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Working Party on Noise and Tyres

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UN Regulation No. 41 (Noise Emissions of Motorcycles)

Proposal for a new 06 series of amendments to UN Regulation No. 41

Submitted by the experts from the Informal Working Group on Real Driving - Additional Sound Emission Provisions*

The text reproduced below was prepared by the experts from the Informal Working Group on Real Driving - Additional Sound Emission Provisions (IWG RD-ASEP) in order to strengthen the RD-ASEP testing conditions of motorcycles. It is based upon the 05 series of amendments to UN Regulation No. 41 up to Supplement 3. The modifications to 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 2025 as outlined in proposed programme budget for 2025 (A/79/6 (Sect. 20), table 20.6), 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 2.13., amend to read*:*

"2.13. Following is a table containing all symbols used in this Regulation:

Symbol	***Units***	***Explanation***	***Reference***
AA'	–	virtual line on the test track	Annex 4 – Figure 1
a_{wot}	m/s^2	calculated acceleration	Annex 3 – 1.4.2.
$a_{wot,ref}$	m/s^2	prescribed reference acceleration	Annex 3 – 1.3.3.3.1.2.
a_{urban}	m/s^2	prescribed target acceleration	Annex 3 – 1.3.3.3.1.2.
BB'	–	virtual line on the test track	Annex 4 – Figure 1
CC'	–	virtual line on the test track	Annex 4 – Figure 1
K	–	gear weighting factor	Annex 3 – 1.4.3.
k_p	–	partial power factor	Annex 3 – 1.4.4.
L	dB(A)	sound pressure level	Annex 3 – 1.4.1.
$L_{wot(i)}$	dB(A)	L at wot condition	Annex 3 – 1.4.6.
L_{ASEP}	dB(A)	L at RD-ASEP additional operating conditions	Annex 7 – 3.3.3.2.
l_{PA}	m	pre-acceleration length	Annex 3 – 1.3.3.1.1.
m_{kerb}	kg	kerb mass of the vehicle	2.6.
m_t	kg	test mass of the vehicle	Annex 3 – 1.3.2.2.
n	min^{-1}	engine speed	
$n_{AA',min}$	**min^{-1}**	**Minimum engine speed of the RD-ASEP control range at line AA'**	**Annex 7 – 2.5**
$n_{BB',max}$	**min^{-1}**	**Maximum engine speed of RD-ASEP control range at line BB'**	**Annex 7 – 2.5**
$n_{PP'}$	min^{-1}	engine speed at PP'	Annex 7 – 2.6.
n_{idle}	min^{-1}	engine speed at idle	–
$n_{wot(i)}$	min^{-1}	$n_{PP'}$ measured at $L_{wot(i)}$ detection	Annex 7 – 2.6.
n_{adj}	**min^{-1}**	**adjustment factor for low PMR vehicles with high S**	**Annex 7 – 2.6.**
PP'	–	virtual line on the test track	Annex 4 – Figure 1
PMR	–	power-to-mass ratio index	2.9.
P_n	kW	rated maximum net power	2.7.
S	min^{-1}	rated engine speed	2.8.
V	km/h	measured vehicle speed	–
v_{max}	km/h	maximum speed	2.10.
v_{test}	km/h	prescribed test speed	Annex 3 – 1.3.3.1.1.

The following indices are used for measured engine speeds "n" and vehicle speeds "v" to indicate the location or rather time of the measurement:

(a) AA' denoting that the measurement corresponds to the point in time when the front of the vehicle passes the line AA' (see Annex 4 – Figure 1); or

(b) PP' denoting that the measurement corresponds to the point in time when the front of the vehicle passes the line PP' (see Annex 4 – Figure 1); or

(c) BB' denoting that the measurement corresponds to the point in time when the rear of the vehicle passes the line BB' (see Annex 4 – Figure 1).

The following indices are used for calculated full throttle accelerations a_{wot} and measured sound pressure levels L to indicate the gear used for the test:

(a) "(i)" denoting, in the case of a two-gear test, the lower gear (i.e. the gear with the higher gear transmission ratio) and otherwise referring to the single test gear or gear selector position used; or

(b) "(i + 1)" denoting, in the case of a two-gear test, the higher gear (i.e. the gear with the lower gear transmission ratio).

Measured sound pressure levels L also carry an index indicating the type of the respective test:

(a) "Wot" denoting a full throttle acceleration test (see paragraph 1.3.3.1.1. of Annex 3); or

(b) "CRS" denoting a constant speed test (see paragraph 1.3.3.3.2. of Annex 3); or

(c) "Urban" denoting a weighted combination of a constant speed test and a full throttle acceleration test (see paragraph 1.4.6.2. of Annex 3).

The index "j" referring to the number of the test run can be used in addition to the indices mentioned above."

Paragraph 12, amend to read:

"12.1. As from the official date of entry into force of the ~~05~~ **06** series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept type approvals under this Regulation as amended by the ~~05~~ **06** series of amendments.

12.2. As from ~~1 September 2024~~ **1 January 2029**, Contracting Parties applying this Regulation shall not be obliged to accept type approvals to the preceding series of amendments, first issued after ~~1 September 2024~~ **1 January 2029**.

12.3. Until ~~1 September 2025~~ **1 January 2030**, Contracting Parties applying this Regulation shall accept type approvals to the preceding series of amendments, first issued before ~~1 September 2024~~ **1 January 2029**.

12.4. As from ~~1 September 2025~~ **1 January 2030**, Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the preceding series of amendments to this Regulation.

12.5. Notwithstanding the transitional provisions above, Contracting Parties who start to apply this Regulation after the date of entry into force of the most recent series of amendments are not obliged to accept type approvals which were granted in accordance with any of the preceding series of amendments to this Regulation / are only obliged to accept type approval granted in accordance with the ~~05~~ **06** series of amendments.

12.6. Notwithstanding paragraph 12.4, Contracting Parties applying this Regulation shall continue to accept type approvals issued according to the preceding series of amendments to this Regulation, for the vehicles/vehicle systems which are not affected by the changes introduced by the ~~05~~ **06** series of amendments.

12.7. Contracting Parties applying this Regulation may grant type approvals according to any preceding series of amendments to this Regulation.

12.8. Contracting Parties applying this Regulation shall continue to grant extensions of existing approvals to any preceding series of amendments to this Regulation.

12.9. From ~~the entry into force of Supplement 3~~ [**10 January] 2025**, ISO 10844:2021 shall be accepted for all approvals granted under this Regulation. Until ~~five years from the entry into force of Supplement 3~~ [**10 January] 2030**, ISO 10844:2014 shall be accepted for all approvals granted under this Regulation."

Annex 7,

Paragraph 2.5., amend to read:

"2.5. RD-ASEP control range

The requirements of this annex apply to any vehicle operation with the following restrictions:

(a) $v_{AA'}$ shall be at least 10 km/h

(b) $v_{BB'}$ shall not exceed 80 km/h for vehicles with PMR≤150

$v_{BB'}$ shall not exceed 100 km/h for vehicles with PMR>150

(c) ~~n_{AA}~~**$n_{AA',min}$** shall be at least $0{,}1 * (S - n_{idle}) + n_{idle}$

(d) ~~n_{BB}~~**$n_{BB',max}$** shall not exceed $0{,}8 \times S$ **for vehicles tested in locked gears.**

For vehicles tested in non-locked gear ratios, $n_{BB',max}$ shall not exceed S.

The values for the RD-ASEP control range shall be seen as absolute values and shall not be increased or lowered by addition or subtraction of the tolerance for v_{test} as indicated in paragraph 3.3.1;"

Paragraph 2.6. amend to read:

"2.6. RD-ASEP limits

The maximum noise level recorded during the passage of the motorcycle through the test track shall not exceed:

for $n_{PP'} < n_{wot,(i)}$

$L_{wot,(i)} + (1 * (n_{PP'} - n_{wot,(i)}) /$ ~~$1{,}000$~~ **1000**$) + 3$ ~~for $n_{PP'} < n_{wot,(i)}$ and~~

~~$L_{wot,(i)} + (5 * (n_{PP'} - n_{wot,(i)}) / 1{,}000) + 3$~~ ~~for $n_{PP'} \geq n_{wot,(i)}$~~

and for $n_{PP'} \geq n_{wot,(i)}$

$$\textbf{min} \begin{cases} \mathbf{L_{wot,(i)} + (5 * (n_{PP'} - n_{wot,(i)}) / 1000) + 3} \\ \mathbf{L_{wot,(i)} + (4 + (n_{BB',max} - n_{AA',min}) / 1000) * \ln((n_{PP'} + n_{adj}) / n_{wot,(i)}) + 6} \end{cases}$$

$$\mathbf{n_{adj}: min} \begin{cases} \mathbf{e\text{^}((S - n_{idle}) / (n_{BB',max} - n_{wot,(i)}))} \\ \mathbf{250} \end{cases}$$

Where $L_{wot,(i)}$ and $n_{PP'}$ have the same meaning as in paragraph 1. of Annex 3 and $n_{wot,(i)}$ refers to the corresponding engine speed when the front of the vehicle passes the line PP'. **The index "(i)" refers to the gear used, $n_{AA',min}$ is the engine speed as defined in paragraph 2.5.(c) of this Annex and $n_{BB',max}$ is the engine speed as defined in paragraph 2.5.(d) of this Annex.**

If the tests according to Annex 3 of this UN Regulation and the RD-ASEP tests are performed with the same vehicle in immediate sequence, the values for $L_{wot(i)}$ and $n_{wot(i)}$ from the Annex 3 test may be used, if agreed by the type approval authority. Otherwise, when compliance with these limits is checked,

values for $L_{wot(i)}$ and $n_{wot(i)}$ shall be newly determined by measurements as defined in paragraph 1. of Annex 3, however using the same gear (i) and the same pre-acceleration distance as during type approval."

Paragraph 3.2.2. amend to read:

"3.2.2. Test speed and gear selection

The vehicle shall be tested at each of the following operating conditions:

(a) $v_{PP'}$ = 50 km/h

The selected gear (i) and pre-acceleration condition shall be the same as those used in the original type approval test of Annex 3 of this Regulation.

(b) $v_{BB'}$ corresponding to $n_{BB'}$ = ~~0,8 × S~~ **$n_{BB',max}$ as defined in paragraph 2.5(d)**

$v_{BB'}$ shall not exceed the values as specified in paragraph 2.5(b) of this Annex.

The selected gear shall be 2nd. If the 3rd gear satisfies requirements of $n_{BB'}$ and $v_{BB'}$, 3rd shall be used. If the 4th gear satisfies requirements of $n_{BB'}$ and $v_{BB'}$, 4th shall be used. If the 5th gear satisfies requirements of $n_{BB'}$ and $v_{BB'}$, 5th shall be used. If the 6th gear satisfies requirements of $n_{BB'}$ and $v_{BB'}$, 6th shall be used.

If in 2nd gear under the above-mentioned condition for $n_{BB'}$ the vehicle speed at line BB' would exceed the value for $v_{BB'}$ as specified in paragraph 2.5 of this Annex, the test shall be performed in 2nd gear and a maximum vehicle speed as specified in paragraph 2.5 of this Annex shall be reached at line BB' instead.

If during the test unusual riding conditions (such as apparent wheel spin or front wheel lift up) occur, the test shall be performed in the next higher gear, and the maximum vehicle speed as specified in paragraph 2.5 of this Annex shall be reached at line BB' instead."

II. Justification

1. At its seventy-second session GRBP adopted the proposal by IWG ASEP for a new 05 series of amendments to UN Regulation No. 41. The purpose of this amendment was to address grey zones in the application of the ASEP testing. With the 05 series of amendments, the ASEP test provisions were made more real-world representative by widening the test window boundaries, of speed, engine speed, gears, throttle operations, etc. To enable quick implementation of those improvements, the RD-ASEP limit line was carried over from the 04 series of amendments, and a review of the RD-ASEP limit line would be addressed at a later stage.

2. With this amendment proposal, IWG RD-ASEP aims to finalise the review of the RD-ASEP test procedure by addressing now also the RD-ASEP limit line.

3. The objective of this proposal is to update the limit line for $n_{PP'} > n_{wot,(i)}$ to reflect the technical progress since it was first introduced in the 04 series of amendments to UN Regulation No. 41, in 2011. The aim was to better reflect the "natural sound emission behaviour" of a motorcycle ("natural" means without flexibilities in the exhaust/silencer system) while also considering citizen complaints from too high motorcycle noise.

4. A 'best fit' limit line was developed based on non-offending vehicle fleet data (vehicles without flaps), ensuring fair treatment of vehicles with different performance characteristics and engine speed ranges, by using the engine speeds of the RD-ASEP control window. To avoid the indefinite increase of the limit line with engine speed, a logarithmic function was applied. Parameters adjusting the logarithmic slope angle (Factor 4 in the formula below taken from paragraph 2.6 of Annex 7) as well as the offset or margin (term +6 dB in the same formula) were selected to suit the objective of reducing the available margins, especially at high engine speeds.

$$L_{wot,(i)} + (4 + (n_{BB',max} - n_{AA',min}) / 1000) * \ln((n_{PP'} + n_{adj}) / n_{wot,(i)}) + 6$$

A factor n_{adj} was introduced to avoid disproportionate disadvantage to vehicles characterized with high engine speeds but low power-to-mass ratio. By applying the "min-function" to the formula, it is guaranteed that the revised RD-ASEP limit is at no point exceeding the current RD-ASEP limit (of the 05 series of amendments).

5. The limit line for $n_{PP'} < n_{wot,(i)}$ was kept unchanged as data shows that with the introduction of RD-ASEP of the 05 series of amendments, the limit definition is already adequately stringent.

6. Despite the increased complexity of the revised RD-ASEP limit line, the applied parameters for the limit calculation are available without the need of additional equipment (neither on the test site nor on the vehicle) and without additional test effort.

7. During the development of the new RD-ASEP limit line, it was discovered that some vehicles with non-lockable, Continuously Variable Transmissions (CVT) often exceeded the RD-ASEP engine speed control window during the RD-ASEP tests, resulting in invalid test runs. Due to the nature of those transmissions, such engine speeds are also more accessible in real-life conditions. To reflect better real driving conditions, the IWG RD-ASEP decided to increase the engine speed control window for those vehicles.

8. Transitional Provisions were discussed within the IWG RD-ASEP, weighing early market penetration of improved products with sufficient lead time for industry to adapt. The application dates for the updated ISO 10844 track surface standard were aligned with the period specified in the 05 series of amendments (pending publication).