



Economic and Social Council

Distr.: General
16 June 2022

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on Noise and Tyres

Seventy-sixth session

Geneva, 5–7 September 2022

Item 4 (c) of the provisional agenda

Tyres: UN Regulation No. 117 (Tyre rolling resistance, rolling noise and wet grip)

Proposal for the 04 series of amendments to UN Regulation No. 117

**Submitted by the experts from the European Tyre and Rim Technical
Organisation***

The text reproduced below was prepared by the experts from the European Tyre and Rim Technical Organisation (ETRTO). The modifications to the existing text are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (Sect.20), para 20.76), 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.



I. Proposal

Paragraph 6.6. and its subparagraphs, amend to read:

"6.6. ~~In order to be classified as a "traction tyre", a tyre is required to meet the condition of paragraph 6.6.1. below. A tyre may be classified as a traction tyre, if the total number (n_{TE}) of traction elements of its tread pattern is equal to or greater than a limit that is calculated based on the deformation potential (P_{def}) of its tread pattern pursuant to paragraph 6.6.3.~~

6.6.1. ~~The tyre shall have a tread pattern with minimum two circumferential ribs, each containing a minimum of 30 block-like elements, separated by grooves and/or sipe elements the depth of which has to be minimum of one half of the tread depth. The use of an alternative option of a physical test will only apply at a later stage following a further amendment to the Regulation including a reference to appropriate test methods and limit values.~~

Calculation of the deformation potential of the tread pattern

The "deformation potential" (P_{def}) is calculated as follows:

$$P_{def} = R_{void} \cdot d_{tr}^3$$

where:

R_{void} is a dimensionless figure between 0 and 1 representing the void to fill ratio of the tread pattern according to the definition in paragraph 2.17.;

d_{tr} is the maximum of the tread depths as defined in paragraph 2.16. of this Regulation expressed in millimetres.

The deformation potential P_{def} is expressed in mm^3 .

6.6.2. **Calculation of the number of traction elements**

"Traction elements" (TE) are elements of the tread pattern which are completely separated from each other by grooves and/or sipes, on all their edges, at tread surface.

The total number n_{TE} of traction elements is calculated as follows

$$n_{TE} = \frac{1}{2} \cdot (n_{TE,50} + n_{TE,70})$$

where:

$n_{TE,50}$ is the number of traction elements separated by grooves/sipes with a depth equal to or greater than 50% of the maximum tread depth;

$n_{TE,70}$ is the number of traction elements separated by grooves/sipes with a depth equal to or greater than 70% of the maximum tread depth.

For the avoidance of doubt, each traction element counted within $n_{TE,70}$ is also counted within $n_{TE,50}$.

6.6.3. In order to be classified as a traction tyre, the total number of traction elements in the tread pattern of a tyre shall, depending on tyre class and, for class C3 tyres, nominal rim diameter, fulfil the respective condition:

For class C2 tyres:
$$n_{TE} \geq -\frac{2}{25 \text{ mm}^3} \cdot P_{def} + 100$$

For class C3 tyres with nominal rim diameter code less than 20:

$$n_{TE} \geq -\frac{1}{10 \text{ mm}^3} \cdot P_{def} + 200$$

For class C3 tyres with nominal rim diameter code equal to or greater than 20:

If $P_{def} < 1400 \text{ mm}^3$:
$$n_{TE} \geq -\frac{17}{70 \text{ mm}^3} \cdot P_{def} + 400$$

$$\text{If } P_{\text{def}} \geq 1400 \text{ mm}^3: \quad n_{\text{TE}} \geq -\frac{1}{10 \text{ mm}^3} \cdot P_{\text{def}} + 200 "$$

II. Justification

1. As indicated in Informal document GRBP-70-19, the tyre industry investigated the possibility of a test procedure to characterize traction tyres. However, test reproducibility is very low especially for soft soils. Therefore, an alternative new definition using a unique or a combination of test(s) was not possible, and it was decided to change from the current pure geometrical approach to a more mechanical approach.
 2. After rediscussing the initial approach, it turned out that the initially proposed definition of traction elements was too hard to be verified and a simpler definition is proposed.
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