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Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on Noise and Tyres

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Item 2 of the provisional agenda

UN Regulation No. 51 (Noise of M and N categories of vehicles)**Proposal for Supplement 8 to the 03 series of amendments to
UN Regulation No. 51****Submitted by the Informal Working Group on Measurement
Uncertainties***

The text below has been prepared by the experts of the Informal Working Group on Measurement Uncertainties (IWG MU) in order to introduce measures to reduce variability. The modifications to the existing text of the UN 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 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

Annex 3,

Paragraph 3.1.2.1.1., amend to read:

"3.1.2.1.1. Power to mass ratio index (PMR)

PMR is defined as follows:

$PMR = (P_n / m_{ro}) * 1000 \text{ kg/kW}$, where P_n is measured in kW **and defined according to paragraph 2.8. of the main body** and m_{ro} is measured in kg and defined according to paragraph 2.4. of the main body.

~~If two or more sources of propulsive power operate at the conditions of test specified in paragraph 3.1.2.1 of Annex 3 to this Regulation, the total engine net power, P_n , shall be the arithmetic sum of parallel propulsive engines on the vehicle.~~

~~Applicable parallel propulsive engines are those power sources which provide forward motion to the vehicle in combination at the conditions of test specified in paragraph 3.1.2.1. of Annex 3 to this Regulation. Specified power for non-combustion engines shall be the power stated by the manufacturer.~~

The PMR with no dimension is used for the calculation of acceleration."

Paragraph 3.1.3.4.1.2., amend to read:

"3.1.3.4.1.2. [...]

The final result is calculated by combining $L_{wot\ rep}$ and $L_{crs\ rep}$. The equation is:

$$L_{urban} = L_{wot\ rep} - k_P * (L_{wot\ rep} - L_{crs\ rep})$$

The weighting factor k_P gives the part power factor for urban driving. In cases other than a single gear test, k_P is calculated by:

$$k_P = 1 - (a_{urban} / a_{wot\ ref})$$

If only one gear was specified for the test, k_P is given by:

$$k_P = 1 - (a_{urban} / a_{wot\ test})$$

In cases where $a_{wot\ test}$ is less than a_{urban} :

$$k_P = 0$$

In cases where the PMR of the vehicle is lower than 25 the final result L_{urban} is the result of the acceleration test:

$$L_{urban} = L_{wot\ rep}$$

In cases where $L_{wot,rep}$ is less than $L_{crs,rep}$:

$$k_P=1$$

In the cases where $L_{wot,rep}$ is less than $L_{crs,rep}$ the final result L_{urban} is the result of the cruise test:

$$L_{urban} = L_{crs,rep}$$

Appendix 2, paragraph 3.3.4., amend to read:

"3.3.4 2.3.4. For each gear, run and vehicle side extract the power train component $L_{PT,wot,j}$ from the reported acceleration test $L_{wot,j}$ by calculation.

$$L_{PT,wot,j} = 10 \times \lg(10^{0,1 \times L_{wot,j}} - 10^{0,1 \times L_{TR,wot,j, \theta_{wot}}})$$

In case that $L_{TR,wot,j, \theta_{wot}}$ is greater than $L_{wot,j}$:

- (a) the power train component $L_{PT,wot,j}$ is determined by

$$L_{PT,wot,j} = 10 \times \lg(0,01 \times 10^{0,1 \times L_{wot,j}})$$

- (b) the tyre component $L_{TR,wot,j,\theta_{ref}}$ is determined by

$$L_{TR,wot,j,\theta_{ref}} = L_{TR,\theta_{ref},v_{TR,ref}} "$$

II. Justification

General

1. The temperature correction in Supplement 7 is based on the sound behavior of internal combustion engine (ICE) vehicles. Due to their powertrain noise, the sound emission in accelerating condition is always higher than in cruising condition.

2. For battery electric vehicles (BEVs) the dominant source is the tyre road noise. For this reason, the sound emission in cruising may be higher than during acceleration. In this case the current temperature correction will be inaccurate and cause an additional burden to the BEVs.

3. Since the standard ISO 362, which describes the basic measuring method of this Regulation, is based on the experience of ICE vehicles, now it must reflect the transformation to BEVs, including this specific case in its future work. The result of this work will probably lead to a new series of amendments to this Regulation.

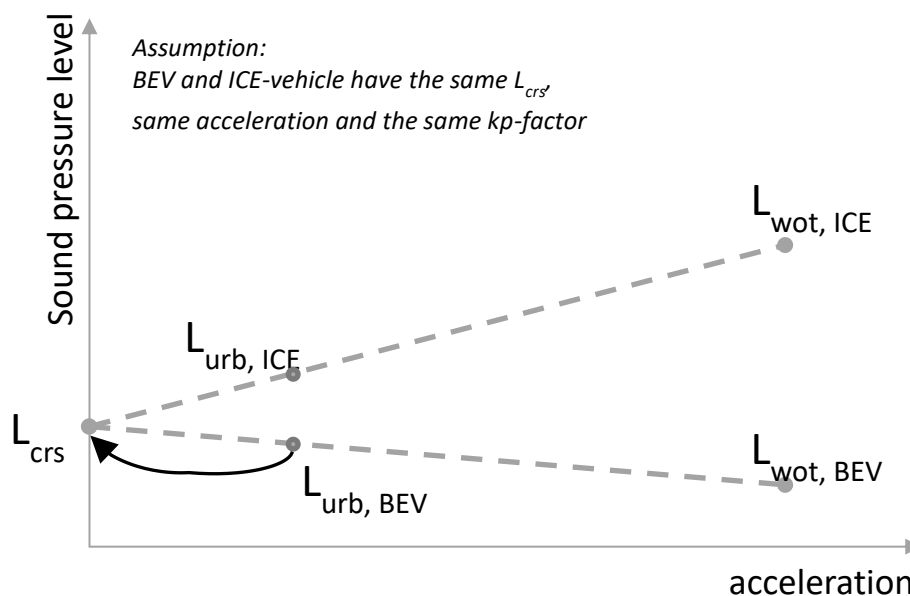
4. In the meantime, the proposed Supplement 8 will reduce this additional burden to BEVs regarding the introduction of stage 3 limits, which will enter into force on 1 July 2024.

Annex 3, paragraph 3.1.2.1.1.

5. With Supplement 7, the definition of "Maximum net power, P_n " in paragraph 2.8. has been adjusted for better clarity. It is therefore proposed to amend the text in the definition of power to mass ratio index (PMR), in order to align it with the adjustment in Supplement 7.

Annex 3, paragraph 3.1.3.4.1.2.

6. To avoid confusion due to a reported value of L_{urban} , which may be smaller than L_{crs} in this special case, L_{urban} is set to L_{crs} , as shown in the diagram below.



Annex 3, Appendix 2, paragraph 3.3.4

7. Since the main burden is caused by an improper speed correction of the tyre rolling sound $L_{TR,wot,j,\theta_{ref}}$, the speed correction according to Annex 3, Appendix 2, paragraph 3.3.1. is not applied in this special case.
