Working Paper N°. STD 03-07

3rd STD meeting, 16th-17th November 2009
Agenda item 5

TYRES

Regulation No. 117
(**UNIFORM PROVISIONS CONCERNING THE APPROVAL OF TYRES WITH REGARD TO ROLLING SOUND EMISSIONS AND TO ADHESION ON WET SURFACES
AND TO ROLLING RESISTANCE**)

Proposal for draft amendments to Regulation No. 117- Rev. 1

Submitted by the expert from Norway

The text reproduced below was prepared by the expert from Norway. Amendments to chapters 2, 3, and 8 are proposed. The modifications to the version of these chapters proposed by ETRTO at the second STD meeting are underlined or as ~~strikethrough~~.

Regulation No. 117

2. DEFINITIONS

For the purpose of this Regulation, in addition to the definitions contained in ECE Regulations Nos. 30 and 54, the following definitions apply.

2.1. **"Type of tyre" means, in relation to this Regulation, a range of tyres** consisting of a list of tyre size designations, brand names and trade descriptions, **which do not differ in such essential characteristics as:**

(a) The manufacturer's name;

(b) The tyre class (see paragraph 2.4.);

(c) The tyre structure and the rubber compounds;

(d) The category of use: normal tyre, snow tyre and special use tyre ;

(e) For Class C1 tyres:

(i) In case of tyres submitted for approval of rolling sound emission levels, whether normal or reinforced (or extra load);

(ii) In case of tyres submitted for approval of performance adhesion on wet surfaces, whether normal tyres or snow tyres with a speed category of Q or below (≤ 160 km/h) or speed category R and above including H (> 160 km/h);

(f) For Class C2 and C3 tyres:

(i) In case of tyres submitted for approval of rolling sound emission levels at stage 1, whether M+S marked or not;

(ii) In case of tyres submitted for approval of rolling sound emission levels at stage 2, whether traction tyre or not;

(g) The tread pattern (see paragraph 3.2.1.) [except in case of tyre submitted for approval of rolling resistance performance].

2.2. "Brand name" or "Trade description" means the identification of the tyre as given by the tyre manufacturer. The Brand name may be the same as that of the manufacturer and the Trade description may coincide with the trade mark.

2.3. "Rolling sound emission" means the sound emitted from the contact between the tyres in motion and the road surface.

2.4. "Tyre Class" means one of the following groupings:

2.4.1. Class C1 tyres: Tyres conforming to ECE Regulation No. 30;

2.4.2. Class C2 tyres: Tyres conforming to ECE Regulation No. 54 and identified by a load capacity index in single formation lower or equal to 121 and a speed category symbol higher or equal to "N";

2.4.3. Class C3 tyres: Tyres conforming to ECE Regulation No. 54 and 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".

2.5. "Representative tyre size" means the tyre size which is submitted to the test described in Annex 3 to this Regulation with regard to rolling sound emissions ~~and~~ or Annex 5 for adhesion on wet surfaces or Annex 6 for rolling resistance to assess the conformity for the type approval of the type of tyre, or Annex 7 for snow performance to assess the category of use “snow”.

2.6. "Temporary-use spare tyre" means a tyre different from a tyre intended to be fitted to any vehicle for normal driving conditions; but intended only for temporary use under restricted driving conditions.

2.7. "Tyres designed for competition" means tyres intended to be fitted to vehicles involved in motor sport competition and not intended for non-competitive on-road use.

2.8. "Normal tyre" means a tyre intended for normal on-road use.

2.9. "Reinforced tyre" or "extra load tyre" means a pneumatic-tyre structure designed to carry more load at a higher inflation pressure than the load carried by the corresponding standard version tyre at the standard inflation pressure as specified in ISO 4000-1[:2009].

2.10. "Traction tyre" means a tyre in category 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. This increased traction is achieved through the use of tread patterns with either transversal sipes and/or large blocks created with transversal grooves which are wider than 1.5 mm

2.11. "Snow tyre" means a tyre whose tread pattern, tread compound or structure are primarily designed to achieve in snow conditions a performance better than that of a normal tyre with regard to its ability to initiate, maintain or stop vehicle motion. This improved performance is compared to a standard reference test tyre as defined in a standardized test procedure according to Annex VII.

2.12. "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. To achieve this performance they have a block tread pattern in which the blocks are larger and more widely spaced than for normal tyres and have the following characteristics :

- For C1/C2 tyres: a tread depth ≥ 11 mm [or] void to fill ratio ≥ 35%
- For C3 tyres: a tread depth ≥ 16 mm [or] void to fill ratio ≥ 35%

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2.13. " Professional Off-road tyre" is a special use tyre primarily used for servicing in severe off-road conditions, and which has all of the following characteristics:

- For C1 and C2 tyres :
  - i) A tread depth ≥ 11 mm
  - ii) A void-to-fill ratio ≥ 35 %
  - iii) A maximum speed rating of ≤ [Q]
- For C3 tyres :
  - i) A tread depth ≥ 16 mm
  - ii) A void-to-fill ratio ≥ 35 %
  - iii) A maximum speed rating of ≤ K

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2.14. "Tread depth" means the depth of the principal grooves

2.14.1. "Principal grooves" means the wide 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.

[2.15. "Void to fill ratio" means …..]

2.16. "Standard reference test tyre" (SRTT) means a tyre that is produced, controlled and stored in accordance with the ASTM (American Society for Testing and Materials) standards E1136-93 (2003) (size P195/75R14) or F2493-08 (size P 225/60R16).

2.17. Wet Grip measurements – Specific definitions

2.17.1 "Adhesion on wet surfaces" means the relative braking performance, on a wet surface, of a test vehicle equipped with the candidate tyre in comparison to that of the same test vehicle equipped with a reference tyre (SRTT).

2.17.2 "Candidate tyre" means a tyre, representative of the type, that is submitted for approval in accordance with this Regulation.

2.17.3 "Control tyre" means a normal production tyre that is used to establish the wet grip performance of tyre sizes unable to be fitted to the same vehicle as the standard reference test tyre – see paragraph 2.2.2.16. of Annex 5 to this Regulation.

2.17.4 "Wet grip index ("G")" means the ratio between the performance of the candidate tyre and the performance of the standard reference test tyre.

2.17.5 "Peak brake force coefficient ("pbfc")" means the maximum value of the ratio of braking force to vertical load on the tyre prior to wheel lock-up.

2.17.6 "Mean fully developed deceleration ("mfdd")" means the average deceleration calculated on the basis of the measured distance recorded when decelerating a vehicle between two specified speeds.

2.17.7 "Coupling (hitch) height" means the height when measured perpendicularly from the centre of the articulation point of the trailer towing coupling or hitch to the ground, when the towing vehicle and trailer are coupled together. The vehicle and trailer must be standing on level pavement surface in its test mode complete with the appropriate tyre(s) to be used in the particular test.

2.18 Rolling resistance measurement – specific definitions

2.18. 1 Rolling Resistance
F_r
loss of energy (or energy consumed) per unit of distance traveled. 1/

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2.18.2. Rolling resistance coefficient
C_r
ratio of the rolling resistance to the load on the tyre. 2/

2.18.3 New test tyre
[Tyre which has not been previously used in a rolling deflected test that raises its temperature above that generated in rolling resistance tests, and which has not previously been exposed to a temperature above 40°C. 3/ 4/]

2.18.4 Measurement Result Correlation
Set of rolling resistance measurements to be carried out on a regular time basis by separate laboratories in order to allow direct comparisons between their rolling resistance results. 5/

2.18.5 Reference Machine
machine considered as a reference for an alignment.

2.18.6 Alignment Tyres
set of two predetermined tyres measured by both the candidate and reference machines to perform machine alignment. 6/

2.18.7 Laboratory Control Tyre
Tyre used by an individual laboratory to control machine behaviour as a function of time. 7/

2.18.8 Capped inflation
Process of inflating the tyre and allowing the inflation pressure to build up, as the tyre is warmed up while running.

2.18.9 Parasitic loss
Loss of energy (or energy consumed) per unit distance excluding internal tyre losses, attributable to aerodynamic loss of the different rotating elements of the test equipment, bearing friction and other sources of systematic loss which may be inherent in the measurement.

2.18.10 Skim test reading
Type of parasitic loss measurement, in which the tyre is kept rolling, without slippage, while reducing the tyre load to a level at which energy loss within the tyre itself is virtually zero.

2.18.11 Inertia or Moment of Inertia.
Ratio of the torque applied to a rotating body to the rotational acceleration of this body. 8/

2.18.12 Measurement reproducibility.
σ_m
capability of a machine to measure rolling resistance 9/

2.18.13 Deviation of Alignment Tyre
Difference in terms of time compared with the mean rolling resistance coefficient measurement results for a given alignment tyre with the appropriate number of repetitions 10/

1/ The International System of Units (SI) unit conventionally used for the rolling resistance is the newton-metre per metre, which is equivalent to a drag force in newtons.
2/ The rolling resistance is expressed in newtons and the load is expressed in kilonewtons. The rolling resistance coefficient is dimensionless.
3/ [Note to be added to explain the reason]
4/ It is permissible to repeat an accepted test procedure.
5/ The results of these measurements are used to compute "alignment" corrective coefficients and permits calculation of aligned rolling resistance measurement, $Cr_{aligned}$. See Annex 6 part7.
6/ see clause 7

7/ An example of machine behaviour is drift.
8/ The rotating body can be, for example, a tyre assembly or machine drum.
9/ σ_m can be estimated by measuring n times (where $n \geq 3$) the whole procedure described in clause 4 for the two alignment tyres, assuming that the variances of the two alignment tyres are homogeneous, as follows:

$$\sigma_m = \sqrt{\frac{1}{2} \cdot \sum_{i}^{2} \sigma_{m,i}^2}$$

$$\sigma_{m,i} = \sqrt{\frac{1}{n-1} \cdot \sum_{j=1}^{n} \left(Cr_{i,j} - \frac{1}{n} \cdot \sum_{j=1}^{n} Cr_{i,j} \right)^2}$$

where
i = either 1 or 2 corresponding to each of the alignment tyres
j = is the counter from 1 to n for the number of repetitions of each measurement for a given tyre
n = repetitions of tyre measurements
10/ see Annex 6 paragraph 7.2.

3. APPLICATION FOR APPROVAL

3.1. The application for approval of a type of tyre with regard to this Regulation shall be submitted by the tyre manufacturer or by his duly accredited representative. It shall specify:

3.1.1. The performance characteristics to be assessed for the tyre type; "rolling sound emissions level" or “adhesion performance level on wet surfaces” or "rolling resistance level”. Tyre “snow performance level” in case the category of use is snow;

3.1.2. Name of manufacturer;

3.1.3. Name and address of applicant;

3.1.4. Address(es) of manufacturing plant(s);

3.1.5. Brand name(s), trade description(s), trade mark(s);

3.1.6. Tyre class (Class C1, C2 or C3) (see paragraph 2.4. of this Regulation);

3.1.6.1. Section width range for class C1 tyres (see paragraph 6.1.1. of this Regulation);

NOTE: This information is required only for approval with regard to rolling sound emission level.

3.1.7. Tyre structure;

3.1.8. For Class C1 tyres, state whether:

(a) Reinforced (or extra load) in case of approval with regard to rolling sound emission level;

(b) Speed category symbol "Q" or below (not including "H") or "R" and above (including "H") in case of "snow" tyres for approval with regard to adhesion on wet surfaces;

For Class C2 and C3 tyres, state whether :

(a) M+S marked in case of approval with regard to rolling sound emission level at stage 1.

(b) Traction in case of approval with regard to rolling sound emission level at stage 2.

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3.1.9. Category of use (normal, snow, or special);

3.1.10. A list of tyre size designations covered by this application.

3.2. The application for approval shall be accompanied (in triplicate) by:

3.2.1. Details of the major features, with respect to the effects on tyre performance (i.e. rolling sound emission level or adhesion on wet surfaces respectively, rolling resistance and snow grip) of ~~the tread pattern(s) to be used on~~ the tires included in the designated range of tyre sizes. This may be by descriptions supplemented by technical data, drawings, photographs and x-rays, and must be sufficient to allow the type approval authority or technical service to determine whether any subsequent changes to the major features will adversely affect the tyre performance. Technical data for the physical properties of the rubber compound(s) of the tread shall always be given (DMA-measurements). If several compounds are used in the tread, geometrical data shall be given, as well as DMA-data for each of the compounds. The effects of changes to minor details of tyre construction on tyre performances will be evident and determined during checks on conformity of production;

3.2.2. Drawings or photographs of the tyre sidewall, showing the information given in paragraph 3.1.4. above and the approval marking referred to in paragraph 5., shall be submitted once the production has been established, but no later than one year after the date of granting of type approval.

3.3. At the request of the type approval authority, the applicant shall submit samples of tyres for test or copies of test reports from the technical services, communicated as given in paragraph 11. of this Regulation.

3.4. With regard to the application, testing may be confined to a worst case selection, at the discretion of the type approval authority or designated technical service. When type approval data are to be used for tyre labelling ( ), testing shall be sufficient to allow the correct classes (A-G) for rolling resistance and wet grip, and the correct decibel levels to be identified.

3.5. The laboratories and test facilities of a tyre manufacturer may be designated as an approved laboratory and the type-approval authority shall have the option of being represented during any tests.

8. 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.2) with the following requirements:

8.1. Any tyre approved under this Regulation shall be so manufactured as to conform to the performance characteristics of the type of tyre approved and satisfy the requirements of paragraph 6. above;

8.2. In order to verify conformity as prescribed in paragraph 8.1. above, a random sample of tyres bearing the approval mark required by this Regulation shall be taken from the series production. The normal frequency of verification of conformity of production shall be at least once every two years;

8.2.1. In the case of verifications with regard to approvals in accordance with paragraph 6.2., these shall be carried out using the same procedure (see Annex 5 to this Regulation) as that adopted for original approval, and the type approval authority shall satisfy itself that all tyres falling within an approved type comply with the approval requirement. The assessment shall be based upon the production volume of the tyre type at each manufacturing facility, taking into account the quality management system(s) operated by the manufacturer. Where the test procedure involves testing a number of tyres at the same time, for example a set of four tyres for the purpose of testing wet grip performance in accordance with the standard vehicle procedure given in Annex 5 to this Regulation, then the set shall be considered as being one unit for the purposes of calculating the number of tyres to be tested.

8.3. Production shall be deemed to conform to the requirements of this Regulation if the levels measured comply with the type approval value(s) (cf. the COMMUNICATION given in accordance with Annex 1 to this regulation), with an additional allowance of +1 dB(A) for possible mass production variations.

8.4 Production shall be deemed to conform to the requirements of this Regulation if the levels measured comply with the EU-labelling class (A-G) corresponding to the type approval value(s) (cf. the COMMUNICATION given in accordance with Annex 1 to this regulation), with an additional allowance of +0.3 N/kN for possible mass production variations.