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Item 6 (c) of the provisional agenda
Tyres: UN Regulation No. 117 (Tyre Rolling Resistance, Rolling Noise and Wet Grip)

Proposal for new Supplement 3 to the 04 series of amendments to UN Regulation No. 117

Submitted by the Informal Working Group on Wet Grip Performance for Tyres in a Worn State*

The text reproduced below was prepared by the Informal Working Group on Wet Grip Performance for Tyres in a Worn State (IWG WGWT). The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* 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.

I. Proposal

Paragraph 6.2.1., amend to read:

"6.2.1. For class C1 tyres, tested in accordance with either procedure given in Annex 5, Part (A), to this Regulation, the tyre shall meet the following requirements:

Stage 1		
Category of use		*Wet grip index (G)*
Normal tyre		≥ 1.1
Snow tyre		≥ 1.1
	Snow tyre that is classified as tyre for use in severe snow conditions and with a speed category greater than 160 km/h	≥ 1.0
	Snow tyre that is classified as tyre for use in severe snow conditions and with a speed category ~~not greater than~~ **less than or equal to**160 km/h	≥ 0.9
Special use tyre		Not defined
	Special use tyre that is classified as tyre for use in severe snow conditions	Not defined

Stage 2			
Category of use			*Wet grip index (G)*
Normal tyre			≥ 1.2
Snow tyre			≥ 1.2
	Snow tyre that is classified as tyre for use in severe snow conditions	Speed category greater than 160 km/h	≥ 1.1
		Speed category ~~not greater than~~ **less than or equal to**160 km/h	≥ 1.0
		Ice grip tyres	≥ 1.0
Special use tyre			≥ 1.1
	Special use tyre that is classified as tyre for use in severe snow conditions		≥ 1.0

"

Add new paragraphs 12.27. and 12.28. to read:

"**12.27. Until 6 July 2026, Contracting Parties applying this Regulation may continue to grant type approvals of class C1 tyres according to the 04 series of amendments to this Regulation, based on the test procedures for measuring the wet adhesion of tyres in worn state as described in Annex 9 to this Regulation using wetted frictional properties of the surface specified in Supplement 2 to the 04 series of amendments to this Regulation.**

12.28. Notwithstanding paragraph 12.27., Contracting Parties applying this Regulation shall continue to grant extensions to existing type approvals of class C1 tyres according to the 04 series of amendments to this Regulation first granted before 7 July 2026, based on the test procedures for measuring the wet adhesion of tyres in worn state as described in Annex 9 to this Regulation using wetted frictional properties of the surface

specified in Supplement 2 to the 04 series of amendments to this Regulation unless a new test has to be performed on a different representative tyre."

Annex 3,

Paragraph 1.1., amend to read:

"1.1. Acoustic measurements

The sound level meter or the equivalent measuring system, including the windscreen recommended by the manufacturer shall meet or exceed the requirements of Type 1 instruments in accordance with IEC 61672-1:2013.

The measurements shall be made using the frequency weighting A, and the time weighting F.

When using a system that includes a periodic monitoring of the A-weighted sound level, a reading should be made at a time interval ~~not greater than~~ **less than or equal to** 30 ms."

Annex 5, part (A), Class C1 tyres,

Paragraphs 3.2.1. and 3.2.2., amend to read:

"3.2.1. Using the procedure described in paragraph 4.1. of this Annex, perform two braking tests of the reference tyre, each consisting of at least six (6) valid test runs in the same direction on aligned segments of the track. The braking tests shall cover the entire potential braking area, including where the texture depth was measured.

Evaluate the braking tests as described in paragraphs 4.1.6.1. and 4.1.6.2. of this Annex. If the coefficient of variation of one braking test CV_{BFC} ~~exceeds~~ **is greater than** 4 per cent, dismiss the results and repeat the braking tests.

For each braking test, the arithmetic mean $\overline{BFC_{\text{ave}}}$ of the average braking force coefficients shall be corrected for effects of temperature as follows:

$$BFC_{\text{ave,corr}} = \overline{BFC_{\text{ave}}} + a \cdot (\vartheta - \vartheta_0)$$

where

ϑ is the wetted surface temperature in degrees Celsius,

$a = 0.002\ ^{\circ}\text{C}^{-1}$ and $\vartheta_0 = 20\ ^{\circ}\text{C}$.

For each braking test, the temperature-corrected average braking force coefficient ($BFC_{\text{ave,corr}}$) shall be **greater than or equal to** ~~not less than~~ 0.57 and ~~not greater than~~ **less than or equal to** 0.79.

The arithmetic means of the temperature-corrected average braking force coefficients of the two braking tests shall not differ by more than 10 per cent of the average of the two values:

$$CVal\left(BFC_{\text{ave,corr}}\right) = 2 \cdot \left|\frac{BFC_{\text{ave,corr,1}} - BFC_{\text{ave,corr,2}}}{BFC_{\text{ave,corr,1}} + BFC_{\text{ave,corr,2}}}\right| \leq 10\ \%$$"

3.2.2. Using the procedure described in paragraph 4.2. of this Annex, perform in the same area where the average macro texture depth was measured one braking test of the reference tyre, consisting of at least six (6) test runs in the same direction.

Evaluate the braking test as described in paragraphs 4.2.8.1. and 4.2.8.2. of this Annex. If the coefficient of variation CV_{μ} ~~exceeds~~ **is greater than** 4 per cent, dismiss the results and repeat the braking test.

The arithmetic mean ($\overline{\mu_{\text{peak}}}$) of the measured peak braking force coefficients shall be corrected for effects of temperature as follows:

$$\mu_{\text{peak,corr}} = \overline{\mu_{\text{peak}}} + a \cdot (\vartheta - \vartheta_0)$$

Where

ϑ is the wetted road surface temperature in degrees Celsius

$a = 0.002\ ℃^{-1}$ and $\vartheta_0 = 20\ ℃$.

The temperature corrected average peak braking force coefficient ($\mu_{peak,corr}$) shall be ~~not less than~~ **greater than or equal to** 0.65 and ~~not greater than~~ **less than or equal to** 0.90."

Paragraph 3.3., amend to read:

"**3.3.** ~~The wind conditions shall not interfere with wetting of the surface (windshields are allowed).~~ **The wetting of the surface shall be performed without wind interference (the use of windscreens is [permitted/recommended]).** "

Paragraph 4.1.6.2.(c), amend to read:

"4.1.6.2. ...

(c) The temperature-corrected average braking force coefficients ($BFC_{ave,corr}$, see paragraph 3.2.1. of this Annex) as calculated from the initial and from the final braking tests of the reference tyre within a test cycle shall be ~~not less than~~ **greater than or equal to** 0.57 and ~~not greater than~~ **less than or equal to** 0.79.

If one or more of the above conditions is not met, the complete test cycle shall be performed again.

For the candidate tyres (T):

The coefficient of variation CV_{BFC} is calculated for each candidate tyre set. If one coefficient of variation is ~~higher~~ **greater** than 4 per cent, the data shall be discarded and the braking test repeated for that candidate tyre set. "

Paragraph 4.2.8.2.(c), amend to read:

"4.2.8.2. ...

(c) The temperature-corrected average peak braking force coefficients ($\mu_{peak,corr}$, see paragraph 3.2.2. of this Annex) as calculated from the initial and from the final braking test of the reference tyre within a test cycle shall be ~~not less than~~ **greater than or equal to** 0.65 and ~~not greater than~~ **less than or equal to** 0.90.

If one or more of the above conditions is not met, the complete test cycle shall be performed again.

For the candidate tyre(s) (T_n):

The coefficient of variation of the peak braking force coefficient CV_μ is calculated for each candidate tyre. If one coefficient of variation is greater than 4 per cent, the data shall be discarded and the braking test repeated for this candidate tyre. "

Annex 5, part (B), Classes C2 and C3 tyres,

Paragraph 1.1.1., amend to read:

1.1.1. "Standard Reference Test Tyre method

This method uses the SRTT16.

Using the procedure described in paragraph 4.2. of part (A) of this Annex, perform in the same area where the average macro texture depth was measured one braking test of the reference tyre, consisting of at least six (6) valid test runs in the same direction.

Evaluate the braking test as described in paragraphs 4.2.8.1. and 4.2.8.2. of part (A) of this Annex. If the coefficient of variation CV_μ ~~exceeds~~ **is greater than** 4 per cent, dismiss the results and repeat the braking test.

The arithmetic mean ($\overline{\mu_{\text{peak}}}$) of the measured peak braking force coefficients shall be corrected for the effects of temperature as follows:

$$\mu_{\text{peak,corr}} = \overline{\mu_{\text{peak}}} + a \cdot (\vartheta - \vartheta_0)$$

where

ϑ is the wetted track surface temperature in degrees Celsius,

$a = 0.002\ ℃^{-1}$ and $\vartheta_0 = 20\ ℃$.

The temperature corrected average peak braking force coefficient ($\mu_{\text{peak,corr}}$) shall be ~~not less than~~ **greater than or equal to** 0.65 and ~~not greater than~~ **less than or equal to** 0.90.

The test shall be conducted using the lanes and length of the track to be used for the wet adhesion measurement.

For the trailer method, testing is run in such a way that braking occurs within 10 metres distance of where the surface was characterized. "

Paragraph 1.3., amend to read:

"**1.3.** ~~The wind conditions shall not interfere with wetting of the surface (windshields are permitted).~~ **The wetting of the surface shall be performed without wind interference (the use of windscreens is [permitted/recommended]).** "

Annex 6,

Paragraph 2.4.1., amend to read:

"2.4.1. Reference conditions

The reference ambient temperature, measured at a distance ~~not less than~~ **greater than or equal to** 0.15 m and **less than or equal to** ~~not more than~~ 1 m from the tyre sidewall, shall be 25 °C. "

Paragraph 6.2., amend to read:

"6.2. Temperature correction

If measurements at temperatures other than 25 °C are unavoidable (only temperatures ~~not less than~~ **greater than or equal to** 20 °C ~~or more than~~ **and less than or equal to** 30 °C are acceptable), then a correction for temperature shall be made using the following equation, with:

F_{r25} is the rolling resistance at 25 °C, in newtons:

$$F_{r25} = F_r\left[1 + K\left(t_{amb} - 25\right)\right]$$

Where:

F_r is the rolling resistance, in newtons,

t_{amb} is the ambient temperature, in degrees Celsius,

K is equal to:
0.008 for class C1 tyres
0.010 for classes C2 and C3 tyres with a load index equal or lower than 121
0.006 for class C3 tyres with a load index greater than 121"

“

Annex 8,

Paragraph 2.1.1.3., amend to read:

"2.1.1.3. The surface grip level shall be controlled by measurements with the reference tyre. The average mean fully developed deceleration of the reference tyre shall

be ~~not less than~~ **greater than or equal to** 0.9 m/s² and ~~not greater than~~ **less than or equal to** 1.6 m/s² in each braking test."

Annex 9,

Add a new paragraph 2.3.1.6. to read:

"**2.3.1.6. Water depth measurement for external watering**

It is recommended to measure the water depth according to the following procedure.

The test track should be watered at least 30 minutes prior to measuring the water depth in order to equalize the surface temperature and water temperature.

The measurement shall be performed without wind interference (the use of windscreens is [permitted/recommended]).

The device shall be capable to measure a water depth range that is larger than the regulatory defined range of 0.5 mm - 1.5 mm.

Three measurements shall be recorded for each measuring point throughout the whole testing area and the average for each measuring point shall be in the range of 0.5 mm - 1.5 mm.

If a contact device (e.g., static pin or dynamic pin) is used, the device shall be dried before each measurement.

If an optical device is used, the measurement shall be performed from the peaks of the pavement.

If an ultrasonic device is used, it shall compensate for air temperature fluctuation."

Paragraph 2.3.2.1., amend to read:

"2.3.2.1. …

where

ϑ is the wetted surface temperature in degrees Celsius,

$a = 0.002\ ℃^{-1}$ and $\vartheta_0 = 20\ ℃$.

- For each braking test, the temperature-corrected average Braking Force Coefficient ($BFC_{ave,corr}$) shall be ~~not less than 0.4~~ **greater than or equal to 0.42** and ~~not greater than 0.65~~ **less than or equal to 0.64**.

…"

Paragraph 2.3.2.2., amend to read:

"2.3.2.2. …

Where

ϑ is the wetted road surface temperature in degrees Celsius

$a = 0.002\ ℃^{-1}$ and $\vartheta_0 = 20\ ℃$.

The temperature corrected average peak braking force coefficient ($\mu_{peak,corr}$) shall be ~~not less than 0.45~~ **greater than or equal to 0.50** and ~~not greater than 0.80~~ **less than or equal to 0.75**."

Paragraph 2.3.3., amend to read:

"**2.3.3.** ~~The wind conditions shall not interfere with wetting of the surface (wind shields are allowed).~~ **The wetting of the surface shall be performed without wind interference (the use of windscreens is [permitted/recommended]).** "

Paragraph 2.4.1.1.2., amend to read:

"2.4.1.1.2. Validation of results

…

(c) The temperature-corrected average braking force coefficients ($BFC_{ave,corr}$, see paragraph 2.3.2.1. of this Annex) as calculated from the initial and from the final braking tests of the reference tyre within a test cycle shall be ~~not less than 0.4~~ **greater than or equal to 0.42** and ~~not greater than 0.65~~ **less than or equal to 0.64**.

…"

Paragraph 2.4.2.1.2., amend to read:

"2.4.2.1.2. Validation of results

…

(c) The temperature-corrected average peak braking force coefficients ($\mu_{peak,corr}$, see paragraph 2.3.2.2. of this Annex) as calculated from the initial and from the final braking test of the reference tyre within a test cycle shall be ~~not less than 0.45~~ **greater than or equal to 0.50** and ~~not greater than 0.80~~ **less than or equal to 0.75**.

…"

II. Justification

1. IWG WGWT agreed to have a two-step approach to improve the test method precision (GRBP-78-15 – the Terms of Reference of IWG WGWT) and GRBP-79-46 (IWG WGWT status report February 2024)): a first step to standardize the water depth measurement and a second step to fine-tune the calculation formula. This working document relates to the first step.

2. IWG WGWT observed in its 2023 workplan (step 1), dedicated to the study of the water depth, that it was opportune to propose recommendations on the water depth measurements in Annex 9.

3. IWG WGWT detected in the course of the 2023 workplan, based on tests performed in fourteen different test centers, that it is possible to reduce the track friction range requirements. This reduced track friction range will have a positive impact on the test dispersion. All details can be found in GRBP-79-46 (IWG WGWT status report to the seventy-ninth session of GRBP) and in an IWG WGWT informal document WT-54-21 (slide 16).

4. IWG WGWT agreed to align the wording of

(a) Annex 5, part (A) Class C1 tyres, paragraph 3.3.

(b) Annex 5, part (B), Classes C2 and C3 tyres, paragraph 1.3., and

(c) Annex 9, paragraph 2.3.3.

with that of Annex 9, new paragraph 2.3.1.6.

5. IWG WGWT agreed to align the wording of

(a) paragraph 6.2.1.

(b) Annex 3, paragraph 1.1.

(c) Annex 5, part (A), paragraphs 3.2.1., 3.2.2., 4.1.6.2. (c), 4.2.8.2. (c)

(d) Annex 5, part (B), paragraphs 1.1.1. and 2.4.1.

(e) Annex 6, paragraph 6.2., and

(f) Annex 8, paragraph 2.1.1.3.

with that of the new Annex 9.