum of  $1.70\text{ m} \pm 1$  per cent diameter;

- 3.2.2. 92 per cent when tested on a drum of 2.00 m  $\pm$  1 per cent diameter.
- 3.3. The initial phase test speed shall be 20 km/h less than that indicated by the speed symbol for the tyre.
  - 3.3.1. Time taken to reach initial test speed shall be 10 min.
  - 3.3.2. The duration of the first phase shall be 10 min.
- 3.4. The second phase test speed shall be 10 km/h less than that indicated by the speed symbol for the tyre.
  - 3.4.1. The duration of the second phase shall be 10 min.
- 3.5. The final phase test speed shall be the speed corresponding to that indicated by the speed symbol for the tyre.
  - 3.5.1. The duration of the final phase shall be 30 min.
- 3.6. The duration of the entire test shall be 1 hr.
- 4. Equivalent test method:

If a test method other than that given in paragraphs 2 or 3 of this annex is used, its equivalence must be demonstrated.



## Annex 7 - Appendix 1

### Endurance-test programme

Load index	Speed symbol	Test-drum speed [km.h <sup>-1</sup> ]		Load placed on the wheel as a percentage of the load corresponding to the load index		
		Radial-ply	Diagonal (bias-ply)	7 h.	16 h.	24 h.
122 or more	E	32	32	66%	84%	101%
	F	32	32			
	G	40	32			
	J	48	40			
	K	56	48			
	L	64	-			
	M	72	-			
N	80	-				
121 or less	E	32	32	70%	88%	106%
	F	32	32			
	G	40	40			
	J	48	48			
	K	56	56			
	L	64	56	4 h.	6 h.	
	M	80	64	75%	97%	114%
	N	88	-	75%	97%	114%
	P	96	-	75%	97%	114%

Notes:

(1) "Special-use" tyres (see paragraph 2.8. of this Regulation) shall be tested at a speed equal to 85 per cent of the speed prescribed for equivalent normal tyres.

(2) Tyres having a load index equal to or greater than 122, a speed symbol "N" or "P" and the additional markings "C" or "LT" included in the tyre size designation (referred to in paragraph 3.2.15. of this Regulation), shall be tested with the same programme as specified in the above table for tyres having a load index equal to or less than 121.

(3) In case of a test drum diameter larger than 1,700 mm ± 1 per cent, the above "percentage of test load" shall be increased as follows:

$$F_1 = K \cdot F_2$$

Where:

$$K = \sqrt{\frac{(R_1/R_2) \cdot (R_2 + r_T)}{(R_1 + r_T)}}$$

$R_1$  is the diameter of test drum, in millimetres

$R_2$  is the diameter of the reference test drum of 1,700 mm

$r_T$  is the tyre outer diameter (see paragraph 6.1.5 of Regulation No. 54), in millimetres

$F_1$  is the percentage of load to be applied for the test drum

$F_2$  is the percentage of load, as per above table, to be applied for reference test drum of 1,700 mm

Example:

$K = 1$  for a test drum diameter of 1,700 mm;

In case of a test drum diameter of 3,000 mm and a tyre diameter of 1,500 mm:

$$K = \sqrt{\frac{(3000/1700) \cdot (1700 + 1500)}{(3000 + 1500)}} = 1.12$$

**Annex 7 - Appendix 2****Relationship between the pressure index and units of pressure**

<i>Pressure Index ("PSI")</i>	<i>bar</i>	<i>kPa</i>
20	1.4	140
25	1.7	170
30	2.1	210
35	2.4	240
40	2.8	280
45	3.1	310
50	3.4	340
55	3.8	380
60	4.1	410
65	4.5	450
70	4.8	480
75	5.2	520
80	5.5	550
85	5.9	590
90	6.2	620
95	6.6	660
100	6.9	690
105	7.2	720
110	7.6	760
115	7.9	790
120	8.3	830
125	8.6	860
130	9.0	900
135	9.3	930
140	9.7	970
145	10.0	1000
150	10.3	1030
...	...	...

## Annex 8

## Variation of load capacity with speed: commercial vehicle tyres

RADIAL AND DIAGONAL PLY  
(in accordance with UN Regulation No. 54)

Variation of load capacity (per cent)										
Speed (km/h)	All load indices				Load indices $\geq 122$ <sup>1/</sup>		Load indices $\leq 121$ <sup>1/</sup>			
	Speed category symbol				Speed category symbol		Speed category symbol			
	F	G	J	K	L	M	L	M	N	P <sup>2/</sup>
0	+150	+150	+150	+150	+150	+150	+110	+110	+110	+110
5	+110	+110	+110	+110	+110	+110	+90	+90	+90	+90
10	+80	+80	+80	+80	+80	+80	+75	+75	+75	+75
15	+65	+65	+65	+65	+65	+65	+60	+60	+60	+60
20	+50	+50	+50	+50	+50	+50	+50	+50	+50	+50
25	+35	+35	+35	+35	+35	+35	+42	+42	+42	+42
30	+25	+25	+25	+25	+25	+25	+35	+35	+35	+35
35	+19	+19	+19	+19	+19	+19	+29	+29	+29	+29
40	+15	+15	+15	+15	+15	+15	+25	+25	+25	+25
45	+13	+13	+13	+13	+13	+13	+22	+22	+22	+22
50	+12	+12	+12	+12	+12	+12	+20	+20	+20	+20
55	+11	+11	+11	+11	+11	+11	+17.5	+17.5	+17.5	+17.5
60	+10	+10	+10	+10	+10	+10	+15.0	+15.0	+15.0	+15.0
65	+7.5	+8.5	+8.5	+8.5	+8.5	+8.5	+13.5	+13.5	+13.5	+13.5
70	+5.0	+7.0	+7.0	+7.0	+7.0	+7.0	+12.5	+12.5	+12.5	+12.5
75	+2.5	+5.5	+5.5	+5.5	+5.5	+5.5	+11.0	+11.0	+11.0	+11.0
80	0	+4.0	+4.0	+4.0	+4.0	+4.0	+10.0	+10.0	+10.0	+10.0
85	-3	+2.0	+3.0	+3.0	+3.0	+3.0	+8.5	+8.5	+8.5	+8.5
90	-6	0	+2.0	+2.0	+2.0	+2.0	+7.5	+7.5	+7.5	+7.5
95	-10	-2.5	+1.0	+1.0	+1.0	+1.0	+6.5	+6.5	+6.5	+6.5
100	-15	-5	0	0	0	0	+5.0	+5.0	+5.0	+5.0
105	-	-8	-2	0	0	0	+3.75	+3.75	+3.75	+3.75
110	-	-13	-4	0	0	0	+2.5	+2.5	+2.5	+2.5
115	-	-	-7	-3	0	0	+1.25	+1.25	+1.25	+1.25
120	-	-	-12	-7	0	0	0	0	0	0
125	-	-	-	-	-	0	-2.5	0	0	0
130	-	-	-	-	-	0	-5.0	0	0	0
135	-	-	-	-	-	-	-7.5	-2.5	0	0
140	-	-	-	-	-	-	-10	-5	0	0
145	-	-	-	-	-	-	-	-7.5	-2.5	0
150	-	-	-	-	-	-	-	-10.0	-5.0	0
155	-	-	-	-	-	-	-	-	-7.5	-2.5
160	-	-	-	-	-	-	-	-	-10.0	-5.0

<sup>1/</sup> The load indices refer to operation in single formation.

<sup>2/</sup> Load variations are not allowed for speeds above 160 km/h. For speed symbols "Q" and above the speed corresponding to the speed symbol specifies the maximum permissible speed for the tyre.

### Annex 9

### Explanatory figure

See paragraph 2 of this Regulation

