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**Economic Commission for Europe****Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****165<sup>th</sup> session**

Geneva, 10-13 March 2015

Item 4.6.4 of the provisional agenda

**1958 Agreement – Consideration of draft amendments  
to existing Regulations submitted by GRB****Proposal for Supplement 7 to the 02 series of amendments to  
Regulation No. 117 (Tyre rolling resistance, rolling noise and  
wet grip)****Submitted by the Working Parties on Noise and on Brakes and  
Running Gear\***

The text reproduced below was adopted by the Working Party on Noise (GRB) at its at its sixtieth session (ECE/TRANS/WP.29/GRB/58, para. 11) and the Working Party on Brakes and Running Gear (GRRF) at its seventy-eighth session (ECE/TRANS/WP.29/GRRF/78, para. 31). It is based on the following documents:

- (a) Annex IV to the GRRF report (ECE/TRANS/WP.29/GRRF/78) and
- (b) ECE/TRANS/WP.29/GRB/2014/7, as amended by Annex V to the GRB report (ECE/TRANS/WP.29/GRB/58).

It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Executive Committee (AC.1) for consideration. The amendment to paragraph 2.16. in square brackets was inserted by the secretariat and is subject to the confirmation by GRRF at its seventy-ninth session in February 2015.

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\* In accordance with the programme of work of the Inland Transport Committee for 2012–2016 (ECE/TRANS/224, para. 94 and ECE/TRANS/2012/12, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Paragraph 2.16., amend to read:

- "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
- (a) E1136-93 (2003) for the size P195/75R14
  - (b) F2872 (2011) for the size 225/75 R 16 C.
  - (c) F2871 (2011) for the size 245/70R19.5
  - (d) F2870 (2011) for the size 315/70R22.5"]

Paragraph 6.4.1.1., amend to read:

"6.4.1.1. Class C1, C2 and C3 tyres

The minimum snow index value, as calculated in the procedure described in Annex 7 and compared with the SRTT shall be as follows:

Class of tyre	Snow grip index (brake on snow method) <sup>(a)</sup>		Snow grip index (spin traction method) <sup>(b)</sup>	Snow grip index (acceleration method) <sup>(c)</sup>
	Ref. = C1 – SRTT 14	Ref. = C2 – SRTT 16C	Ref. = C1 – SRTT 14	Ref. = C3N – SRTT 19.5 Ref. = C3W – SRTT 22.5
C1	1.07	No	1.10	No
C2	No	1.02	1.10	No
C3	No	No	No	1.25

<sup>(a)</sup> See paragraph 3. of Annex 7 to this Regulation

<sup>(b)</sup> See paragraph 2. of Annex 7 to this Regulation

<sup>(c)</sup> See paragraph 4. of Annex 7 to this Regulation"

Annex 1,


Paragraph 3., amend to read (including ):

- "3. "Tyre class" and "category of use" of the type of tyre: .....
- 3.1. Snow tyre for use in severe snow conditions (Yes/No)<sup>2</sup>
- 3.2. Traction tyre (Yes/No)<sup>2</sup> "


Add paragraph 6.4., to read:

"6.4. Snow grip level of the representative tyre size, see paragraph 2.5. of Regulation No. 117, as per item 7. of the test report in the appendix to Annex 7:..... (Snow grip index) using the brake on snow method<sup>2</sup>, spin traction method<sup>2</sup> or acceleration method. <sup>2</sup>"

Annex 2, Appendix 2, example 1, correct to read:

..  **0212345 S2 0236378** ..

Annex 2, Appendix 2, example 3, correct to read:

..  **0212345 S2 0236378** ..

Annex 2, Appendix 2, example 4, correct to read:

„  $\overline{a/3}$  0212345 S2 0236378 „

Annex 2, Appendix 3, example 1, correct to read:

„  $\overline{a/3}$  0236378 + 0251 „

Annex 4, delete duplicated paragraphs 3.2. to 3.2.1.2.

Annex 6,

Paragraph 3.5., amend to read:

"3.5. Duration and speed.

When the deceleration method is selected, the following requirements apply:

- (a) The deceleration  $j$  shall be determined in differential  $d\omega/dt$  or discrete  $\Delta\omega/\Delta t$  form, where  $\omega$  is angular velocity,  $t$  – time;

If the differential form  $d\omega/dt$  is used, then the recommendations of Appendix 5 to this annex are to be applied.

- (b) ..."

Paragraph 5.1.5., amend to read:

"5.1.5.  $R_r$  is the tyre rolling radius, in metre,"

Appendix 1, paragraph 7., delete the reference to the footnote <sup>1</sup> and footnote <sup>1</sup>.

Insert a new Appendix 5, to read:

## "Annex 6 – Appendix 5

Deceleration method: Measurements and data processing for deceleration value obtaining in differential form  $d\omega/dt$ .

- Record dependency "distance-time" of rotating body decelerated from peripheral with a speed range such as 82 to 78 km/h or 62 to 58 km/h dependent on tyre class (Annex 6, paragraph 3.2., table 1) in a discrete form (figure 1) for a rotating body:

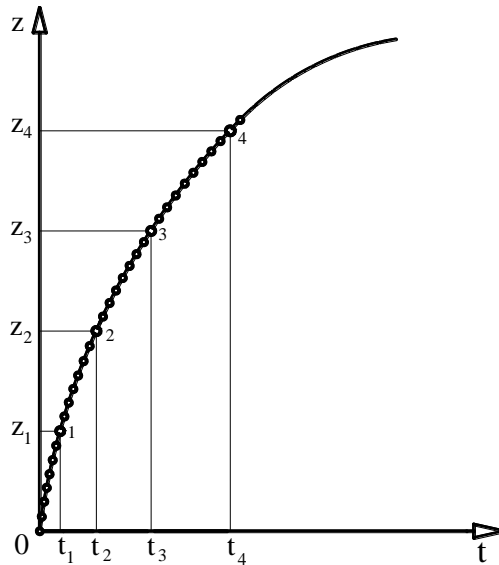
$$z=f(t_z)$$

where:

$z$  is a number of body revolutions during deceleration;

$t_z$  is end time of revolution number  $z$  in seconds recorded with 6 digits after zero.

Figure 1



Note 1: The lower speed of the recording range may be reduced down to 60 km/h when test speed is 80 km/h and 40 km/h when the test speed is 60 km/h.

2. Approximate recorded dependency by continuous, monotonic, differentiable function:
  - 2.1. Choose the value nearest to the maximum of z dividable by 4 and divide it into 4 equal parts with bounds: 0,  $z_1(t_1)$ ,  $z_2(t_2)$ ,  $z_3(t_3)$ ,  $z_4(t_4)$ .
  - 2.2. Work out the system for 4 equations each of the form:

$$z_m = A \ln \frac{\cos B(T_\Sigma - t_m)}{\cos B T_\Sigma}$$

where unknowns:

- A is a dimensionless constant,
- B is a constant in revolutions per second,
- $T_\Sigma$  is a constant in seconds,
- m is the number of bounds shown in figure 1.

Insert in these 4 equations the coordinates of 4-th bound above.

- 2.3. Take constants A, B and  $T_\Sigma$  as the solution of the equation system of paragraph 2.2. above using iteration process and approximate measured data by formulae:

$$z(t) = A \ln \frac{\cos B(T_\Sigma - t)}{\cos B T_\Sigma}$$

where:

- $z(t)$  is the current continuous angular distance in number of revolutions (not only integer values);
- t is time in seconds.

Note 2: Other approximating functions  $z = f(t_z)$  may be used if their adequacy is proven.

3. Calculate the deceleration  $j$  in revolutions per second squared ( $s^{-2}$ ) by the formula:

$$j = AB^2 + \frac{\omega^2}{A}$$

where:

$\omega$  is the angular speed in revolutions per second ( $s^{-1}$ ).

For the case  $U_n = 80$  km/h;  $\omega = 22.222/R_r$  (or  $R$ ).

For the case  $U_n = 60$  km/h;  $\omega = 16.666/R_r$  (or  $R$ ).

4. Estimate the quality of approximation of measured data and its accuracy by parameters:
- 4.1. Standard deviation in percentages:

$$\sigma = \sqrt{\frac{1}{n-1} \sum_1^n \left[ 1 - \frac{z(t)}{z} \right]^2} \times 100\%$$

- 4.2. Coefficient of determination

$$R^2 = 1 - \frac{\sum_1^n [z - z(t)]^2}{\sum_1^n [z - \bar{z}]^2}$$

where:

$$\bar{z} = \frac{1}{n} \sum_{z=1}^n z = \frac{1}{n} (1 + 2 + \dots + n) = \frac{1+n}{2}$$

Note 3: The above calculations for this variant of the deceleration method for tyre rolling resistance measurement can be executed by the computer program "Deceleration Calculator" downloadable from the WP.29 website<sup>1</sup> as well as any software which allows the calculation of nonlinear regression.

Annex 7, paragraph 3.1.4., amend to read:

- "3.1.4. Load and pressure
- 3.1.4.1. For C1 tyres, the vehicle load ...
- ..."

<sup>1</sup> To be indicated at a later stage.