

Proposal for draft amendments to Regulation No. 51

I. Proposal

Insert a new paragraph 2.2.7., to read:

"2.2.7. The tyre dimensions"

Paragraph 2.17., amend to read:

"2.17. *"Pre-acceleration"* means application of acceleration control device prior to AA' for the purpose of achieving stable acceleration ~~between AA' and BB'~~ **within the acceleration calculation areas."**

Annex 3,

Paragraph 3.1.1.5 , amend to read:

"3.1.1.5. The maximum sound level expressed in A-weighted decibels (dB(A)) shall be measured as the vehicle is driven ~~between lines AA' and BB'~~ **passing the test track** . Such value shall constitute the result of the measurement. **The reading of test results should be rounded off to the first decimal place."**

Paragraph 3.1.2.3.2., amend to read:

"3.1.2.3.2.1. Vehicles of categories M_1 and N_1 ¹ fitted with a gearbox having four or less forward gears shall be tested in second gear.

Vehicles of categories M_1 and N_1 ¹ fitted with a gearbox having more than four forward gears shall be tested successively in second and third gear. The average value of the sound levels recorded for these two conditions shall be calculated.

However, vehicles of category M_1 having more than four forward gears and equipped with an engine developing a maximum power greater than 140 kW (ECE) and a permissible maximum-power/maximum-mass ratio greater than 75 kW (ECE)/t shall be tested only in third gear, provided that the speed at which the rear of the vehicle passes the line BB' in third gear is greater than 61 km/h.

If during the test in second gear, the engine speed exceeds the engine speed, S, at which the engine develops its rated maximum power, the test must be repeated with an approach speed and/or approach engine speed reduced by steps of 5 percent S, until the engine speed attained no longer exceeds S.

If the engine speed S is still attained with an approach speed corresponding to the idle speed, then the test will be performed only in third gear and the relevant results have to be evaluated."

Paragraph 3.1.2.3.2.2., shall be deleted

Paragraph 3.1.2.3.2.3., renumber as paragraph 3.1.2.3.2.2.

Paragraph 31.3., amend to read:

"3.1.3. Interpretation of results

The measurement ...

To allow for lack of precision in the measuring instrument the figures read from it during measurement shall each be reduced by 1 dB(a).

The final result should be rounded off to the first decimal place."

Annex 9,

Items 8.2.1 and 8.2.2., amend to read:

"8.2.1. Engine speed in gear i at: $AA' / PP' \cdot 1 \dots \dots \text{min}^{-1}$ (rpm)

$BB' \dots \dots \text{min}^{-1}$ (rpm)

Maximum engine speed during test..... min^{-1} (rpm)

8.2.2. Engine speed in gear (i+1) at: $AA' / PP' \cdot 1 \dots \dots \text{min}^{-1}$ (rpm)

$BB' \dots \dots \text{min}^{-1}$ (rpm)

Maximum engine speed during test..... min^{-1} (rpm)"

Annex 10,

Paragraph 1.3., amend to read:

"1.3. Calibration of the entire Acoustic Measurement System for Measurement Session.

... If this value is exceeded, the results of the measurements obtained after the previous satisfactory check shall be ~~discarded~~ **disregarded.**"

Paragraph 3.1.2.1.2.2., amend to read:

"3.1.2.1.2.2. Calculation procedure for vehicles with automatic transmissions, adaptive transmissions and CVT's tested with non-locked gear ratios:

a $a_{\text{wot test}}$ used in the determination of gear selection shall be the average of the four $a_{\text{wot test, i}}$ during each valid measurement run.

If devices or measures ~~described in paragraph 3.1.2.1.4.2.~~ can be used to **lock gear ratios**, calculate a $a_{\text{wot test}}$ using the equation:

$$a_{\text{wot test}} = ((v_{BB'} / 3.6)^2 - (v_{AA'} / 3.6)^2) / (2 * (20 + 1))$$

Pre-acceleration may be used.

If no devices or measures ~~described in paragraph 3.1.2.1.4.2.~~ **can be used to lock gear ratios are used**, calculate a $a_{\text{wot test}}$ using the equation:

$$a_{\text{wot test PP-BB}} = ((v_{BB'} / 3.6)^2 - (v_{PP'} / 3.6)^2) / (2 * (10 + 1))$$

~~Pre-acceleration shall not be used.~~

~~The location of depressing the accelerator shall be where the reference point of the vehicle passes line AA'.~~

Pre-acceleration may be used."

Paragraph 3.1.2.2.1.1., amend to read:

"3.1.2.2.1.1. Vehicles with manual transmissions, **automatic transmissions, adaptive transmissions and transmissions with variable gear ratio (CVT's) with locked gear ratios.**

Stable acceleration condition shall be ensured. The gear choice is determined by the target conditions. If the difference in speed exceeds the given tolerance, then two gears should be tested, one above and one below the target speed.

If more than one gear fulfils the target conditions select that gear which is closest to 35 km/h. If no gear fulfils the target condition for v_{test} two gears shall be tested, one above and one below v_{test} . **When the test is performed in the gear with the speed below v_{test} , if the engine speed $n_{BB'}$ still exceed the upper limit of the target engine speed attained with an approach speed corresponding to the idle speed, then the test will be performed only in gear with the speed above v_{test} .** The target engine speed shall be reached in any condition. **When testing in the selected gears, if the engine speed exceed the rated engine speed (S) during the test, the test data of this gear must be disregarded, then the next higher gear shall be used.**

A stable acceleration condition shall be ensured. If a stable acceleration cannot be ensured in a gear, this gear has to be disregarded."

Paragraph 3.1.2.2.1.2., amend to read:

"3.1.2.2.1.2. Vehicles with automatic transmissions, adaptive transmissions and transmissions with variable gear ratio (CVT's) **with non-locked gear ratios.**

The gear ... a lower acceleration is allowed after the reference point of the vehicle passes line PP'. Two tests must be performed, one with the end speed of $v_{test} = v_{BB'} + 5$ km/h, and one with the end speed of $v_{test} = v_{BB'} - 5$ km/h.

The reported ~~noise-sound~~ **pressure level is the maximum A-weighted sound level expressed in decibels (dB(A))**, ~~that result which is related to the test with the highest engine speed obtained during the test from AA' to BB'.~~ "

Paragraph 3.1.3., amend to read:

"3.1.3. Interpretation of results

The maximum A-weighted sound pressure level indicated during each passage of the vehicle ~~between the two lines AA' and BB'~~ **during the test** shall be noted. If a noise peak obviously out of character with the general sound pressure level is observed, the measurement shall be ~~discarded~~ **disregarded**. At least four measurements for each test condition shall be made on each side of the vehicle and for each gear ratio. Left and right side may be measured simultaneously or sequentially. ... The calculated acceleration $a_{wot\ test}$ shall be noted to the second digit after the decimal place.

The final result should be rounded off to the first decimal place."

II. Justification

Explanations for draft amendments to UN Regulation No. 51

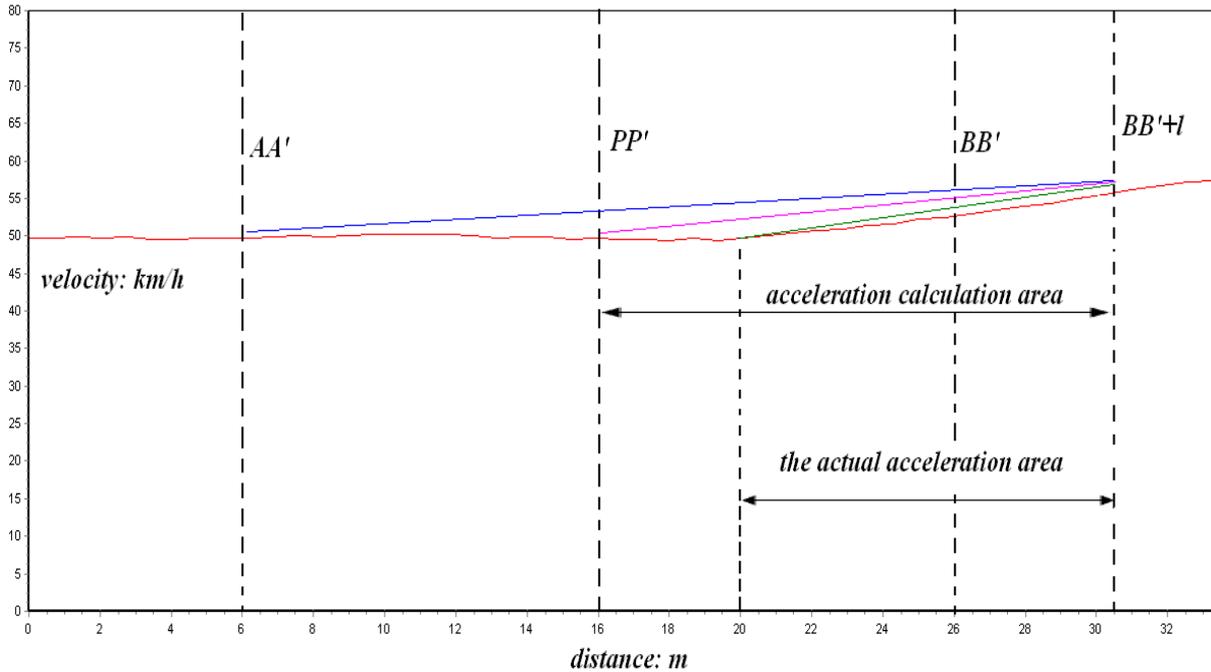


Figure 1: The influence of acceleration delay

Conclusion: If the pre-acceleration is not used, vehicles with non-locked gear transmissions can not tested its' real acceleration, when the acceleration time delay is longer than 0.7 seconds. So in this situation, pre-acceleration of 4 meters is needed for making sure the real acceleration can be get. And the test accelerations $a_{\text{wot test}} = a_{\text{wot ref}}$ is related to the $k_p = 1 - (a_{\text{urban}} / a_{\text{wot ref}})$ weighting factor, and will influence the final result, so China think it's so important to get an exact and equitable acceleration when doing the test for automatic transmission vehicles.

Table 1 The importance of round off to the first decimal place of reading and final result

Limit value	Test result 1	Test result 2
74dB(A)	73.5	74.9
Final result	74	74
Determination	Some test engineers will think the test result is too close to the limit values and will repeat more tests.	Some engineers will think the final result after rounded can satisfy the requirement of ECE R51 so this kind of vehicles can pass the law.

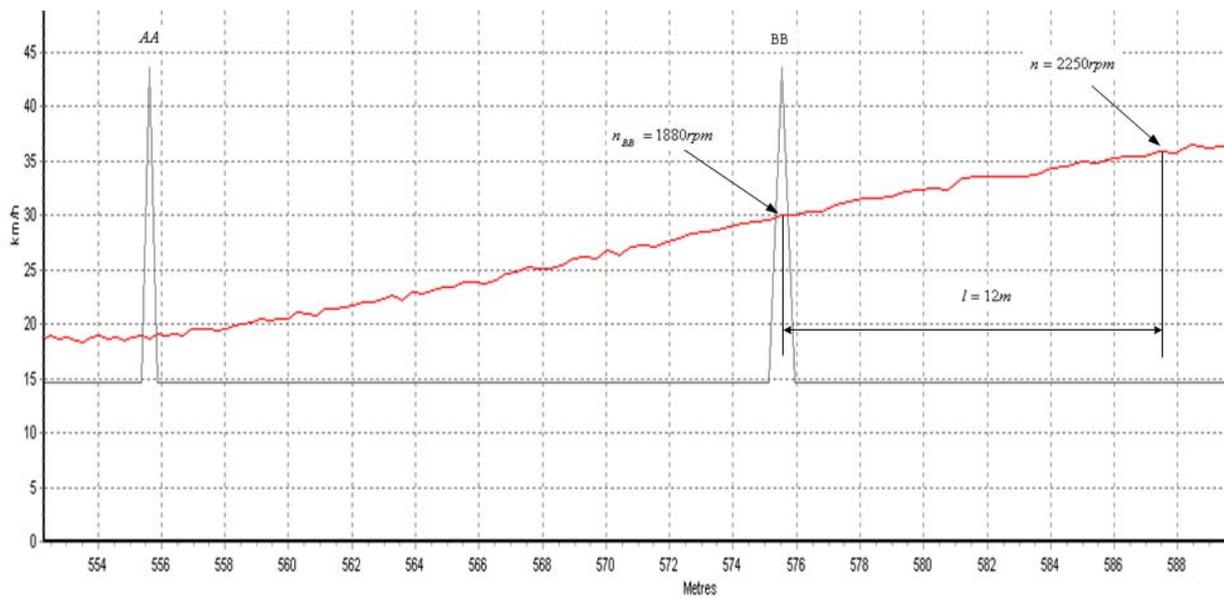


Figure 2 Situation of exceed S and the deceleration delay of commercial vehicles

- ① Some vehicles especial the front engine disposal vehicles, even the $n_{BB'}$ can fulfil the target condition, but when the rear of the vehicle pass the BB line and the engine speed has exceeded the rated engine speed (S), so the report only contains the $n_{BB'}$ and $n_{AA'}$ is not enough.
- ② The condition of engine speed exceeds S in not a recommended working condition by manufacturers, so such kind of working condition should not be contained in our test procedure.

- ③ There is always a deceleration delay when we release the acceleration pedal, so the maximum engine speed is also not in the point when we release the acceleration pedal.

Table 2 the information of this tested vehicle

Vehicle category	N3	Engine arrangement	Front arrangement
Transmission type	manual	Length of vehicle (m)	12
P_n and S (kW/rpm)		228 / 2200	
Target engine speed (rpm)		1870-1958	

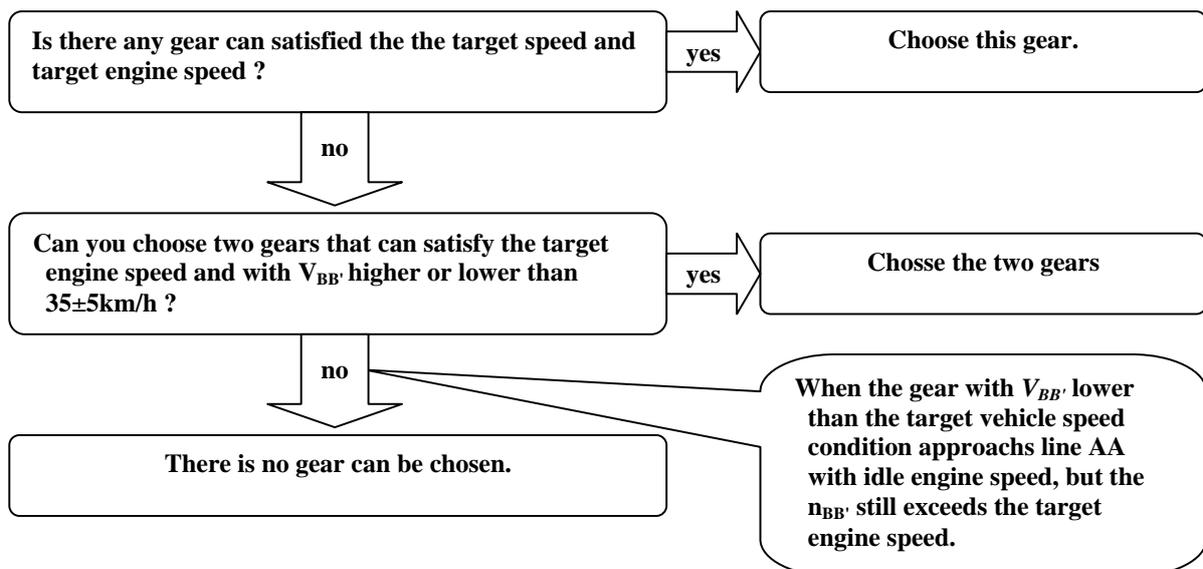


Figure 3 Flow chart for deciding the test gears

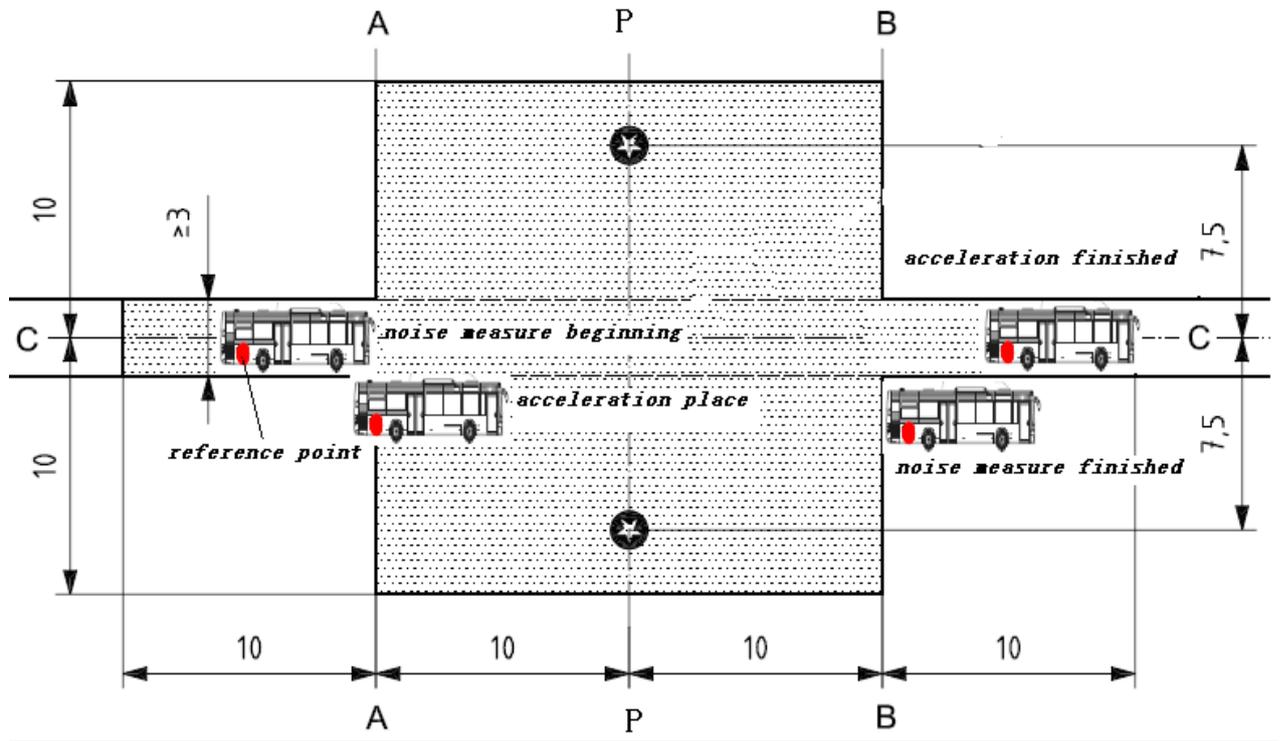


Figure 4 Test conditions for vehicles

Conclusion: such kind of description “test the maximum A-weighted sound pressure level between the two lines AA' and BB'” make the test condition of vehicles so difficult, and the acceleration procedure is not corresponding to the noise measuring procedure. Such kind of description also makes it more hard to finish the test, especially when I ask you how you can make sure the noise you test is just between the two lines AA' and BB'? And it makes the test using sound level meters impossible, maybe the happiest ones are from the noise test equipment suppliers but make no sense to the final result.