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**Economic Commission for Europe****Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Noise****Sixty-first session**

Geneva, 27 – 29 January 2014

Item 4 (a) of the provisional agenda

**Regulation No. 51 (Noise of M and N categories of vehicles): Development****Proposal for amendments to the 03 series of amendments to Regulation No. 51****Submitted by the Informal Working Group on UN Regulations Nos. 51 and 59<sup>1</sup>**

The text reproduced below was prepared by the GRB Informal Working Group (IWG) on UN Regulations Nos. 51 and 59, to update and revise the 03 series of amendments to UN Regulation No. 51 as adopted by GRB at its sixtieth session (ECE/TRANS/WP.29/GRB/2014/5, ECE/TRANS/WP.29/GRB/58, para. 5 and Annex III). The modifications to the current text are marked in bold for new or strikethrough for deleted characters.

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<sup>1</sup> In accordance with the programme of work of the Inland Transport Committee for 2012–2016 (ECE/TRANS/224, para. 94 and ECE/TRANS/2012/12, 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

Paragraph 2.2.1.1., amend to read:

“2.2.1.1. The shape or materials of the ~~bodywork (particularly the~~ engine compartment and its soundproofing);”

Paragraph 2.2.2.1., amend to read:

“2.2.2.1. The shape or materials of the ~~bodywork (particularly the~~ engine compartment and its soundproofing);”

Add a new paragraph 2.8.1., to read:

“2.8.1. **“Total engine power” means the sum of all power from available propulsion sources.”**

Paragraph 2.11.2., amend to read

“2.11.2. In the case of vehicles of categories  $M_2 > 3,500\text{kg}$  **technical permissible maximum laden mass**,  $M_3$ ,  $N_2$ ,  $N_3$ :

- **for front-engine vehicles, the front end of the vehicle;**
- **for all other vehicles, the border of the engine closest to the front of the vehicle;**

~~The border of the engine closest to the front of the vehicle.”~~

Paragraph 2.12., amend to read:

“2.12. “Engine” means the power source without detachable accessories.

**Power source includes in this context all sources of motive power; for example, electric or hydraulic power sources used alone or in combination with other power sources.”**

Paragraph 2.19., amend to read:

“2.19. “Silencing system” means a complete set of components necessary for limiting the noise produced by an engine, **its intake and its exhaust (the exhaust manifold(s), the catalyst(s) and emission after-treatment device(s) are not considered part of the silencing system; these parts belong to the engine).**”

Paragraph 2.20., amend to read:

“2.20. “Design family of **exhaust** silencing system or **exhaust** silencing system components” means a group of silencing systems or components thereof in which all of the following characteristics are the same:

- (a) the presence of net gas flow of the exhaust gases through the absorbing fibrous material when in contact with that material;
- (b) the type of the fibres;
- (c) where applicable, binder material specifications;
- (d) average fibre dimensions;
- (e) minimum bulk material packing density in  $\text{kg/m}^3$ ;
- (f) maximum contact surface between the gas flow and the absorbing material.”

Paragraph 2.21., amend to read:

“2.21. **"Exhaust** silencing system of different types" means silencing systems which significantly differ in respect of at least one of the following:

- (a) trade names or trademarks of their components;
- (b) the characteristics of the materials constituting their components, except for the coating of those components;
- (c) the shape or size of their components;
- (d) the operating principles of at least one of their components;
- (e) the assembly of their components;
- (f) the number of exhaust silencing systems or components.”

Add a new paragraph 2.23., to read:

“2.23. **"R-point"** means R-point as defined in paragraph 2.4. of Annex 1 to the Consolidated Resolution (R.E.3).”

Add a new paragraph 2.24., table of symbols, to read:

"

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$m_{ro}$	kg	Annex 3	2.2.1.	mass in running order; value to be reported and used for calculations to a precision of 10 kg
$m_t$	kg	Annex 3	2.2.1.	test mass of the vehicle; value to be reported and used for calculations to a precision of 10 kg
$m_{target}$	kg	Annex 3	2.2.1.	target mass of the vehicle
$m_{xload}$	kg	Annex 3	2.2.1.	extra loading
$m_{fa\ load\ laden}$	kg	Annex 3	2.2.1.	front axle load in unladen condition
$m_{ra\ load\ unladen}$	kg	Annex 3	2.2.1.	rear axle load in unladen condition
$m_{unladen}$	kg	Annex 3	2.2.1.	line of vehicle travel through test surface defined in ISO 10844
$m_{ac\ ra\ max}$	kg	Annex 3	2.2.1.	Technically permissible maximum laden mass allowed for the rear axle as declared by the manufacturer
$m_d$	kg	Annex 3	2.2.1.	mass of driver
$m_{chassis\ M2M3}$	kg	Annex 3	2.2.1.	mass of the incomplete vehicle ( $M_2$ or $M_3$ )

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$m_{\text{load M2M3}}$	kg	Annex 3	2.2.1.	extra load to be added to the incomplete vehicle ( $M_2$ or $M_3$ ) to reach the mass of the vehicle in running order as chosen by the manufacturer
$m_{\text{fa load laden}}$	kg	Annex 3	2.2.7.2.	front axle load in laden condition
$m_{\text{ra load laden}}$	kg	Annex 3	2.2.7.2.	rear axle load in laden condition
AA'	—	Annex 3	3.1.1.	line perpendicular to vehicle travel which indicates beginning of zone in which to record sound pressure level during test
BB'	—	Annex 3	3.1.1.	line perpendicular to vehicle travel which indicates end of zone in which to record sound pressure level during test
CC'	—	Annex 3	3.1.1.	line of vehicle travel through test surface defined in ISO 10844
PP'	—	Annex 3	3.1.1.	line perpendicular to vehicle travel which indicates location of microphones
$v_{\text{test}}$	km/h	Annex 3	3.1.2.1.	vehicle test speed
PMR	—	Annex 3	3.1.2.1.1.	power-to-mass ratio index to be used for calculations; value to be reported and used for calculations to the first decimal place
$P_n$	kW	Annex 3	3.1.2.1.1.	rated total engine net power
$l$	m	Annex 3	3.1.2.1.2.	reference length; value to be reported and used for calculations to a precision of 0.01 m (1 cm)
$l_{\text{veh}}$	m	Annex 3	3.1.2.1.2.	length of vehicle; value to be reported and used for calculations to a precision of 0.01 m (1 cm)
$v_{\text{AA}'}$	km/h	Annex 3	3.1.2.1.2.	vehicle velocity when reference point passes line AA' (see 5.1. for definition of reference point); value to be reported and used for calculations to the first decimal place

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$v_{BB'}$	km/h	Annex 3	3.1.2.1.2.	vehicle velocity when reference point or rear of vehicle passes line BB' (see 5.1. for definition of reference point); value to be reported and used for calculations to the first decimal place
$v_{PP'}$	km/h	Annex 3	3.1.2.1.2.	vehicle velocity when reference point passes line PP' (see 5.1. for definition of reference point); value to be reported and used for calculations to the first decimal place
$a_{wot\ test}$	$m/s^2$	Annex 3	3.1.2.1.2.1.	acceleration at wide-open throttle from AA' to BB'; value to be reported and used for calculations to the second decimal place
$a_{wot\ test,i}$	$m/s^2$	Annex 3	3.1.2.1.2.1.	acceleration at wide-open throttle achieved in a particular gear i; value to be reported and used for calculations to the second decimal place
$l_{pa}$	m	Annex 3	3.1.2.1.2.1.	point of depressing the accelerator before line AA'; value to be reported in full meter
$a_{wot\ test, PP-BB}$	$m/s^2$	Annex 3	3.1.2.1.2.2.	acceleration at wide-open throttle from PP' to BB'; value to be reported and used for calculations to the second decimal place
$a_{urban}$	$m/s^2$	Annex 3	3.1.2.1.2.3.	target acceleration representing urban traffic acceleration; value to be reported and used for calculations to the second decimal place
$a_{wot\ ref}$	$m/s^2$	Annex 3	3.1.2.1.2.4.	reference acceleration for the wide-open-throttle test; value to be reported and used for calculations to the second decimal place
kP	—	Annex 3	3.1.2.1.3.	partial power factor; value to be reported and used for calculations to the second decimal place

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$a_{wot\ i}$	$m/s^2$	Annex 3	3.1.2.1.4.1.	acceleration at wide-open-throttle in gear ratio $i$ ; value to be reported and used for calculations to the second decimal place
$a_{wot\ (i+1)}$	$m/s^2$	Annex 3	3.1.2.1.4.1.	acceleration at wide-open-throttle in gear ratio $(i+1)$ ; value to be reported and used for calculations to the second decimal place
gear ratio $i$	—	Annex 3	3.1.2.1.4.1.	first of two gear ratios for use in the vehicle test
gear ratio $i+1$	—	Annex 3	3.1.2.1.4.1.	second of two gear ratios, with an engine speed lower than gear ratio $i$
$k$	—	Annex 3	3.1.2.1.4.1.	gear ratio weighting factor; value to be reported and used for calculations to the second decimal place
$n_{BB'}$	1/min	Annex 3	3.1.2.2.	engine rotational speed of the vehicle, when the reference point passes $BB'$ ; value to be reported and used for calculations to a precision of $10\ min^{-1}$
$S$	1/min	Annex 3	3.1.2.2.	rated engine rotational speed in revs per minute, synonymous with the engine rotational speed at maximum power
$n_{target\ BB'}$	1/min	Annex 3	3.1.2.2.1.1. (a)	target engine rotational speed of the vehicle when the reference point has to pass line $BB'$ (see 2.11.2. for definition of reference point)
$v_{target\ BB'}$	km/h	Annex 3	3.1.2.2.1.1. (a)	target vehicle velocity when it is necessary that the reference point has to pass line $BB'$ (see 2.11.2. for definition of reference point)
$v_{BB'\ gear\ I}$	km/h	Annex 3	3.1.2.2.1.1. (b)	target vehicle velocity when certain conditions are met
$v_{BB'\ gear\ i,\ i=1,2}$	km/h	Annex 3	3.1.2.2.1.1. (c)	target vehicle velocity when certain conditions are met

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
<b>gearx</b>	-	<b>Annex 3</b>	<b>3.1.2.2.1.1. (d)</b>	<b>first of two gear ratios used for testing of M<sub>2</sub> having a maximum authorized mass of more than 3 500 kg, M<sub>3</sub>, N<sub>2</sub>, and N<sub>3</sub> where certain criteria on test conditions are met</b>
<b>geary</b>	-	<b>Annex 3</b>	<b>3.1.2.2.1.1. (d)</b>	<b>second of two gear ratios used for testing of M<sub>2</sub> having a maximum authorized mass of more than 3,500 kg, M<sub>3</sub>, N<sub>2</sub>, and N<sub>3</sub> where certain criteria on test conditions are met</b>
<b>v<sub>BB'x</sub></b>	<b>km/h</b>	<b>Annex 3</b>	<b>3.1.2.2.1.1. (d)</b>	<b>target vehicle velocity when certain conditions are met</b>
<b>v<sub>BB'y</sub></b>	<b>km/h</b>	<b>Annex 3</b>	<b>3.1.2.2.1.1. (d)</b>	<b>target vehicle velocity when certain conditions are met</b>
<b>v<sub>BB'1</sub></b>	<b>km/h</b>	<b>Annex 3</b>	<b>3.1.2.2.1.2. (b)</b>	<b>target vehicle velocity when certain conditions are met</b>
<b>v<sub>BB'2</sub></b>	<b>km/h</b>	<b>Annex 3</b>	<b>3.1.2.2.1.2. (b)</b>	<b>target vehicle velocity when certain conditions are met</b>
<b>n<sub>BB'i</sub>, i=1,2</b>	<b>1/min</b>	<b>Annex 3</b>	<b>3.1.2.2.1.2. (d)</b>	<b>engine rotational speed when the reference point passes BB' when certain conditions are met</b>
<b>L<sub>crs i</sub></b>	<b>dB</b>	<b>Annex 3</b>	<b>3.1.3.1.</b>	<b>vehicle sound pressure level at constant speed test for gear i; value to be reported and used for calculations to the first decimal place</b>
<b>L<sub>crs (i + 1)</sub></b>	<b>dB</b>	<b>Annex 3</b>	<b>3.1.3.1.</b>	<b>vehicle sound pressure level at constant speed test for gear (i + 1); value to be reported and used for calculations to the first decimal place</b>
<b>L<sub>crs rep</sub></b>	<b>dB</b>	<b>Annex 3</b>	<b>3.1.3.1.</b>	<b>reported vehicle sound pressure level at constant speed test; value to be reported and used for calculations to the first decimal place</b>
<b>L<sub>wot i</sub></b>	<b>dB</b>	<b>Annex 3</b>	<b>3.1.3.1.</b>	<b>vehicle sound pressure level at wide-open-throttle test for gear i; value to be reported and used for calculations to the first decimal place</b>

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$L_{wot(i+1)}$	dB	Annex 3	3.1.3.1.	vehicle sound pressure level at wide-open-throttle test for gear (i + 1); ; value to be reported and used for calculations to the first decimal place
$L_{wot\ rep}$	dB	Annex 3	3.1.3.1.	reported vehicle sound pressure level at wide-open-throttle; value to be reported and used for calculations to the first decimal place
$L_{urban}$	dB	Annex 3	3.1.3.1.	reported vehicle sound pressure level representing urban operation; value to be reported mathematically rounded to the nearest integer
$a_{wot\_ASEP}$	$m/s^2$	Annex 7	2.3.	maximum required acceleration at wide-open-throttle
$k$	—	Annex 7	2.3.	gears to be tested under "Additional Sound Emission Provisions" (ASEP)
$n_{BB\_ASEP}$	1/min	Annex 7	2.3.	maximum test engine speed; value to be reported and used for calculations to a precision of 10 min-1
$v_{AA\_ASEP}$	km/h	Annex 7	2.3.	minimum vehicle speed at line AA' reported and used for calculations to the first decimal place
$v_{BB\_ASEP}$	km/h	Annex 7	2.3.	maximum vehicle speed at line AA' reported and used for calculations to the first decimal place
$P_j$	—	Annex 7	2.5.	test point(s) under ASEP
$j$	—	Annex 7	2.5.	index for the test points under ASEP
$v_{BB\_j}$	km/h	Annex 7	2.5.	vehicle test speed at BB' for a particular ASEP test point
$a_{wot,test,kj}$	$m/s^2$	Annex 7	2.6.	acceleration at wide-open throttle achieved in gear k and at test point j
$L_{wot,kj}$	dB	Annex 7	2.6.	sound pressure level measured for a gear k and at a test point j; value to be reported and used for calculations to the first decimal place

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$n_{BB,kj}$	1/min	Annex 7	2.6.	vehicle test engine speed at BB' for a gear k and at test point j
$v_{AA,kj}$	km/h	Annex 7	2.6.	vehicle test speed at AA' for a gear k and at test point j; value to be reported and used for calculations to the first decimal place
$v_{BB,kj}$	km/h	Annex 7	2.6.	vehicle test speed at BB' for a gear k and at test point j; value to be reported and used for calculations to the first decimal place
$L_{anchor,i}$	dB	Annex 7	3.1.	reported vehicle sound pressure level for gear ratio i from Annex 3; value to be reported and used for calculations to the first decimal place
$n_{anchor,i}$	1/min	Annex 7	3.1.	reported vehicle engine speed for gear ratio i from Annex 3
$v_{anchor,i}$	km/h	Annex 7	3.1.	reported vehicle test speed for gear ratio i from Annex 3; value to be reported and used for calculations to the first decimal place
$L_{kj}$	dB	Annex 7	4.	sound pressure level measured for a gear k and at a test point j; value to be reported and used for calculations to the first decimal place
$L_{ref}$	dB	Annex 7	5.3.	reference sound pressure level for reference sound assessment; value to be reported and used for calculations to the first decimal place
$n_{ref,k}$	1/min	Annex 7	5.3.	reference engine speed for reference sound assessment
$v_{ref}$	km/h	Annex 7	5.3.	reference vehicle test speed for reference sound assessment
$k_{P\_ASEP}$	—	Annex 7	6.2.	partial power factor determined for the $L_{Urban}$ principle of ASEP
$L_{wot\ ASEP}$	dB	Annex 7	6.2.	vehicle sound pressure level measured for the $L_{Urban}$ principle of ASEP; value to be reported and used for calculations to the first decimal place

<i>Symbol</i>	<i>Unit</i>	<i>Annex</i>	<i>Paragraph</i>	<i>Explanation</i>
$L_{\text{urban\_ASEP}}$	dB	Annex 7	6.2.	Estimated urban sound pressure level determined for the $L_{\text{Urban}}$ principle of ASEP; value to be reported and used for calculations to the first decimal place
$L_{\text{urban\_Measured\_ASEP}}$	dB	Annex 7	6.2.	interim result for calculation of $L_{\text{Urban\_ASEP}}$ ; value to be reported and used for calculations to the first decimal place
$L_{\text{urban\_Normalized}}$	dB	Annex 7	6.2.	interim result for calculation of $L_{\text{Urban\_ASEP}}$ ; value to be reported and used for calculations to the first decimal place

"

Paragraph 6.2.3., third sentence, amend to read:

"6.2.3. ...

Vehicles ~~of category  $N_1$~~  are exempted from ASEP if one of the following conditions is fulfilled:

- (a) **For vehicles of category  $N_1$ , if** the engine capacity does not exceed 660 cc and the power-to-mass ratio PMR calculated by using the technically permissible maximum laden mass does not exceed 35.
- (b) **For vehicles of category  $N_1$ , if** the payload is at least 850 kg and the power-to-mass ratio calculated by using the technically permissible maximum laden mass does not exceed 40.
- (c) **For vehicles of category  $N_1$  or  $M_1$  derived from  $N_1$  if the technically permissible maximum laden mass is greater than 2.5 tons and the R-point height is greater than 850 mm from the ground and the power-to-mass ratio calculated by using the technically permissible maximum laden mass does not exceed 40."**

Paragraph 11.2.3., amend to read:

"11.2.3. Until ~~1 July 30 June~~ 2022 no Contracting Party applying this Regulation shall refuse national or regional type approval of a vehicle type-approved to the 02 series of amendments to this Regulation."

Paragraph 11.3.3., amend to read:

"11.3.3. Until ~~1 July 30 June~~ 2022 for vehicle types other than  $N_2$  and ~~as from until 1 July 30 June~~ 2023 for vehicles types of category  $N_2$ , no Contracting Party applying this Regulation shall refuse national or regional type approval of a vehicle type-approved to phase 1 (see paragraph 6.2.2. above) or the 02 series of amendments to this Regulation."

Paragraph 11.4.3., amend to read:

"11.4.3. Until ~~1 July 30 June~~ 2026 for vehicle types other than  $N_2$ ,  $N_3$  and  $M_3$  and ~~as from until 1 July 30 June~~ 2027 for vehicles types of category  $N_2$ ,  $N_3$  and  $M_3$ ,

no Contracting Party applying this Regulation shall refuse national or regional type approval of vehicle type-approved to phase 2 according to paragraph 6.2.2. above.”

Add a new paragraph 11.8., to read:

“11.8. Until 30 June 2022 for vehicle types of category N<sub>1</sub> and for vehicle types of category M<sub>1</sub> derived from N<sub>1</sub> having a technically permissible maximum laden mass of less than or equal to 2.5 tons, an R-point height greater or equal to 800 mm from the ground, a mid-engine where the centre point of gravity of the engine is between 300 mm and 1,500 mm behind the front axle and with rear axle drive, the limits according to paragraph 6.2.2. of the vehicle types of category N<sub>1</sub> having a technically permissible maximum laden mass above 2.5 tons apply.”

Annex 3, paragraph 2.1., amend to read:

“2.1. ...  
The surface of the test track and the dimensions of the test site shall be in accordance with ISO 10844:20112014...”

Annex 3, paragraph 2.2.1., amend to read:

“2.2.1. ...  
Measurements shall be made on vehicles at the test mass m<sub>t</sub> specified according to the following table.

**Target mass, m<sub>target</sub>, is used to denote the mass that N<sub>2</sub> and N<sub>3</sub> vehicles should be tested at. The actual test mass of the vehicle can be less due to limitations on vehicle and axle loading.**

Vehicle category	Vehicle test mass
M <sub>1</sub>	m <sub>t</sub> = m <sub>ro</sub> +/- 5%
N <sub>1</sub>	m <sub>t</sub> = m <sub>ro</sub> +/- 5%
N <sub>2</sub> , N <sub>3</sub>	<p>m<sub>target</sub> = 50 [kg/<del>per</del> kW] x P<sub>n</sub> [kW]<del>rated engine maximum net power</del></p> <p>Extra loading, m<sub>xload</sub>, to reach the <del>test target</del> mass, m<sub>target</sub>, of the vehicle shall be placed above the <del>driven</del> rear axle(s).</p> <p>The <b>sum of the extra loading and the rear axle load in an unladen condition, m<sub>ra load unladen</sub></b>, is limited to 75 per cent of the technically permissible maximum laden mass allowed for the rear axle, m<sub>ac ra max</sub>. The <del>test target</del> mass shall be achieved with a tolerance of ±5 per cent.</p> <p>If the centre of gravity of the extra loading cannot be aligned with the centre of the rear axle, the test mass, m<sub>t</sub>, of the vehicle shall not exceed the sum of the front axle <b>in an unladen condition, m<sub>fa load unladen</sub></b>, and the rear axle load in an unladen condition, m<sub>ra load unladen</sub>, plus the extra loading, m<sub>xload</sub>, <b>and the mass of the driver m<sub>d</sub></b>.</p> <p>The test mass for vehicles with more than two axles shall be the same as for a two-axle vehicle.</p> <p><b>If the vehicle mass of a vehicle with more than two axles in an unladen condition, m<sub>unladen</sub>, is greater than the test mass for the</b></p>

<i>Vehicle category</i>	<i>Vehicle test mass</i>
	<p>two-axle vehicle, then this vehicle shall be tested without extra loading.</p> <p>If the vehicle mass of a vehicle with two axles, <math>m_{unladen}</math>, is greater than the target mass, then this vehicle shall be tested without extra loading.</p>
M <sub>2</sub> , M <sub>3</sub>	<p><del><math>m_t = m_{ro}</math> — mass of the crew member (if applicable)</del></p> <p><del><math>M_2 - M_3 - m_t = m_{ro}</math></del></p> <p>The mass in running order shall be achieved with a tolerance of <del>±5</del><b>10</b> per cent.</p> <p><del>or,</del></p> <p><del>if the tests are carried out to an incomplete vehicle not having a bodywork,</del></p> <p><del><math>m_{target} = 50</math> kg per kW rated engine maximum net power respectively in compliance with conditions above (see N<sub>2</sub>, N<sub>3</sub> category).</del></p>
Incomplete M <sub>2</sub> , M <sub>3</sub>	<p>If the tests are carried with an incomplete vehicle not having a bodywork,</p> <p><math>m_{target} = 50</math> [kg/kW] x P<sub>n</sub> [kW] is calculated in compliance with conditions above (see N<sub>2</sub>, N<sub>3</sub> category),</p> <p>or</p> <p><math>m_t = m_{chassisM2M3} + m_{xloadM2M3} = m_{ro}</math></p> <p>The mass in running order shall be achieved with a tolerance of <b>± 10%</b>.</p>

...

Annex 3, new paragraph 2.2.7., amend to read:

**“2.2.7. Calculation procedure to determine extra loading of N<sub>2</sub> and N<sub>3</sub> vehicles only**

**2.2.7.1. Calculation of extra loading**

The target mass,  $m_{target}$ , (per kW rated power) for two-axle vehicles of category N<sub>2</sub> and N<sub>3</sub> is specified in Table 2.2.1:

$$m_{target} = 50 \text{ [kg / kW]} \times P_n \text{ [kW]} \tag{1}$$

To reach the required target mass,  $m_{target}$ , for a vehicle being tested, the unladen vehicle, including the mass of the driver,  $m_d$ , shall be loaded with an extra mass,  $m_{xload}$ , which shall be placed above the rear axle as given in Formula (8):

$$m_{target} = m_{unladen} + m_d + m_{xload} \tag{2}$$

The target mass,  $m_{target}$ , shall be achieved with a tolerance of **±5** per cent.

The vehicle mass of the test vehicle in the unladen condition,  $m_{unladen}$ , is calculated by measuring on a scale the unladen front axle load,  $m_{fa \text{ load}}$

unladen, and the unladen rear axle load,  $m_{ra \text{ load unladen}}$ , as given in Formula (3):

$$m_{\text{unladen}} = m_{fa \text{ load unladen}} + m_{ra \text{ load unladen}} \quad (3)$$

By using Formulae (2) and (3), the extra loading,  $m_{\text{xload}}$ , is calculated as given in Formulae (4) and (5):

$$m_{\text{xload}} = m_{\text{target}} - (m_{\text{d}} + m_{\text{unladen}}) \quad (4)$$

$$m_{\text{xload}} = m_{\text{target}} - (m_{\text{d}} + m_{fa \text{ load unladen}} + m_{ra \text{ load unladen}}) \quad (5)$$

The sum of the extra loading,  $m_{\text{xload}}$ , and the unladen rear axle load,  $m_{ra \text{ load unladen}}$ , is limited to 75 per cent of the technically permissible maximum laden mass for the rear axle,  $m_{ac \text{ ra max}}$ , as given in Formula (6):

$$0,75 m_{ac \text{ ra max}} \geq m_{\text{xload}} + m_{ra \text{ load unladen}} \quad (6)$$

The  $m_{\text{xload}}$  is limited according to Formula (7):

$$m_{\text{xload}} \leq 0,75 m_{ac \text{ ra max}} - m_{ra \text{ load unladen}} \quad (7)$$

If the calculated extra loading,  $m_{\text{xload}}$ , in Formula (5) fulfils Formula (7), then the extra loading is equal to Formula (5). The test mass,  $m_{\text{t}}$ , of the vehicle is as calculated from Formula (8):

$$m_{\text{t}} = m_{\text{xload}} + m_{\text{d}} + m_{fa \text{ load unladen}} + m_{ra \text{ load unladen}} \quad (8)$$

In this case, the test mass of the vehicle is equal to the target mass

$$m_{\text{t}} = m_{\text{target}} \quad (9)$$

If the calculated extra loading,  $m_{\text{xload}}$ , in Formula (5) does not fulfil Formula (7), but rather fulfils Formula (10)

$$m_{\text{xload}} > 0,75 m_{ac \text{ ra max}} - m_{ra \text{ load unladen}} \quad (10)$$

then, the extra loading,  $m_{\text{xload}}$ , shall be as given by Formula (11):

$$m_{\text{xload}} = 0,75 m_{ac \text{ ra max}} - m_{ra \text{ load unladen}} \quad (11)$$

and the test mass,  $m_{\text{t}}$ , of the vehicle shall be as given by Formula (12):

$$m_{\text{t}} = 0,75 m_{ac \text{ ra max}} + m_{\text{d}} + m_{fa \text{ load unladen}} \quad (12)$$

In this case, the test mass of the vehicle is lower than the target mass

$$m_{\text{t}} < m_{\text{target}} \quad (13)$$

#### 2.2.7.2. Loading considerations if load cannot be aligned with the centre of rear axle

If the centre of gravity of the extra loading,  $m_{\text{xload}}$ , cannot be aligned with the centre of the rear axle, the test mass of the vehicle,  $m_{\text{t}}$ , shall not exceed the sum of the unladen front axle load,  $m_{fa \text{ load unladen}}$ , and the unladen rear axle load,  $m_{ra \text{ load unladen}}$ , plus the extra loading,  $m_{\text{xload}}$ , and the mass of the driver,  $m_{\text{d}}$ .

This means that if the actual front and rear axle loads are measured on a scale when the extra loading,  $m_{\text{xload}}$ , is placed onto the vehicle and it is aligned with the centre of the rear axle, the test mass of the vehicle minus the mass of the driver is as given by Formula (14):

$$m_{\text{t}} - m_{\text{d}} = m_{fa \text{ load laden}} + m_{ra \text{ load laden}} \quad (14)$$

where

$$m_{fa \text{ load laden}} = m_{fa \text{ load unladen}} \quad (15)$$

If the centre of gravity of the extra loading cannot be aligned with the centre of the rear axle, Formula (14) is still fulfilled, but

$$m_{fa \text{ load laden}} > m_{fa \text{ load unladen}} \quad (16)$$

because the extra loading has partly distributed its mass to the front axle. In that case, it is not allowed to add more mass onto the rear axle to compensate for the mass moved to the front axle.

#### 2.2.7.3. Test mass for vehicles with more than two axles

If a vehicle with more than two axles is tested, then the test mass of this vehicle shall be the same as the test mass for the two-axle vehicle.

If the unladen vehicle mass of a vehicle with more than two axles is greater than the test mass for the two-axle vehicle, then this vehicle shall be tested without extra loading.”

*Annex 3, paragraph 3.1.2.1., last sentence, amend to read:*

“3.1.2.1. The test speed  $v_{\text{test}}$  is 50 km/h  $\pm$  1 km/h. The test speed shall be reached, when the reference point is at line PP’.

**If the test speed is modified according to 3.1.2.1.4.1. (e), the modified test speed shall be used for both the acceleration and constant speed test.”**

*Annex 3, paragraph 3.1.2.1.1., amend to read:*

“3.1.2.1.1. ...

PMR =  $(P_n / m_{t_{ro}}) * 1000$  kg/kW, where  $P_n$  is measured in kW and  $m_{t_{ro}}$  is measured in kg according to point 2.2.1. of this Annex.

**If two or more sources of propulsive power operate at the conditions of test specified in 3.1.2.1, 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 3.1.2.1. Specified power for non-combustion engines shall be the power stated by the manufacturer.”**

*Annex 3, paragraph 3.1.2.1.2., amend to read:*

“3.1.2.1.2. ...

Due to the definition of the reference point for the vehicle the length of the vehicle ( $l_{\text{veh}}$ ) is considered differently in the formula below. If the reference point is in the front of the vehicle, then  $l = l_{\text{veh}}$ , mid:  $l = \frac{1}{2} l_{\text{veh}}$  and rear:  $l = 0$ .

**At the choice of the vehicle manufacturer, front engine vehicles may use  $l = 5$  m, and mid-engine vehicles may use  $l = 2.5$  m.”**

*Annex 3, paragraph 3.1.2.1.2.2., amend to read:*

“3.1.2.1.2.2. ...

If devices or measures described in paragraph 3.1.2.1.4.2. ~~can be~~ **are** used to control transmission operation for the purpose of achieving test requirements, calculate  $a_{\text{wot}}$  test using the equation: ...”

Annex 3, paragraph 3.1.2.1.4., amend to read:

“3.1.2.1.4. Gear ratio selection

The selection of gear ratios for the test depends on their specific acceleration potential  $a_{wot}$  under full throttle condition, according to the reference acceleration  $a_{wot\ ref}$  required for the full throttle acceleration test.

**If the vehicle allows different transmission setups like automatic or manual gear selection and/or ~~Some vehicles may have~~ has different software programs or modes ~~for the transmission~~ (e.g. sporty, winter, adaptive). ~~If the vehicle has different modes~~ leading to valid accelerations, the vehicle manufacturer shall prove to the satisfaction of the Technical Service, that the vehicle is tested in the mode which achieves an acceleration being closest to  $a_{wot\ ref}$ .**

**The vehicle transmission, gear, or gear ratio may be controlled by electronic or mechanical measures to avoid the activation of a kick-down function.”**

**Appendix 3, Figure 3a to Figure 3e, give gear selection criteria and test run criteria for categories  $M_1$  and  $M_2$  having a technically permissible maximum laden mass not exceeding 3.500 kg and for category  $N_1$ , in a flowchart form as an aid to test operation.”**

Annex 3, paragraph 3.1.2.1.4.1. (e), amend to read:

“3.1.2.1.4.1. (e) ...

If rated engine speed is exceeded in a gear ratio before the vehicle passes BB' the next higher gear shall be used. **If the next higher gear results in an acceleration below  $a_{urban}$ , the vehicle test speed,  $v_{test}$ , shall be reduced by 2.5 km/h and the gear ratio selection shall proceed as specified by the options given in this paragraph. In no case shall the vehicle test speed be reduced below 40 km/h. In this case, a gear ratio is allowed even if  $a_{wot\ test}$  does not exceed  $a_{urban}$ .”**

Annex 3, paragraph 3.1.2.2., amend to read:

“3.1.2.2. Vehicles of categories  $M_2 > 3.500$  kg technically permissible maximum laden mass,  $M_3$ ,  $N_2$ ,  $N_3$

The path of the centreline of the vehicle shall follow line CC' as closely as possible throughout the entire test, from the approach to line AA' until the rear of the vehicle passes line BB'. The test shall be conducted without a trailer or semi-trailer. If a trailer is not readily separable from the towing vehicle the trailer shall be ignored when considering the crossing of line BB'. If the vehicle incorporates equipment such as a concrete mixer, a compressor, etc., this equipment shall not be in operation during the test. The test mass of the vehicle shall be according to the table of paragraph 2.2.1.

**The value of  $n_{BB'}$  and  $v_{BB'}$  used in the determination of gear and vehicle speed selection shall be the average of the four  $n_{BB', j}$  and  $v_{BB', j}$  values during each valid measurement run.**

**The value of  $n_{BB'}$  shall be reported to a precision of 10 revolutions per minute. The reported  $n_{BB'}$  shall be used in all subsequent calculation.**

**The value of  $v_{BB'}$  shall be reported to the first digit after the decimal (xx,x). The reported  $v_{BB'}$  shall be used in all subsequent calculation...”**

Annex 3, paragraph 3.1.2.2.1., amend to read:

“3.1.2.2.1. Gear ratio selection

**It is the responsibility of the manufacturer to determine the correct manner of testing to achieve the required conditions.**

**The vehicle transmission, gear, or gear ratio, shall be chosen to be able to fulfil the target conditions according to 3.1.2.2.1.1. or 3.1.2.2.1.2. The vehicle transmission, gear, or gear ratio may be controlled by electronic or mechanical measures including exclusion of kick-down function.**

**Appendix 3, Figure 4a to Figure 4d, give gear selection criteria and test run criteria for categories M<sub>2</sub> having a technically permissible maximum laden mass exceeding 3,500 kg, and for category N<sub>2</sub>, M<sub>3</sub> and N<sub>3</sub>, in a flowchart as an aid to test operation.”**

Annex 3, paragraph 3.1.2.2.1.1., amend to read:

“3.1.2.2.1.1. ~~Vehicles with manual transmissions~~ **Manual transmission, automatic transmissions, adaptive transmissions or transmissions with continuously variable gear ratios (CVTs) tested 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  $v_{\text{test}}$ , two gears shall be tested, one above and one below  $v_{\text{test}}$ . The target engine speed shall be reached in any condition.~~

The following conditions for fulfilling the target conditions in 3.1.2.2. are possible:

- (a) If one gear choice fulfils both target conditions for the rotational engine speed  $n_{\text{target BB'}}$  and for the vehicle speed  $v_{\text{target BB'}}$ , test with that gear.
- (b) If more than one gear choice fulfils both target conditions for the rotational engine speed  $n_{\text{target BB'}}$  and for the vehicle speed  $v_{\text{target BB'}}$ , test in gear  $i$  that gives velocity  $v_{\text{BB' gear } i}$  closest to 35 km/h.
- (c) If two gear choices fulfil both target conditions for the rotational engine speed  $n_{\text{target BB'}}$  and for the vehicle speed  $v_{\text{target BB'}}$ , and fulfil the following condition.

$$(v_{\text{target BB'}} - v_{\text{BB' gear } i}) = (v_{\text{BB' gear } i+1} - v_{\text{target BB'}})$$

then both gears are taken for further calculation of  $L_{\text{urban,bb}}$

- (d) If one gear choice fulfils the target condition for the rotational engine speed  $n_{\text{target BB'}}$  but not the target condition for the vehicle speed  $v_{\text{target BB'}}$ , use two gears, gear<sub>x</sub> and gear<sub>y</sub>. The target conditions for the vehicle speed for these two gears are as follows:

gear<sub>x</sub>

$$25 \text{ km/h} \leq v_{\text{BB'x}} \leq 30 \text{ km/h}$$

and

gear<sub>y</sub>

$40 \text{ km/h} \leq v_{BB'y} \leq 45 \text{ km/h}$

Both gears, gear<sub>x</sub> and gear<sub>y</sub> shall fulfil the target rotational engine speed  $n_{\text{target BB}'}$ . Both gears shall be used for further calculation of  $L_{\text{urban}}$ .

If only one of the gears fulfils the target rotational engine speed,  $n_{\text{target BB}'}$ , test with that gear. This gear shall be used for further calculation of  $L_{\text{urban}}$ .

- (e) If none of the two gears fulfils the target rotational engine speed  $n_{\text{target BB}'}$  under condition d) then condition f) shall be chosen.
- (f) If no gear choice fulfils the target rotational engine speed choose the gear that fulfils the target vehicle velocity  $v_{\text{target BB}'}$  and is closest to the target rotational engine speed  $n_{\text{target BB}'}$ , but not higher than  $n_{\text{target BB}'}$ .

$v_{BB' \text{ gear } i} = v_{\text{target BB}'}$

$n_{BB' \text{ gear } i} \leq n_{\text{target BB}'}$

A stable acceleration condition shall be insured. If a stable acceleration cannot be insured in a gear, this gear shall be disregarded. In all conditions, the rated engine speed shall not be exceeded while the reference point of the vehicle is in the measurement zone. If the rated engine speed is exceeded within the measurement zone, this gear shall be disregarded.”

Annex 3, paragraph 3.1.2.2.1.2., amend to read:

“3.1.2.2.1.2. ~~Vehicles with automatic transmissions, adaptive transmissions CVTs~~ Automatic transmission, adaptive transmissions, and transmissions with variable gear ratio tested with non-locked gear ratios”

~~If the vehicle includes a transmission design, which provides only a single gear selection (drive), which limits engine speed during the test, the vehicle shall be tested using only a target vehicle speed. If the vehicle uses an engine and transmission combination that does not fulfil paragraph 3.1.2.2.1.1., the vehicle shall be tested using only the target vehicle speed. The target vehicle speed for the test is  $v_{BB'} = 35 \text{ km/h} \pm 5 \text{ km/h}$ . A gear change to a higher range and a lower acceleration is allowed after the reference point of the vehicle passes line PP'. Two tests shall be performed, one with the end speed of  $v_{\text{test}} = v_{BB'} + 5 \text{ km/h}$ , and one with the end speed of  $v_{\text{test}} = v_{BB'} - 5 \text{ km/h}$ . The reported sound level is that result which is related to the test with the highest engine speed obtained during the test from AA' to BB'.~~

The gear selector position for full automatic operation shall be used.

The test may then include a gear change to a lower range and a higher acceleration. A gear change to a higher range and a lower acceleration is not allowed. In any case a gear change to a gear ratio that is typically not used at the specified condition as defined by the manufacturer in urban traffic shall be avoided.

Therefore, it is permitted to establish and use electronic or mechanical devices, including alternative gear selector positions, to prevent a

downshift to a gear ratio that is typically not used at the specified test condition as defined by the manufacturer in urban traffic.

The following conditions for fulfilling the target conditions in 3.1.2.2. are possible:

(a) If the choice of the gear selector position fulfils both target conditions for the rotational engine speed  $n_{\text{target BB'}}$  and for the vehicle speed  $v_{\text{target BB'}}$ , test with the gear selector in that position.

(b) If the choice of the gear selector position fulfils the target condition for the rotational engine speed  $n_{\text{target BB'}}$  but not the target condition for the vehicle speed  $v_{\text{target BB'}}$ , change the target condition for the vehicle speed to two vehicle target speeds as follows:

Define  $v_{\text{BB'1}}$  as

$$25 \text{ km/h} \leq v_{\text{BB'1}} \leq 35 \text{ km/h}$$

and

Define  $v_{\text{BB'2}}$  as

$$35 \text{ km/h} \leq v_{\text{BB'2}} \leq 45 \text{ km/h}.$$

Conduct two tests, one with  $v_{\text{BB'1}}$  and one with  $v_{\text{BB'2}}$ .

Both test conditions are used for further calculation of  $L_{\text{urban}}$ .

(c) If under condition b) the target rotational engine speed  $n_{\text{target BB'}}$  cannot be fulfilled, condition d) shall be chosen.

(d) If the choice of the gear selector position cannot fulfil the target condition for the rotational engine speed  $n_{\text{target BB'}}$  but the target condition for the vehicle speed  $v_{\text{target BB'}}$ , change the target condition for the vehicle speed to two vehicle target speeds as follows:

Define  $v_{\text{BB'1}}$  as

$$25 \text{ km/h} \leq v_{\text{BB'1}} \leq 30 \text{ km/h}$$

and

Define  $v_{\text{BB'2}}$  as

$$40 \text{ km/h} \leq v_{\text{BB'2}} \leq 45 \text{ km/h}.$$

Conduct two tests, one with  $v_{\text{BB'1}}$  and one with  $v_{\text{BB'2}}$ .

Use the test where  $n_{\text{BB'}}$  is closest to the target rotational engine speed  $n_{\text{target BB'}}$  but not higher than  $n_{\text{target BB'}}$ .

$$n_{\text{BB' } i} \leq n_{\text{target BB'}} \text{ for } i = 1, 2$$

If the vehicle cannot fulfil the condition:

$$n_{\text{BB' } i} \leq n_{\text{target BB'}} \text{ for } i = 1, 2$$

condition e) shall be used.

(e) If the choice of the gear selector position cannot fulfil the target conditions for the rotational engine speed  $n_{\text{target BB'}}$  and the target

condition for the vehicle speed  $v_{\text{target BB}'}$ , change the target condition for the vehicle speed to the following:

$$v_{\text{BB}'} = v_{\text{target BB}'} + 5 \text{ km/h}$$

Conduct the test with that vehicle speed  $v_{\text{BB}'}$  where  $n_{\text{BB}'}$  is closest to the target rotational engine speed  $n_{\text{target BB}'}$ . A gear change to a higher range and a lower acceleration is allowed after the vehicle passes line PP'.

- (f) If the vehicle includes a transmission design that provides only a single gear selection (D) that limits engine speed during the test, the vehicle shall be tested using only the target vehicle speed  $v_{\text{target BB}'}$ .”

*Annex 3, new paragraph 3.1.2.2.1.3., amend to read:*

**“3.1.2.2.1.3. Powertrain with no combustion engine rotational engine speed available**

Vehicles with a powertrain where no combustion engine rotational engine speed is available shall fulfil only the target condition for the vehicle speed  $v_{\text{target BB}'}$

The following conditions for fulfilling the target condition  $v_{\text{target BB}'}$  in 3.1.2.2. are possible.

- (a) If no rotational engine speed is available, it is necessary to fulfil only the target vehicle speed  $v_{\text{target BB}'}$ .
- (b) If no rotational engine speed is available and the target vehicle speed  $v_{\text{target BB}'}$  cannot be fulfilled, two test conditions shall be conducted as follows:

$v_{\text{BB}'1}$  for the first test condition is defined as

$$25 \text{ km/h} \leq v_{\text{BB}'1} \leq 35 \text{ km/h}$$

and

$v_{\text{BB}'2}$  for the second test condition is defined as

$$35 \text{ km/h} \leq v_{\text{BB}'2} \leq 45 \text{ km/h}$$

Both test conditions are used for further calculation of  $L_{\text{urban}}$ .

- (c) If no rotational engine speed is available and the target vehicle speed  $v_{\text{target BB}'}$  and  $v_{\text{BB}'1}$  defined as

$$25 \text{ km/h} \leq v_{\text{BB}'1} \leq 35 \text{ km/h}$$

cannot be fulfilled, it is necessary to conduct, only one test with  $v_{\text{BB}'2}$  where  $v_{\text{BB}'2}$  is defined as

$$35 \text{ km/h} \leq v_{\text{BB}'2} \leq 45 \text{ km/h}$$

The test condition for  $v_{\text{BB}'2}$  is taken for further calculation of  $L_{\text{urban}}$ .”

*Annex 3, paragraph 3.1.2.2.2., amend to read:*

**“3.1.2.2.2. Acceleration test**

When the reference point of the vehicle reaches the line AA' the accelerator control shall be fully depressed (without operating the automatic downshift to a lower range than normally used in urban driving) ~~and held fully depressed~~

~~until the rear of the vehicle passes BB', but the reference point shall be at least 5 m behind BB'. The accelerator control shall then be released, and held fully engaged until the reference point reaches BB' + 5 m. The acceleration control unit can then be released on request of the manufacturer..."~~

*Annex 3, paragraph 3.1.3., amend to read:*

“3.1.3. For vehicles of categories  $M_1$  and  $M_2$  having a maximum authorized mass not exceeding 3,500 kg, and category  $N_1$  ~~The~~ the maximum A-weighted sound pressure level indicated during each passage of the vehicle between the two lines AA' and BB' shall be rounded **to the first significant digit after the decimal place (e.g. XX,X).**

**For vehicles of category  $M_2$  having a maximum authorized mass exceeding 3,500 kg and categories  $M_3$ ,  $N_2$ , and  $N_3$  the maximum A-weighted sound pressure level indicated during each passage of the reference point of the vehicle between line AA' and line BB' + 5 m shall be rounded, to the first significant digit after the decimal place (e.g. XX,X).**

If a sound peak obviously out of character with the general sound pressure level is observed, the measurement shall be discarded. 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 first four valid consecutive measurement results, within 2 dB(A), allowing for the deletion of non-valid results (see paragraph 2.1.), shall be used for the calculation of the final result for the given side of the vehicle. The results of each side shall be averaged separately. The intermediate result is the higher value of the two averages mathematically rounded to the first decimal place.

The speed measurements at AA', BB', and PP' shall be noted and used in calculations to the first significant digit after the decimal place.

The calculated acceleration  $a_{wot\ test}$  shall be noted to the second digit after the decimal place.”

*Annex 3, paragraph 3.1.3.2., amend to read:*

“3.1.3.2. ...

When ~~the result of one test condition gear is used tested~~ the final result  $L_{urban}$  is equal to the intermediate result.

When ~~the results of two test conditions gears are used tested~~ the arithmetic mean of the intermediate results **of the two averages for each side of the two conditions** shall be calculated. **The final result  $L_{urban}$  is the higher value of the two calculated averages.**”

*Annex 3, Appendix 3, amend to read:*

“Annex 3 – Appendix

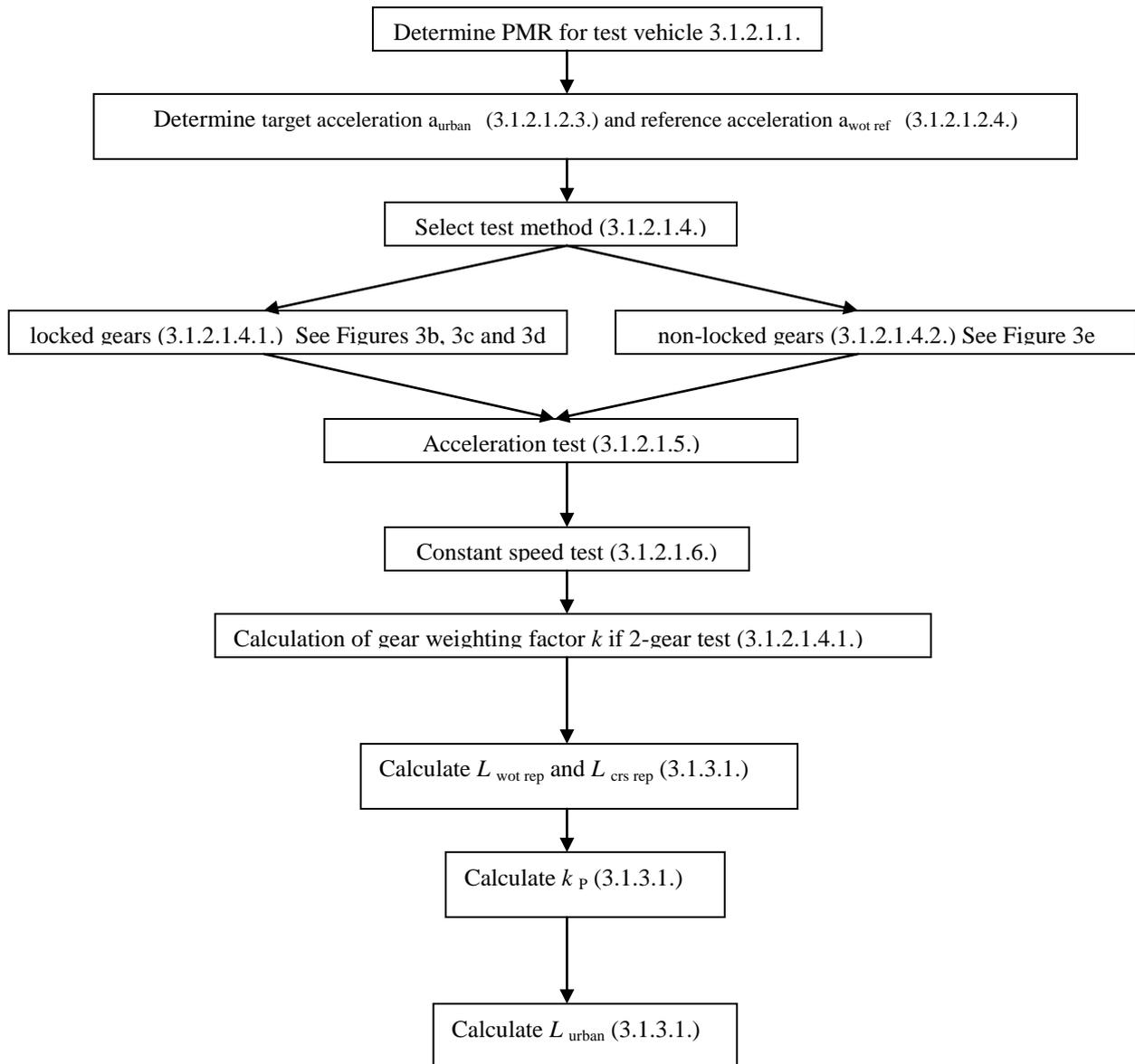
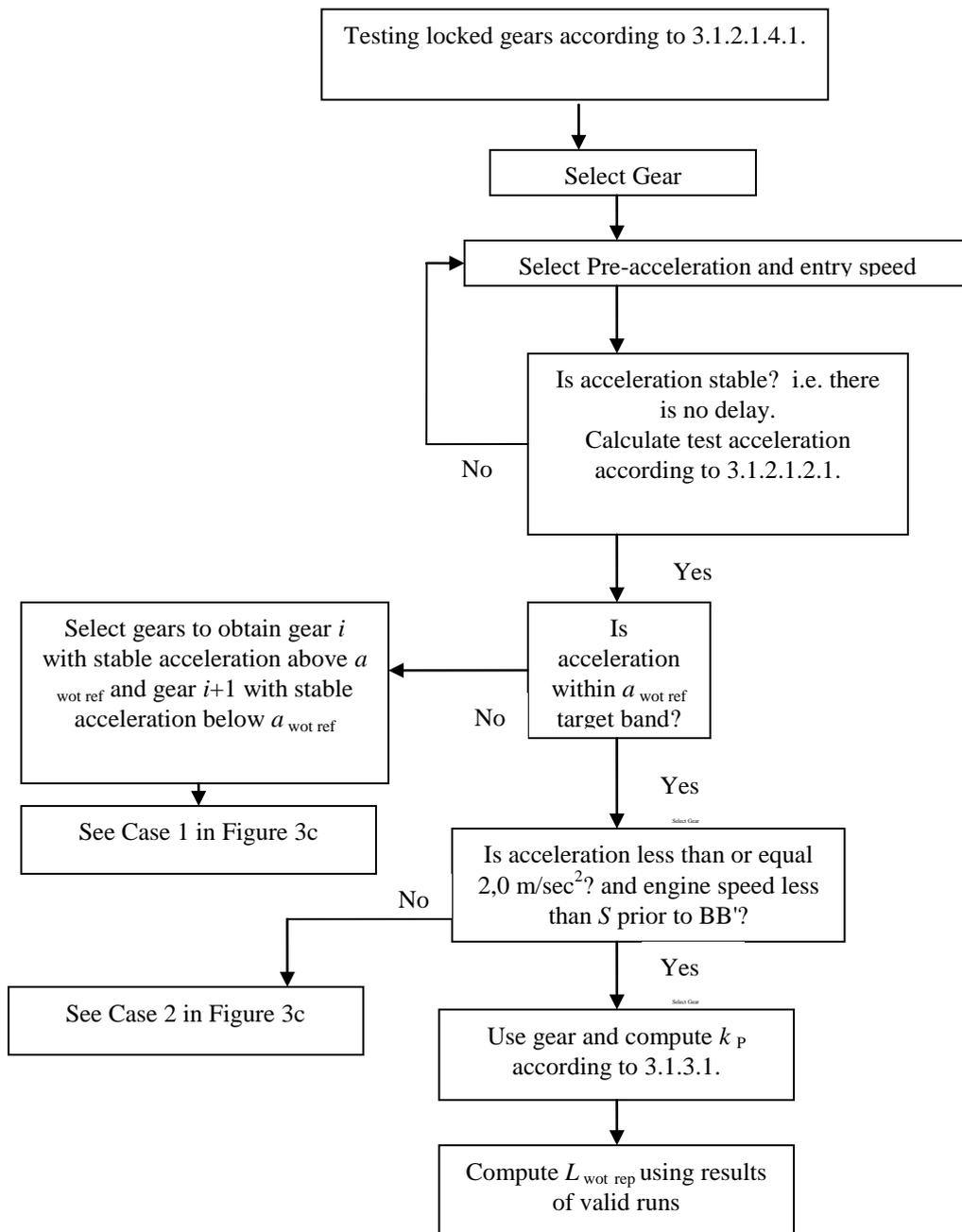


Figure 3a [Flowchart for vehicles tested according to 3.1.2.1. –  $L_{urban}$  computation]



**Figure 3b [Flowchart for vehicles tested according to 3.1.2.1. – Gear selection using locked gear PART 1]**

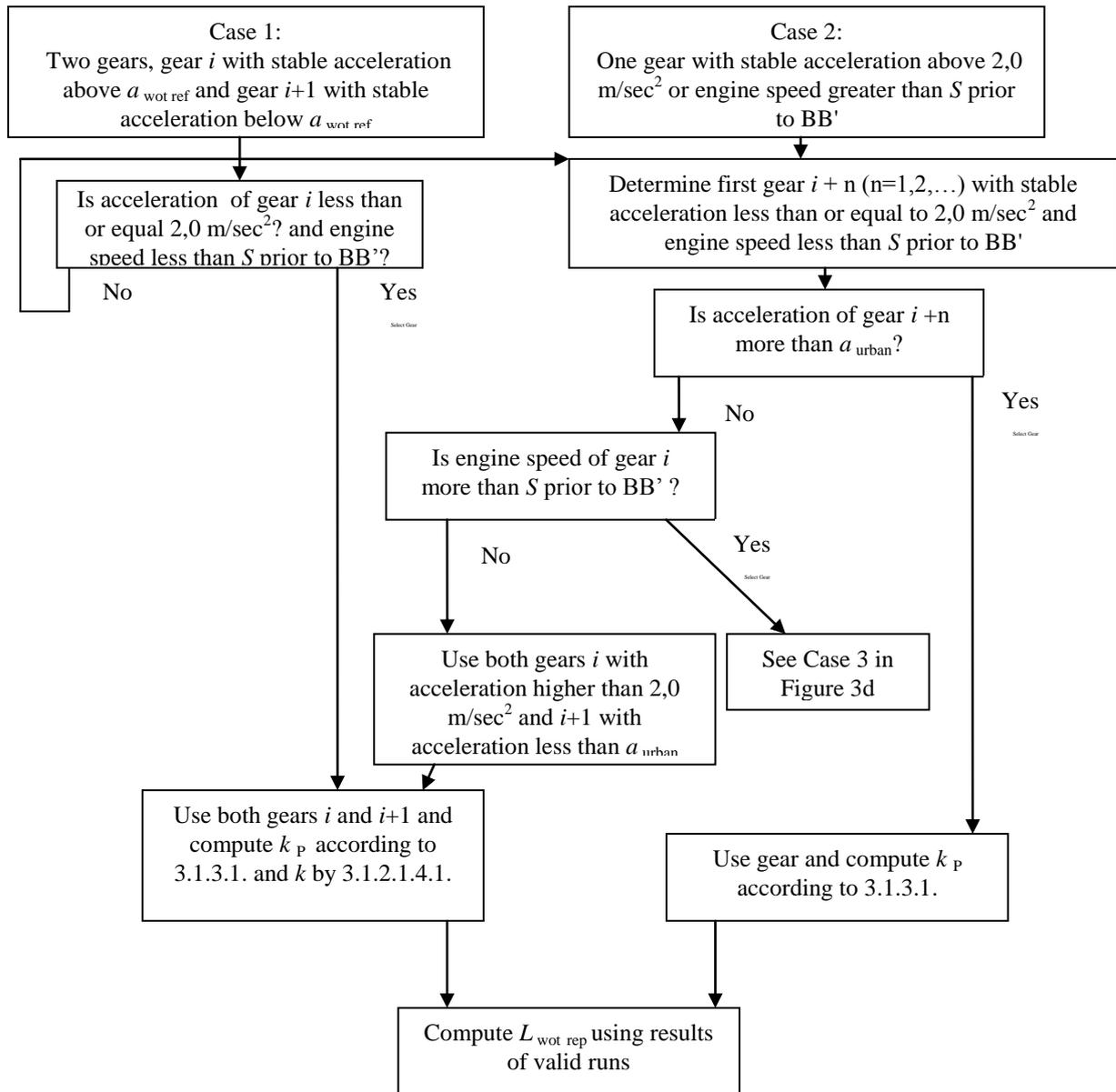


Figure 3c [Flowchart for vehicles tested according to 3.1.2.1. – Gear selection using locked gear PART 2]

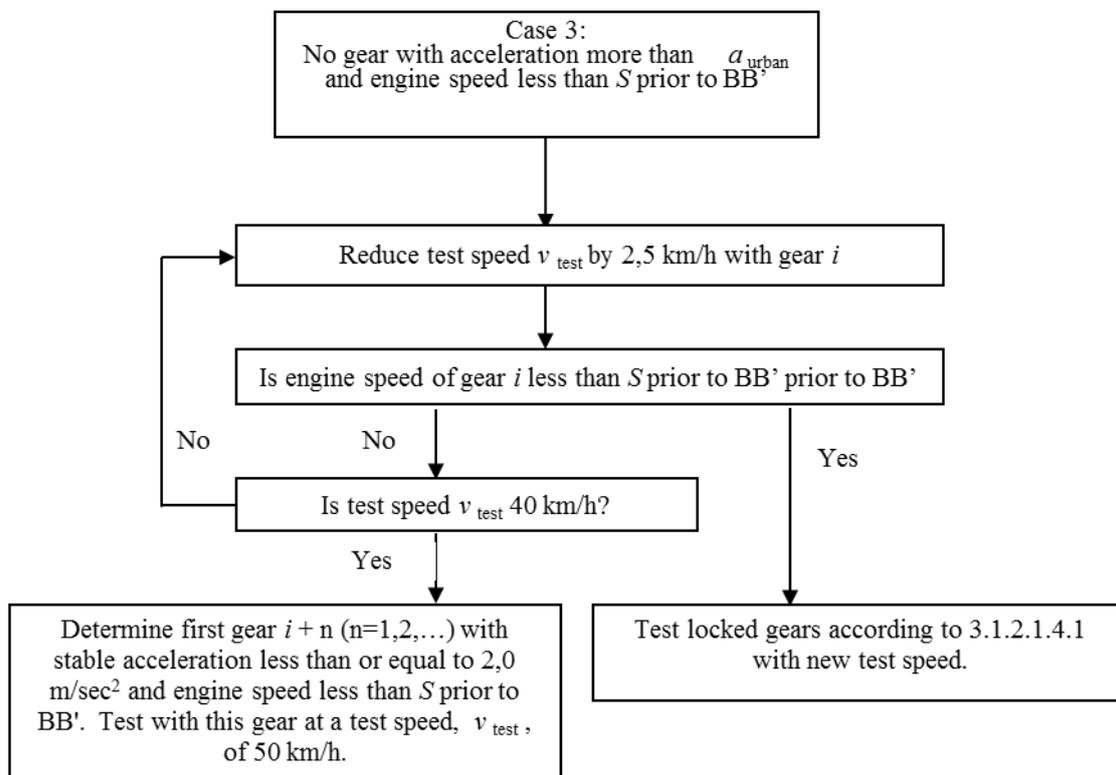
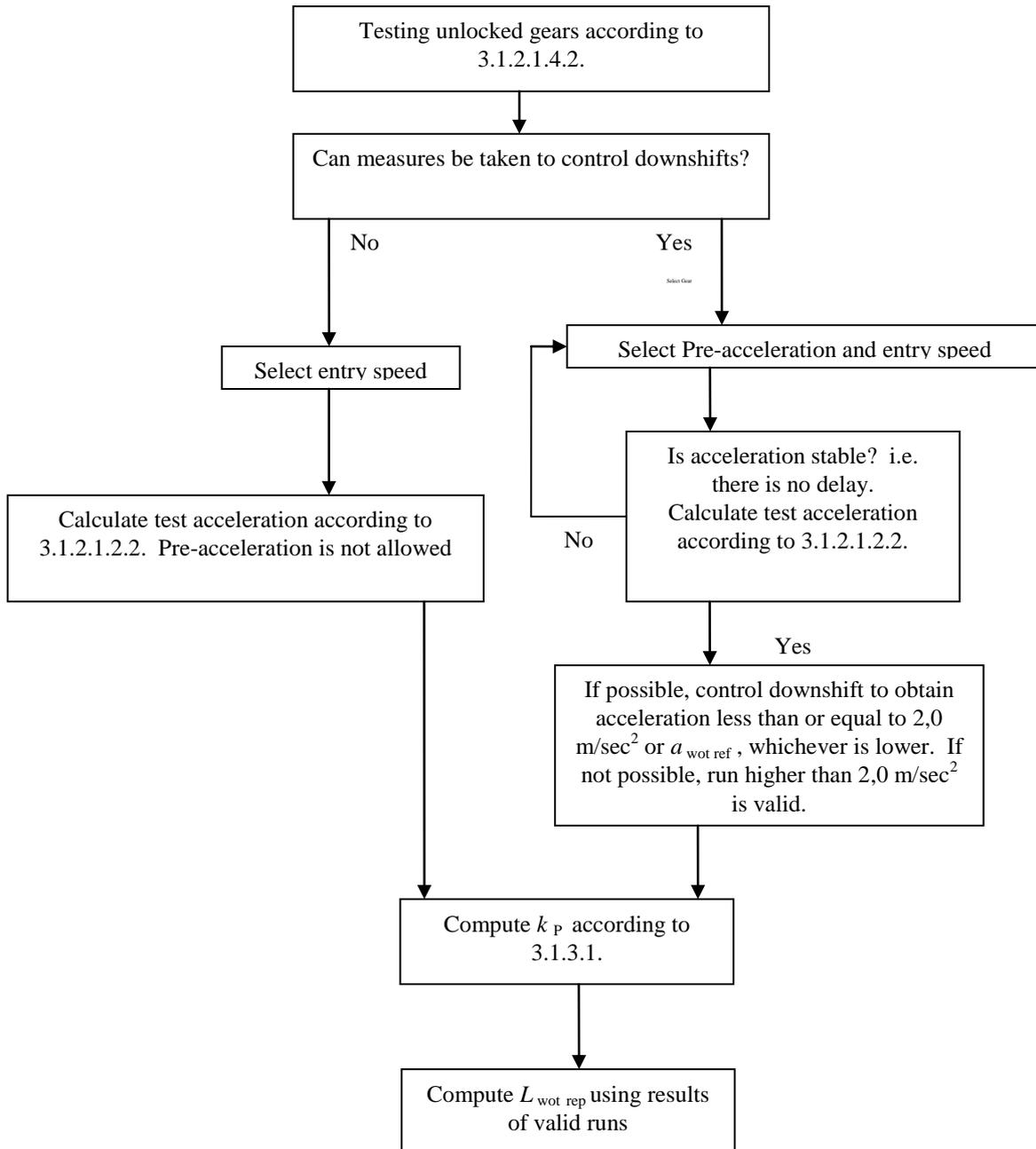


Figure 3d [Flowchart for vehicles tested according to 3.1.2.1. – Gear selection using locked gear PART 3]



**Figure 3e [Flowchart for vehicles tested according to 3.1.2.1 – Gear Selection using non-locked gears]**

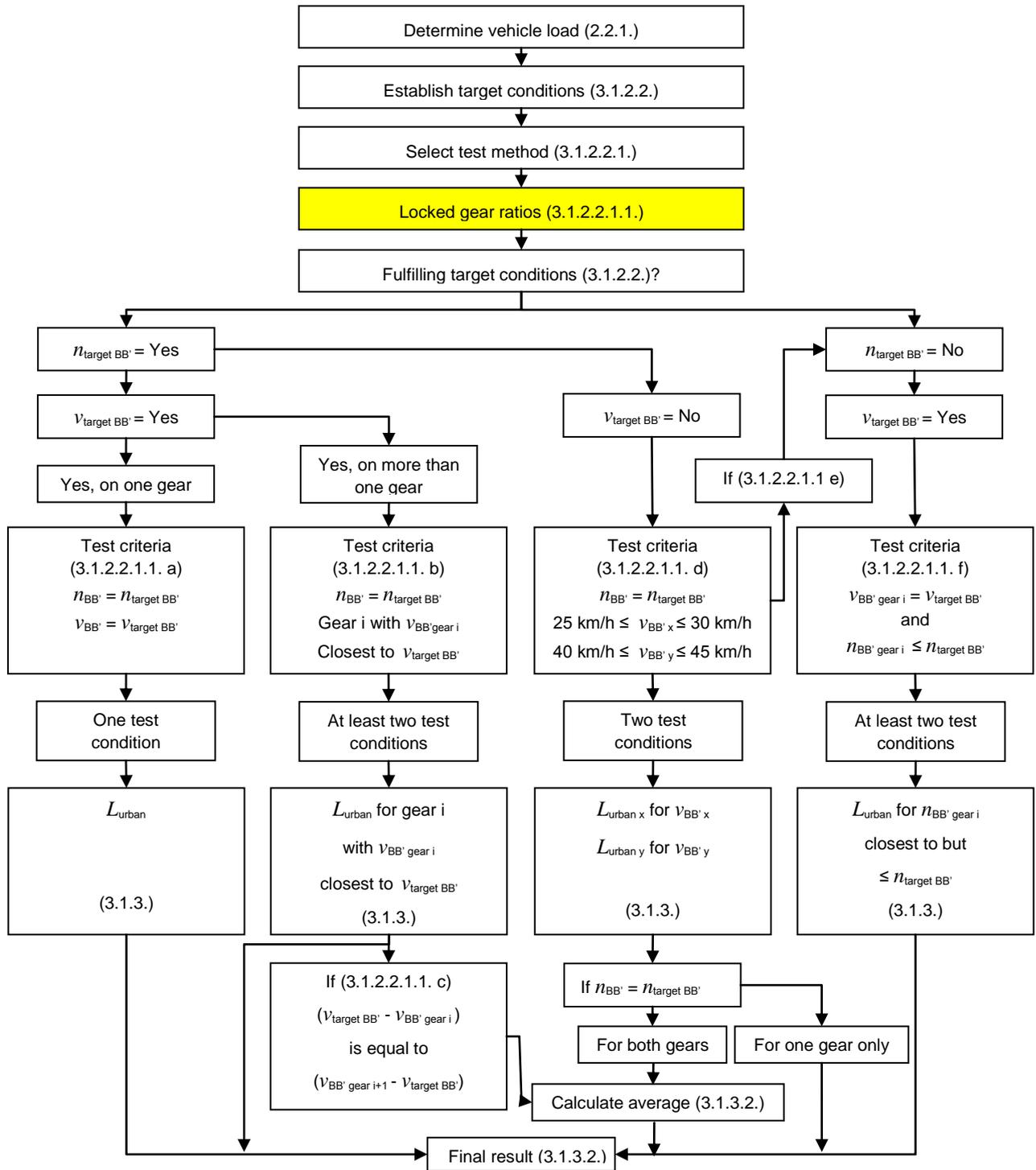


Figure 4a [Flowchart for vehicles tested according to 3.1.2.2. – Test in locked gears]

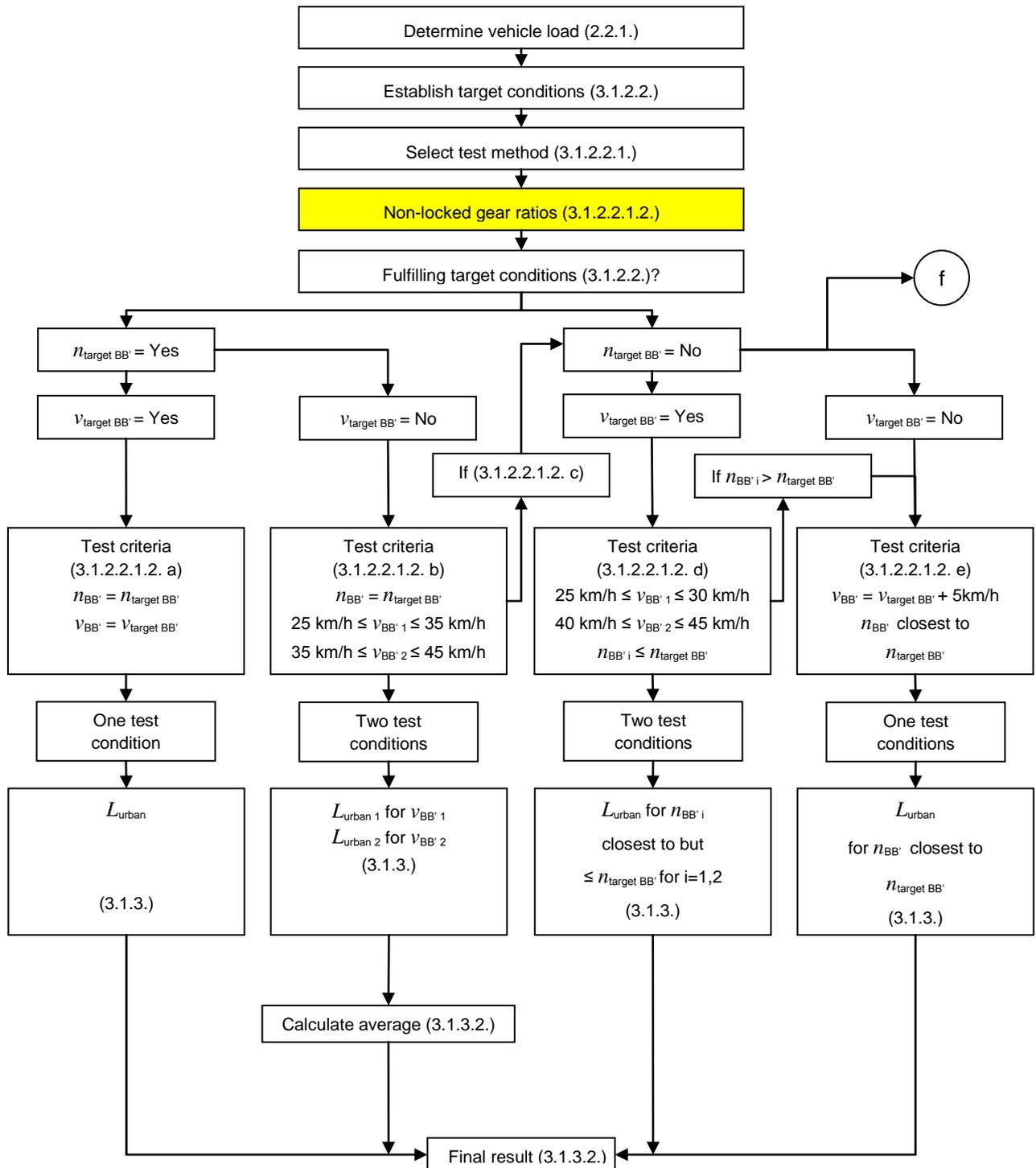
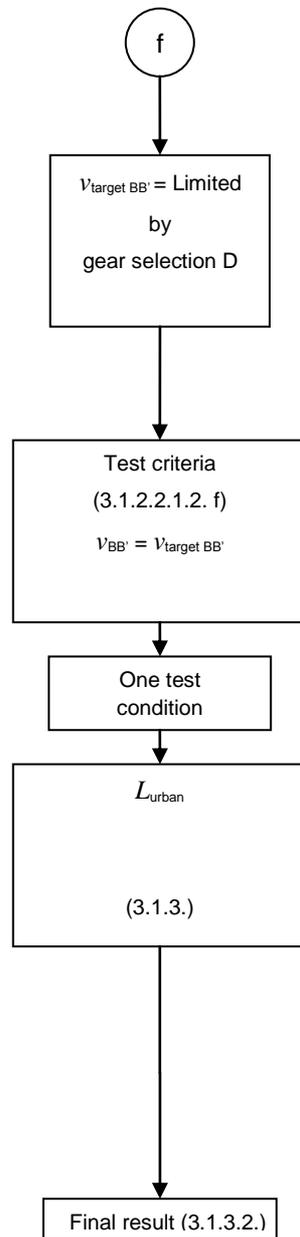


Figure 4b [Flowchart for vehicles tested according to 3.1.2.2. – Test in non-locked gears PART 1]



**Figure 4c [Flowchart for vehicles tested according to 3.1.2.2. – Test in non-locked gears PART 2]**



“ Broaden the window for the target vehicle speed  $v_{\text{target BB}'}$  for vehicles of category  $M_2 > 3,500$  kg technically permissible maximum laden mass and for vehicles of category  $N_2, M_3$  and  $N_3$ .

The target vehicle velocity  $v_{\text{target BB}'}$  is defined as  $v_{\text{target BB}'} = 35 \text{ km/h} \pm 5 \text{ km/h}$  which results in a window for the velocity  $v_{\text{BB}'}$ , when the reference point passes line  $BB'$ , from 30 km/h to 40 km/h. If the target vehicle velocity  $v_{\text{target BB}'}$  is changed into two target vehicle velocities, a lower and a higher one, the following is meant: The lower target vehicle velocity is defined as the target vehicle velocity  $v_{\text{target BB}'}$  reduced by 5 km/h ( $v_{\text{target BB}'} - 5 \text{ km/h}$ ) which results in a window for the velocity  $v_{\text{BB}' 1}$ , when the reference point passes line  $BB'$ , from 25 km/h to 35 km/h.

$$25 \text{ km/h} \leq v_{\text{BB}' 1} \leq 35 \text{ km/h}.$$

The higher target vehicle velocity is defined as the target vehicle velocity  $v_{\text{target BB}'}$  increased by 5 km/h ( $v_{\text{target BB}'} + 5 \text{ km/h}$ ) which results in a window for the velocity  $v_{\text{BB}' 2}$ , when the reference point passes line  $BB'$ , from 35 km/h to 45 km/h.

$$35 \text{ km/h} \leq v_{\text{BB}' 2} \leq 45 \text{ km/h}.”$$

Annex 7, paragraph 2.3., amend to read:

“2.3. Control range

...

gears  $k \leq \text{gear ratio } i$  as determined in Annex 3

If the vehicle, in the lowest valid gear, does not achieve the maximum engine speed below 70 km/h, the vehicle speed limit is 80 km/h.”

Annex 7, paragraph 3.1., amend to read:

“3.1. Determination of the anchor point for each gear ratio

For measurements in gear  $i$  and lower, the anchor point consists of the maximum sound level  $L_{\text{woti}}$ , the reported engine speed  $n_{\text{woti}}$  and vehicle speed  $v_{\text{woti}}$  at  $BB'$  of gear ratio  $i$  of the acceleration test in Annex 3.

$$L_{\text{anchor},i} = L_{\text{woti,Annex 3}}$$

$$n_{\text{anchor},i} = n_{\text{BB,woti,Annex 3}}$$

$$v_{\text{anchor},i} = v_{\text{BB,woti,Annex 3}}$$

~~For measurements in gear  $i+1$  the anchor point consists of the maximum sound level  $L_{\text{woti}+1}$ , the reported engine speed  $n_{\text{woti}+1}$  and vehicle speed  $v_{\text{woti}+1}$  at  $BB'$  of gear ratio  $i+1$  of the acceleration test in Annex 3.~~

~~$$L_{\text{anchor},i+1} = L_{\text{woti}+1, \text{Annex 3}}$$~~

~~$$n_{\text{anchor},i+1} = n_{\text{BB,woti}+1, \text{Annex 3}}$$~~

~~$$v_{\text{anchor},i+1} = v_{\text{BB,woti}+1, \text{Annex 3}}”$$~~

## II. Justification

Paragraphs 2.2.1.1. and 2.2.2.1.

1. The type definition should be restricted to those body components and insulation material which are relevant for the sound emission.

Paragraph 2.8.1.

2. Introduction of a definition to allow the determination of the overall power of all available propulsion sources.

Paragraph 2.11.2.

3. The proposed wording is a simplification for front engine vehicles, to allow more easy and practical access to the reference point.

Paragraph 2.12.

4. A sentence was added to clarify that for the calculation of the power all propulsion sources need to be considered.

Paragraph 2.19.

5. Clarification on the components that are considered to constitute the silencing system.

Paragraph 2.20.

6. Clarification that this paragraph applies to exhaust systems (only relevant for Annex 4).

Paragraph 2.21.

7. Clarification that this paragraph applies to exhaust systems.

Paragraph 2.22.

8. Definition for "R-point" has been added, necessary for sub-classes mentioned by this Regulation.

Paragraph 2.23.

9. Table with symbols and further definitions and tolerances added for the test procedures for all vehicle categories according to Annexes 3 and 7.

Paragraph 6.23.

10. The original sentence for "bigger  $N_1$ " was a first approach to exempt  $N_1$  based on a commercial vehicle platform from ASEP. The new proposed wording is overtaken from the limit specifications which now includes  $N_1$  based on a commercial vehicle platform more precise and in addition covers those variants that fall under the  $M_1$  category (which is the very minor part of an  $N_1$  platform).

Paragraphs 11.2.3.; 11.3.3.; 11.4.3.

11. Date corrected by one day to have a precise transient from one phase to the next phase. Correction was made in 11.3.3. and 11.4.3. to ensure that this transitional provision is setting and end date and not a starting date. The correct phrasing is "until".

Paragraphs 11.8.

12. China has presented in (addendum documents) the specific need for Chinese micro vans and micro trucks which are primarily designed for Chinese rural areas. China proposes to accept this amendment to support the progress in harmonization between UN Regulations and Chinese standards (GB), to enable the adoption of UN Regulation No. 51 in China at a later stage. In order to allow Contracting Parties to study the impact and further necessity of this special vehicle class, it is suggested to apply a time limit to the

application of this provision. The IWG adopted this amendment, with a reservation of Japan. Japan asked for more time to investigate the impact on the Japanese market. The IWG suggests further negotiation within GRB.

Annex 3, paragraph 2.1.

13. The reference to ISO10844 should be updated to the latest revision. As presented by ISO to GRB, this last update does not change the specifications; most changes are of editorial nature.

Annex 3, paragraph 2.2.1.

14. Clarification on the masses, especially on the difference between the target mass and the test mass of the vehicle for vehicles of category  $M_2 > 3,500$  kg technically permissible maximum laden mass,  $M_3$ ,  $N_2$  and  $N_3$ .

Annex 3, new paragraph 2.2.7. and subparagraphs

15. Paragraph 2.2.7. was added to assist in the calculation of the mass of the extra loading for vehicles of category  $N_2$  and  $N_3$  and for incomplete vehicles of category  $M_2$  and  $M_3$ . It makes the work to prepare the vehicles for the tests much easier for all engineers and test authorities who have to conduct tests with heavy commercial vehicles according to the 03 series of amendments to UN Regulation No. 51.

Annex 3, paragraph 3.1.2.1.

16. Additional test provisions to reflect potential lower speed testing for low powered vehicles according paragraph 3.1.2.1.4.1. (e).

Annex 3, paragraph 3.1.2.1.1.

17. Additional sentence added to specify how to determine the overall power in case of vehicles with more than one propulsion system and to specify more precise the mass of the vehicle for the determination of the PMR.

Annex 3, paragraph 3.1.2.1.2.

18. Simplification was added for practical reasons when performing the measurements.

Annex 3, paragraph 3.1.2.1.2.2.

19. Clarification that this specification is only applicable, if transmission control devices “are” used. It is not possible to know if a vehicle can be tested with external controls, only that is either has been tested this way or not. If a manufacturer states it is not possible to test with measures described in 3.1.2.1.4.2., how should they prove this? There is no positive proof that can be given.

Annex 3, paragraph 3.1.2.1.4.

20. Clarification on the transmission setup and the modes to achieve accelerations closest to  $a_{wot\ ref}$ . After the introduction of the flowcharts (Figures 3a to 3e) in Annex 3 Appendix 3 for vehicles of categories  $M_1$  and  $M_2$  having a maximum authorized mass not exceeding 3,500 kg and for category  $N_1$  there is a need to connect them to the right paragraph in Annex 3.

Annex 3, paragraph 3.1.2.1.4.1. (e)

21. Amendment to account for very low powered vehicles, to ensure that they can be tested at accelerations sufficiently high.

Annex 3, paragraph 3.1.2.2.,

22. Technical clarification and rounding procedure was added for interim values.

Annex 3, paragraph 3.1.2.2.1.

23. Clarification, the added text is needed to determine the correct manner of testing to achieve the required conditions laid down in paragraphs 3.1.2.2.1.1., 3.2.2.1.2. and 3.1.2.2.1.3.

24. After the introduction of the flowcharts (Figure 4a to 4d) in Annex 3 Appendix 3 for vehicles of categories  $M_2$  having a technically permissible maximum laden mass exceeding 3,500 kg, and for category  $N_2$ ,  $M_3$  and  $N_3$ , there is a need to connect them to the right paragraph in Annex 3.

Annex 3, paragraphs 3.1.2.2.1.1. and 3.1.2.2.1.2.

25. The titles changed to accurately reflect condition and harmonize with  $M_1/N_1$ . In addition, the test schedule was re-written to be more precise how to determine the correct gear for testing and enhanced by further specifications to ensure worldwide testing of all products. This structure is in line with the introduced flowcharts introduced to the Appendix in Annex 3.

Annex 3, paragraph 3.1.2.2.1.3.

26. This paragraph has been added to make sure that electrical and hybrid electrical vehicles with powertrains with no combustion engine rotational engine speed available can perform the required test.

Annex 3, paragraphs 3.1.2.2.2. and 3.1.3.

27. This point has been discussed in GRB and in the IWG in conjunction with paragraph 6.2.2.4. The actual text is not very clear when to stop a measurement for long trucks or busses. The actual wording could lead to a testing until the vehicle reaches or even exceeds rated engine speed at the end of the test track. It is not necessary to the test to release "as rapidly as possible". In fact, this is irrelevant as the measurement should be terminated as soon as the rear of the vehicle passes BB". For clarification, it was added that the maximum A-weighted sound pressure level shall be noted to the first significant digit after the decimal place.

Annex 3, paragraph 3.1.3.2.

28. According to paragraphs 3.1.2.2.1.1., 3.1.2.2.1.2. and 3.1.2.2.1.3. where certain test conditions are required, this paragraph needed to be revised to change the term "gear" to "test condition".

Annex 3, Appendix, Figures 3a to 3e and Figures 4a to 4d

29. The flowcharts have been added to assist test engineers in the correct selection of test modes and the calculation of test results for the pass-by tests of Annex 3.

Annex 3, Appendix

30. Clarification on the target vehicle speed  $v_{\text{target BB}}$  as used in paragraphs 3.1.2.2.1.1., 3.1.2.2.1.2. and 3.1.2.2.1.3.

Annex 7, paragraph 2.3.

31. Correction on the gear selection. New working ensures that lower gears and higher engine speeds are tested.

Annex 7, paragraph 3.1.

32. According to the specification in Annex 7, paragraph 2.3. (control range) on the gears to be used, tests in gear higher than gear  $i$  are not foreseen. Thus the anchor point in gear  $i+1$  is not needed.

