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Item 7(d) of the provisional agenda

Tyres – Regulation No. 117 (Tyres - Rolling resistance, rolling noise and wet grip)

Proposal for Supplement 04 to the 02 series of amendments to Regulation No. 117

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

The text reproduced below was prepared by the expert from the European Tyre and Rim Technical Organisation (ETRTO) amending the snow test method for C3 tyres. The modifications to the existing 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 2010–2014 (ECE/TRANS/208, para. 106 and ECE/TRANS/2010/8, 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.

I. Proposal

Annex 7, paragraph 4.7.2.1., amend to read:

- "4.7.2.1. The test shall be conducted with a 2 axles standard model commercial vehicle in good running conditions equipped with:
- (a) Low rear axle weight and enough powerful engine to ensure the average percentage of slip during the test as required in **paragraphs 4.7.5.1. and 4.7.5.2.1.** below;
 - (b) A manual gearbox (automatic gearbox with manual shift allowed) having a gear ratio covering **the speed range of at least a 19 km/h range** between 4 **km/h** and 30 km/h;
 - (c) Blocking differential on driven axle is recommended as increasing repeatability;
 - (d) A standard commercial system controlling/limiting the slip of the driving axle when accelerating (called Traction Control, ASR, TCS, etc.)."

Annex 7, paragraph 4.7.2.1.1., amend to read:

- "4.7.2.1.1. In the particular case where it is not possible to find a standard commercial vehicle equipped with a traction control system, a vehicle without Traction Control/ASR/TCS is allowed with a mandatory display of the percentage slip as stated in **paragraph 4.3.4.** and a **recommended mandatory** blocking differential on the driven axle to put in practice the operating procedure 4.7.5.2.1. **If the blocking differential is not used, the average slip ratio should be measured on the left and right driven wheel.**"

Annex 7, paragraph 4.7.4.2., amend to read:

- "4.7.4.2. The driven tyres inflation pressure shall be 70 per cent of the one written on the sidewall.

The steer tyres are inflated at nominal sidewall pressure.

If the pressure is not marked on the sidewall, refer to the specified pressure in applicable tyre standards manuals corresponding to maximum load capacity."

Annex 7, paragraph 4.7.5.1., amend to read:

- "4.7.5.1. Mount first the set of reference tyres on the vehicle and when on the testing area.

Drive the vehicle at ~~a an initial~~ constant speed between 4 km/h and 11 km/h and the gear ratio capable of covering the speed range of **at least 19 km/h for the complete test programme (e.g. R-T1-T2-T3-R).**

Recommended Gear ratio selected ~~in is~~ 3rd or 4th ~~should shall~~ give a minimum **10** ~~13~~ per cent average slip ratio in the measured range of speed."

Annex 7, paragraph 4.7.5.2.1., amend to read:

- "4.7.5.2.1. In the particular case 4.7.2.1.1 where it is not possible to find a standard commercial vehicle having the Traction Control system, the driver maintains manually the averaged slip ratio range **for each test run from 10 per cent to**

40 per cent of 20 per cent ~~± 10 per cent~~ (Controlled Slip procedure in place of the Full Slip) in the same range of speeds. **If the blocking differential is not used, the averaged slip ratio difference between the left and right driven wheel shall not be higher than 8 per cent for each run.** All the tyres and runs in the test session are performed with Controlled Slip procedure."

Annex 7, paragraph 4.7.5.3., amend to read:

"4.7.5.3. Measure the distance ~~and the time~~ between the initial speed and the final speed."

Annex 7, paragraph 4.7.5.4., amend to read:

"4.7.5.4. For every candidate tyre and the standard reference tyre, the acceleration test runs shall be repeated a minimum of 6 times and the coefficients of variation (standard deviation/average*100) calculated for minimum 6 valid runs on the distance ~~and the time~~ should be lower than or equal to 6 per cent."

Annex 7, paragraph 4.7.5.5., amend to read:

"4.7.5.5. In case of Traction Control System equipped vehicle, the Average Slip ratio shall be in the range from **10** ~~13~~ per cent to 40 per cent (calculated as per 4.3.4.)"

Annex 7, paragraph 4.8.6., amend to read:

"4.8.6. Calculation of the Slip Ratio

The slip ratio can be calculated as the average of Slip ratio as mentioned in paragraph 4.3.4. or by comparing the average distance referred to in paragraph 4.7.5.3. of the minimum 6 runs to the distance of a run done without slip (very low acceleration)

$$\text{Slip Ratio \%} = \left[\frac{\text{Average distance} - \text{No slip distance}}{\text{No slip distance}} \right] \times 100$$

No slip distance means the wheel distance calculated on a run done with a constant speed or a continuous low acceleration."

Annex 7 - Appendix 3, paragraph 5., amend to read:

"5. Test results: average accelerations (m/s²)

Run number	Specification	SRTT (1st test)	Candidate 1	Candidate 2	Candidate 3	SRTT (2nd test)
1						
2						
3						
4						
5						
6						
Mean						
Std-deviation						
Slip ratio (per cent)						
CV (per cent)	≤ 6 per cent					
Validation SRTT	(SRTT) ≤ 6 per cent					
SRTT average						
Snow index		1.00 ± 0.00				

II. Justification

1. Annex 7, paragraphs 4.7.2.1. and 4.7.5.1.: The speed range comes from the following calculation.

$$\Delta S = S0 + St + S1, \text{ where}$$

ΔS = Total speed range of the testing run

S0 = Pre-acceleration speed range before Initial speed (minimum 2 km/h)

St = Measuring speed range (Final speed – Initial speed = 15 km/h)

S1 = Additional speed range after Final speed (Minimum 2 km/h)

Therefore 19 km/h is the minimum speed range.

The speed range of 19 km/h including the additional acceleration is the minimum requirement (= 2 + 15 + 2) between 4 km/h and 30 km/h. For the quality of the measurement accuracy, it is preferable to choose the wider speed range and not only the minimum.

2. Annex 7, paragraph 4.7.2.1.1.: It is proposed to replace the word "mandatory" by "recommended" as described in paragraph 4.7.2.1.(c), because the controlled slip procedure is keeping the averaged slip ratio in certain range and, therefore, guarantees the measurement accuracy.
 3. Annex 7, paragraph 4.7.4.2.: It should be described how to refer to the nominal pressure for the tyres when not marked on the sidewall.
 4. Annex 7, paragraph 4.7.5.1.: Initial speed means the measuring start speed, so the wording "initial" in this sentence should be deleted. The minimum slip ratio should be coherent with the slip range specified in paragraphs 4.7.5.2.1. and 4.7.5.5.
 5. Annex 7, paragraphs 4.7.5.2.1. and 4.7.5.5.: The slip range for the two test methods (with and without traction control system) should be coherent and the maximum slip ratio of 40 per cent and the minimum slip ratio of 10 per cent guarantee the good repeatability. To insure the vehicle stability behaviour, it is recommended to specify the slip ratio difference between left and right driven wheel.
 6. Annex 7, paragraphs 4.7.5.3. and 4.7.5.4.: The time is not used for the calculation of Average Acceleration AA.
 7. Annex 7, paragraph 4.8.6.: ETRTO proposes to clarify the meaning of "no slip distance" for the calculation of slip ratio to avoid the misinterpretation of the test method.
 8. Annex 7 - Appendix 3, paragraph 5: Editorial correction.
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