

Proposal for a new Supplement to the original version of UN Regulation No. 154 (Worldwide harmonized Light vehicles Test Procedures (WLTP))

The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

I. Proposal

Paragraph 1.2., amend to read:

"1.2. Scope for Level 1B;

This Regulation applies to the type approval of vehicles of categories M₂ and N₁ with a technical permissible maximum laden mass not exceeding 3,500 kg and to all vehicles of category M₁ with regard to the WLTP Type 1 test for emissions of gaseous compounds, particulate matter, **particle number** and to emissions of carbon dioxide and fuel efficiency and/or the measurement of electric energy consumption and electric range and to the Type 4 test on evaporative emissions.

In addition, this Regulation lays down rules for verifying the durability of pollution control devices and On-Board Diagnostic (OBD) systems.

OVC-FCHVs are out of the scope of Level 1B of this Regulation."

Justification: Japan regional new requirement (introduction of PN limit).

[Editorial note: now that there is a requirement for PN measurement in both Level 1A and Level 1B it makes the references to “if PN measurement is required” throughout the UNR (x16) redundant. Do we need to itemise them separately to update the UNR or can a mass change be made?]

Paragraph 6.3.10., Table 1B, amend to read:

"Table 1B

This table is only applicable for L1B
Emissions limits for the Type 1 test

		technically permissible maximum laden mass (GVW) (kg)	Limit values														
			Mass of carbon monoxide (CO)		Mass of non- methane hydrocarbons (NMHC)		Mass of oxides of nitrogen (NO _x)			Mass of particulate matter (PM)		Particle Number (PN)					
			L ₁ (mg/km)		L ₃ (mg/km)		L ₄ (mg/km)			L ₅ (mg/km)		L ₆ (#/km)					
Category	Class		G, O	D			G, O	D	G	D	O			G*1, O	D	G*1, O	D
M	—	All	1,150	630			100	24	50	150	150			5	5	6.0 × 10 ¹¹	6.0 × 10 ¹¹
N ₁ , N ₂	—*2	GVW ≤ 1,700	1,150	630			100	24	50	150	150			5	5	6.0 × 10 ¹¹	6.0 × 10 ¹¹
	—	1,700 < GVW ≤ 3,500	2,550	630			150	24	70	240	240			7	7	6.0 × 10 ¹¹	6.0 × 10 ¹¹
	—*3	All	4,020	—			100	—	50	—	150			5	—	6.0 × 10 ¹¹	—

G Petrol, LPG

D Diesel

O Other fuel

¹ For petrol or LPG, particulate mass **and particle number** limits shall apply only to vehicles with direct injection engines.

² Except vehicles having engine displacement less than or equal to 0.660 litre, vehicle length less than or equal to 3.40m, vehicle width less than or equal to 1.48m, and vehicle height less than or equal to 2.00m, seats less than or equal to 3 in addition to a driver, and payload less than or equal to 350kg.

³ Vehicles having engine displacement less than or equal to 0.660 litre, vehicle length less than or equal to 3.40m, vehicle width less than or equal to 1.48m, and vehicle height less than or equal to 2.00m, seats less than or equal to 3 in addition to a driver, and payload less than or equal to 350kg."

Justification: Japan regional new requirement (introduction of PN limit) and correction of previous error (relating to N₂).

Paragraph 6.7.2. Table 3b, amend to read:

"Table 3b
This table is only applicable for Level 1B
Additive Deterioration factors ^{*5}

Engine Category	Assigned additive deterioration factors					
	CO		NMHC	NO _x		PM
Gasoline fuel and LPG	0.11		0.12	0.21		0.00
Compression-ignition	As there are no assigned deterioration factors for compression ignition vehicles, manufacturers shall use the whole vehicle ageing durability test procedures to establish deterioration factors.					

Category		Class	Technically Permissible Maximum Laden Mass (GVW) (kg)	Assigned additive deterioration factors										
				Mass of carbon monoxide (CO)		Mass of non-methane hydrocarbons (NMHC)		Mass of oxides of nitrogen (NO _x)			Mass of particulate matter (PM)		Particle Number (PN)	
				L ₁ (mg/km)	D, O	L ₃ (mg/km)	D, O	L ₄ (mg/km)	G, D, O	L ₅ (mg/km)	G*1, D, O	L ₆ (#/km)	G*1, D, O	
M	—	All	127		12		11		*4	0		0		
N ₁	—*2	GVW ≤ 1,700	1276.50	*4	12	*4	11	*4		0	*4	0	*4	
	—	1,700 < GVW ≤ 3,500	281		18		15			0		0		
	—*3	All	327	—	9	—	8	—		0	—	0	—	

G Petrol, LPG

D Diesel

O Other fuel

¹ For petrol or LPG, particulate mass and particle number limits shall apply only to vehicles with direct injection engines.

² Except vehicles having engine displacement less than or equal to 0.660 litre, vehicle length less than or equal to 3.40m, vehicle width less than or equal to 1.48m, and vehicle height less than or equal to 2.00m, seats less than or equal to 3 in addition to a driver, and payload less than or equal to 350kg.

³ Vehicles having engine displacement less than or equal to 0.660 litre, vehicle length less than or equal to 3.40m, vehicle width less than or equal to 1.48m, and vehicle height less than or equal to 2.00m, seats less than or equal to 3 in addition to a driver, and payload less than or equal to 350kg.

⁴ As there are no assigned deterioration factors for compression ignition vehicles, manufacturers shall use the whole vehicle ageing durability test procedures to establish deterioration factors.

⁵ In case that limit value is different from the value defined in Table 1B, the assigned additive deterioration factor shall be calculated using the following equation and shall be rounded according to approval authority instruction:

$$\text{the assigned additive deterioration factor} = \text{Limit value} * A * (\text{Useful life} - 3,000) / (80,000 - 3,000)$$

where :

A 0.11 for CO, 0.12 for NMHC, 0.21 for NO_x and 0.00 for PM and PN"

Justification: Japan regional new requirement (introduction of PN limit) and relevant sections of the UNR and editorial correction.

Paragraph 8.2.4.1., amend to read:

"8.2.4.1. For Level 1A:

At the request of the manufacturer and with the acceptance of the responsible authority, a run-in test procedure may be carried out on a vehicle of the CoP family to establish derived run-in factors for criteria emissions, CO₂ emissions and/or electric energy consumption according to the test procedure in Appendix 3.

For Level 1B:

At the request of the manufacturer and with the acceptance of the responsible authority, a run-in test procedure may be carried out on a vehicle of the CoP family to establish derived run-in factors for **criteria emissions**, fuel efficiency and/or electric energy consumption according to the test procedure in Appendix 3."

Justification: Japan regional new requirement (introduction of PN limit) and relevant sections of the UNR.

Appendix 2

Paragraph 3.4., amend to read:

"3.4. For Level 1A only:

~~For vehicles referred to in paragraph 5.11. of this Regulation the accuracy $x_{i,OBFCM}$ of the OBFCM device shall be determined for each single test i in accordance with the formulae in paragraph 4.2. of Appendix 5.~~

For vehicles referred to in paragraph 5.11. of this Regulation the conformity of production of OBFCM devices as defined in paragraph 2.1. of Appendix 5 shall be evaluated as follows:

- (1) **For each single test i performed for the purposes of paragraph 3. of this Appendix the accuracy x_i of the OBFCM device shall be determined in accordance with paragraph 4.2. of Appendix 5.**
- (2) **The conformity of production of the OBFCM devices shall be evaluated according to the requirements of paragraph 3.3.1., but applying a factor A value of [1.05].**
- (3) **If for the last test N performed for the purposes of paragraph 3. the decision (iii) of paragraph 3.3.1. with regard to the conformity of production of the OBFCM devices is reached, the sequence of tests shall be continued until a final decision (i) or (ii) of paragraph 3.3.1. is reached.**

The Type Approval authority shall keep a record of the determined accuracies of OBFCM device at each test as well as the decision according to paragraph 3.3.1. after each test.

Justification: From the time that OBFCM provisions have been introduced in the Euro 6 legislation the OBFCM accuracy has been monitored for Conformity of Production in order to collect data to establish an accuracy requirement.

Appendix 3

Paragraph 1.2.1., amend to read:

"1.2.1. For ~~Level 1B~~ **the run-in factor for fuel efficiency** only:

Extension of run-in factor

At the request of the vehicle manufacturer including technical evidence and with confirmation by the responsible authority, the derived run-in factor can be extended to other interpolation families."

Appendix 3 Paragraph 1.8., amend to read:

"1.8. After the run-in, the test vehicle shall be tested according to the Type 1 test procedure specified in Annex B6 and Annex B8. The test shall be repeated until the following number of valid test results have been obtained:

For Level 1A **and Level 1B criteria emissions**: three tests

For Level 1B **fuel efficiency and/or electric energy consumption** : two tests

Drive trace indexes ..."

Appendix 3 Paragraph 1.11., amend to read:

"1.11. ~~For Level 1A only:~~

For the determination of the run-in factor for all applicable criteria emissions, the coefficients $C_{RI,c}$ and $C_{const,c}$ shall be calculated with a least squares regression analysis to four significant digits on all valid tests before and after the run-in:

..."

Appendix 3 Paragraph 1.12., amend to read:

"1.12. ~~For Level 1A only:~~

The run-in factor $RI_c(j)$ for criteria emission component C of CoP test vehicle j shall be determined by the following equation:

..."

Justification: Japan regional new requirement (introduction of PN limit) and relevant sections of the UNR.

Paragraph 2., amend to read:

"2. For Level 1B only

Prior to the application of the derived run-in factor **for fuel efficiency**, the manufacturer shall provide the following information to the responsible authority.

(a) evidence ..."

Justification: Editorial correction

Annex A1

Insert new paragraph 3.3.2.10.; to read:

"

3.3.2.10.	Type of coolant : air/liquid (1)
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"

Insert new paragraph 3.3.10.; to read:

"

3.3.10.	Electric energy converters
3.3.10.1	Electric energy converter between the electric machine and traction REESS
3.3.10.1.1	Make :
3.3.10.1.2	Type :
3.3.10.1.3	Nominal power : W
3.3.10.2	Electric energy converter between the traction REESS and low voltage power supply
3.3.10.2.1	Make :
3.3.10.2.2	Type :
3.3.10.2.3	Nominal power : W
3.3.10.3	Electric energy converter between the recharge-plug-in and traction REESS
3.3.10.3.1	Make :
3.3.10.3.2	Type :
3.3.10.3.3	Nominal power : W

"

Insert new paragraph 3.4.4.7.; to read:

"

3.4.4.7.	Type of coolant : air/liquid ⁽¹⁾
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"

Insert new paragraph 3.4.5.6.; to read:

"

3.4.5.6.	Cooling system: Motor: liquid/air (1) Controller: liquid/air (1)
3.4.5.6.1.	Liquid-cooling equipment characteristics:
3.4.5.6.1.1.	Nature of the liquid circulating pumps: yes/no (1)
3.4.5.6.1.2.	Characteristics or make(s) and type(s) of the pump:
3.4.5.6.1.3.	Thermostat: setting:
3.4.5.6.1.4.	Radiator: drawing(s) or make(s) and type(s):
3.4.5.6.1.5.	Relief valve: pressure setting:
3.4.5.6.1.6.	Fan: characteristics or make(s) and type(s):
3.4.5.6.1.7.	Fan duct:
3.4.5.6.2.	Air-cooling equipment characteristics
3.4.5.6.2.1.	Blower: characteristics or make(s) and type(s):
3.4.5.6.2.2.	Standard air ducting:

3.4.5.6.2.3.	Temperature regulating system: yes/no (1)
3.4.5.6.2.4.	Brief description:
3.4.5.6.2.5.	Air filter: make(s): type(s):
3.4.5.6.3.	Temperatures admitted by the manufacturer (maximum)
3.4.5.6.3.1.	Motor outlet:° C
3.4.5.6.3.2.	controller inlet:° C
3.4.5.6.3.3.	at motor reference point(s):° C
3.4.5.6.3.4.	at controller reference point(s):° C

"

Insert new paragraph 3.4.11.; to read:

"

3.4.11.	Electric energy converters
3.4.11.1	Electric energy converter between the electric machine and traction REESS
3.4.11.1.1	Make :
3.4.11.1.2	Type :
3.4.11.1.3	Nominal power : W
3.4.11.2	Electric energy converter between the traction REESS and low voltage power supply
3.4.11.2.1	Make :
3.4.11.2.2	Type :
3.4.11.2.3	Nominal power : W
3.4.11.3	Electric energy converter between the recharge-plug-in and traction REESS
3.4.11.3.1	Make :
3.4.11.3.2	Type :
3.4.11.3.3	Nominal power : W

"

Justification: additions to the Information Document to add the type of coolant of the motor, the type of coolant of the REESS, and the electric energy converters in the vehicle as these are IP family criteria for HEVs and PEV but the information is not currently declared in the Information Document.

Annex A1, Appendix 1, Part I, Paragraph 2.1.1.2.1., amend to read:

"2.1.1.2.1. CO₂ emission of vehicles with at least one combustion engine, of NOVC-HEV and of OVC-HEV in the case of a charge-sustaining Type 1 test

For each driver selectable mode tested the points below have to be repeated (predominant mode or best case mode and worst case, mode if applicable)

Test 1

<i>CO₂ emission</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Extra High</i>	<i>Combined</i>
Measured value $M_{CO_2,p,1} / M_{CO_2,e,2}$					- [Editorial note: the "-" above has been struck-through]
Speed and distance corrected value $M_{CO_2,p,1b,2b} / M_{CO_2,e,2b}$					
RCB correction coefficient: ⁽⁵⁾					
$M_{CO_2,p,3} / M_{CO_2,e,3}$					
Regeneration factors (Ki) Additive					
Regeneration factors (Ki) Multiplicative					
$M_{CO_2,e,4}$			-		
$AF_{Ki} = M_{CO_2,e,3} / M_{CO_2,e,4}$			-		
$M_{CO_2,p,4} / M_{CO_2,e,4}$					-
ATCT correction (FCF) ⁽⁴⁾					
Temporary values $M_{CO_2,p,5} / M_{CO_2,e,5}$					
Declared value	-	-	-	-	
$d_{CO_2}^1 * \text{declared value}$	-	-	-	-	

"

Annex A1, Appendix 1, Part II, Paragraph 2.1.2., amend to read:

"2.1.2. CO₂ emission of vehicle with at least one combustion engine, of NOVC-HEV and of OVC-HEV in case of a charge-sustaining tests

<i>CO₂ emission (g/km)</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Extra High</i>	<i>Combined</i>
Measured value $M_{CO_2,p,1} / M_{CO_2,e,2}$					- [Editorial note: the "-" above has been struck-through]
Measured Speed and distance corrected value $M_{CO_2,p,1b,2b} / M_{CO_2,e,2b}$					
RCB correction coefficient ⁽²⁾					
$M_{CO_2,p,3} / M_{CO_2,e,3}$					

"

Annex A1, Appendix 1, Part II, Paragraph 2.2.2., amend to read:

"2.2.2. CO₂ emission of vehicle with at least one combustion engine, of NOVC-HEV and of OVC-HEV in case of a charge-sustaining tests

<i>CO₂ emission (g/km)</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>	<i>Extra High</i>	<i>Combined</i>
Measured value $M_{CO_2,p,1} / M_{CO_2,c,2}$					- [Editorial note: the "-" above has been struck-through]
Measured Speed and distance corrected value $M_{CO_2,p,1b} / M_{CO_2,c,2b}$					
RCB correction coefficient (²)					
$M_{CO_2,p,3} / M_{CO_2,c,3}$					

"

Justification: Editorial corrections and correction of errors

Annex B2

Paragraph 6. (as introduced by Supp.1), amend to read:

"6. Calculation tools

Examples of gear shift calculating tools can be found in the same webpage as this Regulation.¹

The following tools are provided:

- (a) ACCESS based tool,
- (b) Matlab code tool
- (c) NET ~~core~~ **framework** tool
- (d) Python based tool**

These tools were validated by the comparison of calculation results between the ACCESS tool, the Matlab code, ~~and~~ the .NET ~~core~~ **framework** code **and the Python based tool** for 115 different vehicle configurations supplemented by additional calculations for 7 of them with additional options like "apply speed cap", "suppress downscaling", "choose other vehicle class cycle" and "choose individual n_{min_drive} values".

The 115 vehicle configurations cover extreme technical designs for transmission and engines and all vehicle classes.

All ~~three~~ **four** tools deliver identical results with respect to gear use and clutch operation and although only the text in Annexes B1 and B2 is legally binding the tools have achieved a status that qualifies them as reference tools."

Justification: addition of a new verified tool and editorial correction

Annex B3

Paragraph 3.1., Table A3/1, amend to read:

"3.1. Gasoline/Petrol (nominal 90 RON, E0)

Table A3/1

This table is only applicable for Level 1B;

Gasoline/petrol (nominal 90 RON, E0)

<i>Fuel property or substance name</i>	<i>Unit</i>	<i>Standard</i>		<i>Test method</i>
		<i>Minimum</i>	<i>Maximum</i>	
Research octane number, RON		90.0	92.0	JIS K2280 ^a
Motor octane number, MON		80.0	82.0	JIS K2280 ^a
Density	g/cm ³	0.720	0.734	JIS K2249-1,2,3 ^a
Vapour pressure	kPa	56	60	JIS K2258-1,2 ^a
Distillation:				
— 10 % distillation temperature	K (°C)	318 (45)	328 (55)	JIS K2254 ^a
— 50 % distillation temperature	K (°C)	353 (80)	368 (95)	JIS K2254 ^a
— 70 % distillation temperature	K (°C)		393 (120)	JIS K2254 ^a
— 90 % distillation temperature	K (°C)	413 (140)	433 (160)	JIS K2254 ^a
— final boiling point	K (°C)		468 (195)	JIS K2254 ^a
— olefins	% v/v	15	25	JIS K2536-1,2 ^a
— aromatics	% v/v	20	45	JIS K2536-1,2,3 ^a
— benzene	% v/v		1.0	JIS K2536-2,3,4 ^a
Oxygen content		not to be detected		JIS K2536-2,4,6 ^a
Existent gum	mg/100ml		5	JIS K2261 ^a
Sulphur content	wt ppm		10	JIS K2541-1,2,6,7 ^a
Lead content		not to be detected		JIS K2255 ^a
Ethanol		not to be detected		JIS K2536-2,4,6 ^a
Methanol		not to be detected		JIS K2536-2,4,5,6 ^a
MTBE		not to be detected		JIS K2536-2,4,5,6 ^a
Kerosene		not to be detected		JIS K2536-2,4 ^a

^a Other method that is traceable to national or international standard may be used. "

Paragraph 3.3., Table A3/3, amend to read:

"3.3. Gasoline/petrol (nominal 100 RON, E0)

Table A3/3

This table is only applicable for Level 1B;

Gasoline/petrol (nominal 100 RON, E0)

Fuel Property or Substance Name	Unit	Standard		Test method
		Minimum	Maximum	
Research octane number, RON		99.0	101.0	JIS K2280 ^a
Motor octane number, MON		86.0	88.0	JIS K2280 ^a
Density	g/cm ³	0.740	0.754	JIS K2249-1,2,3 ^a
Vapour pressure	kPa	56	60	JIS K2258-1,2 ^a
Distillation:				
— 10 % distillation temperature	K (°C)	318 (45)	328 (55)	JIS K2254 ^a
— 50 % distillation temperature	K (°C)	353 (80)	368 (95)	JIS K2254 ^a
— 70 % distillation temperature			393 (120)	JIS K2254^a
— 90 % distillation temperature	K (°C)	413 (140)	433 (160)	JIS K2254 ^a
— final boiling point	K (°C)		468 (195)	JIS K2254 ^a
— olefins	% v/v	15	25	JIS K2536-1,2 ^a
— aromatics	% v/v	20	45	JIS K2536-1,2,3 ^a
— benzene	% v/v		1.0	JIS K2536-2,3,4 ^a
Oxygen content		not to be detected		JIS K2536-2,4,6 ^a
Existent gum	mg/100ml		5	JIS K2261 ^a
Sulphur content	wt ppm		10	JIS K2541-1,2,6,7 ^a
Lead content		not to be detected		JIS K2255 ^a
Ethanol		not to be detected		JIS K2536-2,4,6 ^a
Methanol		not to be detected		JIS K2536-2,4,5,6 ^a
MTBE		not to be detected		JIS K2536-2,4,5,6 ^a
Kerosene		not to be detected		JIS K2536-2,4 ^a

^a Other method that is traceable to national or international standard may be used. "

Justification: Japan regional new requirement (introduction of PN limit) and relevant other sections of the UNR.

Paragraph 5.1., Table A3/14, amend to read:

"5.1. J-Diesel (nominal 53 Cetane, B0)

Table A3/14

This table is only applicable for Level 1B;

J-Diesel (nominal 53 cetane, B0)

Fuel Property or Substance Name	Units	Specification		Test method
		Minimum	Maximum	
Cetane number Cetane index		53	57	JIS K2280 ^a
Density	g/cm ³	0.824	0.840	JIS K2249 ^a
Distillation:				
— 50 % distillation temperature	K (°C)	528 (255)	568 (295)	JIS K2254 ^a
— 90 % distillation temperature	K (°C)	573 (300)	618 (345)	JIS K2254 ^a
— final boiling point	K (°C)		643 (370)	JIS K2254 ^a
Flash point	K (°C)	331(58)		JIS K2265–3 ^a
Kinematic viscosity at 30 °C	mm ² /s	3.0	4.5	JIS K2283 ^a
All aromatic series	vol %		25	JIS Method HPLC ^a
Polycyclic aromatic hydrocarbons	vol %		5.0	JIS Method HPLC ^a
Sulphur content	wt ppm		10	JIS K2541-1,2,6,7 ^a
FAME	%		0.1	Method prescribed in the Japanese concentration measurement procedure announcement ^a
Triglyceride	%		0.01	Method prescribed in the Japanese concentration measurement procedure announcement ^a

^a Other method that is traceable to national or international standard may be used. "

Justification: Editorial correction

Paragraph 7., Table A3/19, amend to read:

"7. Technical data on fuels for Type 4 test on evaporative emissions
Table A3/19

Petrol reference fuel for Type 4 test

Parameter	Unit	Limits		Test method
		Minimum	Maximum	
Research octane number, RON		95.0	98.0	EN ISO 5164 JIS K2280
Density at 15 °C	kg/m ³	743.0	756.0	EN ISO 12185 JIS K2249-1,2,3
Vapour pressure	kPa	56.0	60.0	EN 13016-1 JIS K2258-1,2
Distillation:				
– evaporated at 70 °C	% v/v	34.0	46.0	EN ISO 3405
– evaporated at 100 °C	% v/v	54.0	62.0	EN ISO 3405
– evaporated at 150 °C	% v/v	86.0	94.0	EN ISO 3405
Hydrocarbon analysis:				
– olefins	% v/v	6.0	13.0	EN 22854 JIS K2536-1,2
– aromatics	% v/v	25.0	32.0	EN 22854 JIS K2536-1,2,3
– benzene	% v/v	-	1.00	EN 22854 EN 238 JIS K2536-2,3,4
Oxygen content	% m/m	3.3	3.7	EN 22854 JIS K2536-2,4,6
Sulphur content	mg/kg	—	10	EN ISO 20846 EN ISO 20884 JIS K2541-1,2,6,7
Lead content	mg/l	Not detected		EN 237 JIS K2255
Ethanol	% v/v	9.0	10.0	EN 22854 JIS K2536-2,4,6
MTBE		Not detected		JIS K2536-2,4,5,6 ^a
Methanol		Not detected		JIS K2536-2,4,5,6 ^a
Kerosene		Not detected		JIS K2536-2,4 ^a

^a Other method that is traceable to national or international standard may be used. "

Justification: Editorial correction

Annex B4

Paragraph 4.3.2.5.3., amend to read:

"4.3.2.5.3. Aerodynamic drag modelling

The aerodynamic drag coefficient $C_D(Y)$ shall be modelled as a ~~four-term~~
five-term polynomial as a function of yaw angle Y as in the equation
below:

$$C_D(Y) = a_0 + a_1Y + a_2Y^2 + a_3Y^3 + a_4Y^4$$

..."

Justification: correction of error

Annex B6

Table A6/1, amend to read:

" ...

NOVC-FCHV	-	FCcs Paragraph 4.2.1.2.1. of Annex B8.	FEcs Paragraph 4.2.1.2.1. of Annex B8.	-	-
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..."

Justification: correction of error

Paragraph 2.6.1.4., amend to read:

"2.6.1.4. Gaseous fuel vehicles

Between the tests on the first gaseous reference fuel and the second gaseous reference fuel, for vehicles with positive ignition engines fuelled with LPG or NG/biomethane or so equipped that they can be fuelled with either petrol or LPG or NG/biomethane, the vehicle shall be preconditioned again before the test on the second reference fuel.
~~Between the tests on the first gaseous reference fuel and the second gaseous reference fuel, for vehicles with positive ignition engines fuelled with LPG or NG/biomethane or so equipped that they can be fuelled with either petrol or LPG or NG/biomethane, the vehicle shall be preconditioned again before the test on the second reference fuel."~~

Justification: Editorial correction

Annex B6, Appendix 2

Table A6.App2/1, amend to read:

"Table A6.App2/1

Energy content of fuel (as applicable)

Fuel	Petrol (E0)	Petrol (E10)	Ethanol (E85)	Diesel (B0)	Diesel (B7)	LPG	CNG
Heat value	8.92 kWh/l	8.64 kWh/l	6.41 kWh/l	9.85 kWh/l	9.79 kWh/l	12.86 x ρ kWh/l	11.39 MJ/m³ kWh/m ³

ρ = test fuel density at 15°C (kg/l) "

Justification: correction of error

Annex B6 Appendix 2 Paragraph 3.4., amend to read:

"3.4. Correction of CO₂ mass emission over the whole cycle as a function of the correction criterion *e*

3.4.1. **Reserved**

~~Calculation of the correction criterion *e*~~

~~The correction criterion *e* is the ratio between the absolute value of the electric energy change $\Delta E_{REESS,j}$ and the fuel energy and shall be calculated using the following equations:~~

$$e = \left| \frac{\Delta E_{REESS,j}}{E_{fuel}} \right|$$

~~where:~~

~~*e* is the correction criterion;~~

~~$\Delta E_{REESS,j}$ is the electric energy change of all REESSs over period *j* determined according to paragraph 4.1. of this appendix, Wh;~~

~~*j* is, in this paragraph, the whole applicable WLTP test cycle;~~

~~E_{fuel} is the fuel energy according to the following equation:~~

$$E_{fuel} = 10 \times HV \times FC_{nb} \times d$$

~~where:-~~

~~E_{fuel} is the energy content of the consumed fuel over the applicable WLTP test cycle, Wh;~~

~~HV is the heating value according to Table A6.App2/1, kWh/l;~~

~~FC_{nb} is the non-balanced fuel consumption of the Type 1 test, not corrected for the energy balance, determined according to paragraph 6. of Annex B7, and using the results for criteria emissions and CO₂ calculated in step 2 in Table A7/1, l/100 km;~~

~~*d* is the distance driven over the corresponding applicable WLTP test cycle, km;~~

~~10 is the conversion factor to Wh.~~

3.4.2. The correction shall be applied if ΔE_{REESS} is negative (corresponding to REESS discharging)

At the request of the manufacturer, the correction may be omitted and uncorrected values may be used if:

- (a) ΔE_{REESS} is positive (corresponding to REESS charging);
- (b) the manufacturer can prove to the responsible authority by measurement that there is no relation between ΔE_{REESS} and CO₂ mass emission and ΔE_{REESS} and fuel consumption respectively."

Justification: When GTR No. 15 was transposed to UNR154 it was decided not to apply correction criterion *e* for REESS energy change-based correction procedure under paragraph 3.4.2. of Appendix 2 to Annex B6. Accordingly, paragraph 3.4.1. is no longer necessary and should therefore be deleted, with the heading for paragraph 3.4. also needing to be updated to reflect this change.

Annex B7

Table A7/1, Step 4c, amend to read:

"

4c	Output step 4a	M _{i,c,4a} , g/km; M _{CO₂,c,4a} , g/km.	<p>In the case these values are used for the purpose of conformity of production, the criteria emission values and CO₂ mass emission values shall be multiplied with the run-in factor determined according to paragraph 8.2.4. of this Regulation:</p> $M_{i,c,4c} = RI_C(j) \times M_{i,c,4a}$ $M_{CO_2,c,4c} = RI_{CO_2}(j) \times M_{CO_2,c,4a}$ <p>In the case these values are not used for the purpose of conformity of production:</p> $M_{i,c,4c} = M_{i,c,4a}$ $M_{CO_2,c,4c} = M_{CO_2,c,4a}$	M _{i,c,4c} ; M _{CO₂,c,4c}
			<p>Calculate fuel efficiency (FE_{c,4c_temp}) according to paragraph 6. of Annex B6.</p> <p>In the case this value is used for the purpose of conformity of production, the criteria emission values and the fuel efficiency value shall be multiplied with the run in factor determined according to paragraph 8.2.4. of this Regulation:</p> $M_{i,c,4c} = RI_C(j) \times M_{i,c,4a}$ $FE_{c,4c} = RI_{FE}(j) \times FE_{c,4c_temp}$ <p>In the case these values are not used for the purpose of conformity of production:</p> $FE_{c,4c} = FE_{c,4c_temp}$	M _{i,c,4c} ; FE _{c,4c} , km/l;

"

Justification: Japan regional new requirement (introduction of PN limit) and relevant sections of the UNR.

Paragraph 3.2.1.1.4., amend to read:

"3.2.1.1.4. Flow-weighted arithmetic average concentration calculation

The following calculation method shall be applied for CVS systems that are not equipped with a heat exchanger or for CVS systems with a heat exchanger that ~~do~~ **does** not comply with paragraph 3.3.5.1. of Annex B5.

..."

Justification: Editorial correction

Paragraph 3.2.3.2.2.1., amend to read:

"3.2.3.2.2.1. Mass of an individual vehicle

The test masses of vehicles H and L shall be used as input for the interpolation method.

TM_{ind}, in kg, shall be the ~~individual~~ **an individual** test mass of ~~the an individual~~ vehicle according to paragraph 3.2.25. of this Regulation.

If the same test mass is used for test vehicles L and H, the value of TM_{ind} shall be set to the mass of test vehicle H for the interpolation method."

Justification: Editorial correction

Paragraph 3.2.3.2.2.3.2.1., amend to read:

"3.2.3.2.2.3.2.1. The manufacturer shall ~~submit the declared~~ **declare the** scope of applicable vehicles for the alternative method **to the responsible authority** and the declared scope shall be documented ~~to~~ **in** relevant test reports when evidence of equivalency is shown to the responsible authority. The responsible authority may request the confirmation of equivalency for the alternative method by selecting the vehicle from the scope declared by the manufacturer after equivalency was demonstrated. The result shall fulfil an accuracy for $\Delta(CD \times Af)$ of $\pm 0.015 \text{ m}^2$. This procedure shall be based on wind tunnel measurements fulfilling the criteria of this Regulation. If this procedure is not satisfied, the approval of the alternative method is regarded as invalidated."

Justification: Editorial correction

Paragraph 7.4.2.3., amend to read:

"7.4.2.3. ...

For the city cycle during which the combustion engine starts to consume fuel, the drive indices IWR and RMSSE shall not be calculated individually. Instead, depending on the number of completed city cycles before the city cycle during which the combustion engine starts, the incomplete city cycle shall be combined with the previous city cycles as follows and shall be considered as one cycle in the context of the drive trace index calculations.

..."

Justification: Editorial correction

Annex B8

Table A8/5, Step 4c, amend to read:

"

4c	Output step 4a	$M_{i,CS,c,4a}$, g/km; $M_{CO_2,CS,c,4a}$, g/km.	In the case these values are used for the purpose of conformity of production, the criteria emission values and CO ₂ mass emission values shall be multiplied with the run-in factor RI determined according to paragraph 8.2.4. of this Regulation: $M_{i,CS,c,4c} = RI_C(j) \times M_{i,CS,c,4a}$ $M_{CO_2,CS,c,4c} = RI_{CO_2}(j) \times M_{CO_2,CS,c,4a}$ In the case these values are not used for the purpose of conformity of production: $M_{i,c,4c} = M_{i,c,4a}$ $M_{CO_2,c,4c} = M_{CO_2,c,4a}$	$M_{i,CS,c,4c}$; $M_{CO_2,CS,c,4c}$
			In the case these values are used for the purpose of conformity of production, the criteria emission values shall be multiplied with the run-in factor RI determined according to paragraph 8.2.4. of this Regulation: $M_{i,CS,c,4c} = RI(j) \times M_{i,CS,c,4a}$ Calculate fuel efficiency ($FE_{c,4c_temp}$) according to paragraph 6.14.1. of Annex B6.	$M_{i,CS,c,4c}$; $FE_{c,4c}$, km/l;

			<p>In the case this value is used for the purpose of conformity of production, the fuel efficiency value shall be multiplied with the run in factor determined according to paragraph 8.2.4. of this Regulation: $FE_{c,4c} = RI_{FE} (j) \times FE_{c,4c_temp}$</p> <p>In the case these values are not used for the purpose of conformity of production:</p> <p>$FE_{c,4c} = FE_{c,4c_temp}$</p>	
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"

Justification: Japan regional new requirement (introduction of PN limit) and relevant sections of the UNR.

Paragraph 4.4.1.1., amend to read:

"4.4.1.1. All-electric range AER

The all-electric range AER for OVC-HEVs shall be determined from the charge-depleting Type 1 test described in paragraph 3.2.4.3. of this annex as part of the Option 1 test sequence and is referenced in paragraph 3.2.6.1. of this annex as part of the Option 3 test sequence by driving the applicable WLTP test cycle according to paragraph 1.4.2.1. of this annex. The AER is defined as the distance driven from the beginning of the charge-depleting Type 1 test to the point in time where the combustion engine or fuel cell in the case of OVC-FCHVs starts consuming fuel."

Justification: Editorial correction

Paragraph 4.4.2.1.1., amend to read:

"...

$EC_{DC,WLTC}$ is the weighted electric energy consumption for the applicable WLTP test cycle of the shortened Type 1 test procedure ~~Type 1 test~~, Wh/km;

..."

Justification: Editorial correction

Paragraph 4.4.3., amend to read:

"4.4.3. Charge-depleting cycle range for OVC-HEVs

The charge-depleting cycle range R_{CDC} shall be determined from the charge-depleting Type 1 test described in paragraph 3.2.4.3. of this annex as part of the Option 1 test sequence and is referenced in paragraph 3.2.6.1. of this annex as part of the Option 3 test sequence. The R_{CDC} is the distance driven from the beginning of the charge-depleting Type 1 test to the end of the transition cycle according to paragraph 3.2.4.4. of this annex."

Justification: Editorial correction

Paragraph 4.4.4.1., amend to read:

"...

R_{CDC} is the charge-depleting cycle range according to ~~paragraph 4.4.2.~~ **paragraph 4.4.3.** of this annex, km;

..."

Justification: correction of error

Paragraph 4.4.6.1., amend to read:

"4.4.6.1. Determination of cycle-specific equivalent all-electric range

The cycle-specific equivalent all-electric range shall be calculated using the following equation:

$$EAER = \left(\frac{FC_{CS,declared} - FC_{CD,avg} \times \frac{FC_{CD,declared}}{FC_{CD,ave}}}{FC_{CS,declared}} \right) \times R_{CDC}$$

where:

EAER is the cycle-specific equivalent all-electric range, km;

$FC_{CS,declared}$ is the declared charge-sustaining fuel consumption according to Table A8/7 Step 5, kg/100km;

$FC_{CD,avg}$ is the arithmetic average charge-depleting fuel consumption according to the equation below, kg/100km;

$FC_{CD,declared}$ is the declared charge-sustaining fuel consumption according to Table A8/9a Step 11, kg/100km;

$FC_{CD,ave}$ is the arithmetic average charge-depleting fuel consumption according to ~~the equation below~~ **Table A8/9a, step no. 10**, kg/100km;

R_{CDC} is the charge-depleting cycle range according to paragraph 4.4.2. of this annex, km;

and

$$FC_{CD,avg} = \frac{\sum_{j=1}^k (FC_{CD,j} \times d_j)}{\sum_{j=1}^k d_j}$$

where:

$FC_{CD,avg}$ is the arithmetic average charge-depleting fuel consumption, kg/100 km. In the case of more than one charge-depleting test, the additional average of each test shall be calculated;

$FC_{CD,j}$ is the fuel consumption of phase j of the charge-depleting Type 1 test, kg/100km;

d_j is the distance driven in phase j of the charge-depleting Type 1 test, km;

j is the index number of the considered phase;

k is the number of phases driven up to the end of the transition cycle n according to paragraph 3.2.4.4. of this annex."

Justification: correction of error

Paragraph 4.4.6.2., amend to read:

"...

$FC_{CD,avg,p}$ is the arithmetic average charge-depleting fuel consumption for the considered phase p, ~~g/km~~ **kg/100km**. In the case of more than one charge-depleting test, the additional average of each test shall be calculated, kg/100km;

...

~~For Level 1A;~~

The considered phase shall be the low phase, medium phase, high phase, extra high phase, and the city driving cycle."

Justification: correction of error and editorial correction. The text “For Level 1A;” is superfluous here and could potentially be confusing and lead to misunderstanding of the paragraph as a whole.

Paragraph 4.5.1.1.2., amend to read:

"4.5.1.1.2. The maximum difference in charge-sustaining CO₂ **emissions** allowed over the applicable cycle ..."

Table A8/8, step 5, amend to read:

"

For Level 1A 5	Output step 1	M _{i,CD,j} , g/km; PM _{CD,e} , mg/km; PN _{CD,j} , particles per kilometer.	Calculation of combined values for emissions for n _{veh} cycles; in the case of interpolation for n_{veh,L} cycles for each vehicle in the case that the interpolation method is applied, n_{veh,L} cycles shall be used for n_{veh,H} cycles and n_{veh,M} cycles, if applicable. Output is available for each test. In the case that the interpolation method is applied, the output is available for vehicle H, L and, if applicable, M.	M _{i,CD,e} , g/km; PM _{CD,e} , mg/km; PN _{CD,e} , particles per kilometer.
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"

Justification: Editorial correction

Table A8/9b, step 5, amend to read:

"

5	Output step 1	FC _{CD,j} , kg/100 km n _{veh} ; n _{veh,L} ; UF _{phase,j} ; FC _{CS,declared} , kg/100km; FC _{CD,declared} , kg/100km; FC _{CD,ave} , kg/100km;	Calculation of weighted CO ₂ mass emission and fuel consumption according to paragraphs 4.1.3.1. and 4.2.3. of this annex. Output is available for each CD test. In the case that the interpolation method is applied, n _{veh,L} cycles shall be used. With reference to paragraph 4.1.2. of this annex, M _{CO₂,CD,j} of the confirmation cycle shall be corrected according to Appendix 2 to this annex. In the case that the interpolation method is applied, the output is available for each vehicle H, vehicle L and, if applicable, vehicle M.	FC _{weighted} , kg/100 km;
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"

Justification: correction of error. "vehicle LH" should read "vehicle L".

Annex B8 Appendix 2

Paragraph 2.1. (as amended by Supp.1), amend to read:

"2.1.

In the case that vehicle H was tested for the development of the correction coefficient for CO₂ mass emission for NOVC-HEVs and OVC-HEVs, the

coefficient may be applied to vehicles that fulfil the same interpolation family criteria. For interpolation families which fulfil the criteria of the K_{CO_2} correction **factor** family, defined in paragraph 6.3.11. of this Regulation, the same K_{CO_2} value may be applied."

Justification: Editorial correction

Paragraph 2.2., amend to read:

"2.2.

The correction coefficients determined by the manufacturer shall be reviewed and approved by the responsible authority prior to ~~its~~ **their** application.

If the set of at least five tests ..."

Justification: Editorial correction

Paragraph 3.1.1.3.4., amend to read:

"3.1.1.3.4. To obtain a set of applicable WLTP test cycles required for the determination of the correction coefficients **according to paragraph 2.2. of this appendix**, the test may be followed by a number of consecutive sequences ~~required according to paragraph 2.2. of this appendix~~ **in accordance with the requirements of** paragraph 3.1.1.1. to paragraph 3.1.1.3.3. inclusive of this appendix."

Justification: Editorial correction

Annex C3

Paragraph 4.2.3.4., amend to read:

"4.2.3.4. Calculations

The calculation of net hydrocarbon mass change within the enclosure is used to determine the chamber's hydrocarbon background and leak rate. Initial and final readings of hydrocarbon concentration, temperature and barometric pressure are used ~~in the following formula~~ to calculate the mass change.

The calculation shall be undertaken in accordance **with the equation in paragraph 7. either paragraph 7.1. or alternatively paragraph 7.1.1.** of this annex, using the following value for V.

V is the net enclosure volume, m^3 ."

Justification: Editorial correction. A draft of GTR19 Amendment 3 had an equation in paragraph 4.2.3.4. which was then deleted as it was duplicated in paragraph 7. Paragraph 4.2.3.4. was not then updated to reflect this deletion – hence the need to now update.

Paragraph 8., amend to read:

"8. Test report

...

(e) Measurement of first diurnal, $DL_{1st\ day}$;

(f) Measurement of second diurnal, $DL_{2nd\ day}$;

..."

Justification: Editorial correction. "1st day" and "2nd day" made sub-script.

Annex C4

Paragraph 3.1., amend to read:

"3.1. The vehicle shall be VH. It shall be in good mechanical order; the engine and the anti-pollution devices shall be new. The vehicle may be the same as that presented for the Type 1 test; in this case the Type 1 test has to be done after the vehicle has run at least 3,000 km of the ageing cycle of Appendix 3. **or Appendix 3b (as applicable)** to this annex."

Justification: Editorial correction

Paragraph 6.1., amend to read:

"6.1. Operating cycle
During operation on track, road or on roller test bench, the distance shall be covered according to the driving schedule described in Appendix 3 **or Appendix 3b (as applicable)** of this annex. "

Justification: Editorial correction

Paragraph 6.3.1.1., amend to read:

"6.3.1.1. When the durability test is performed on a chassis dynamometer, the dynamometer shall enable the cycle described in Appendix 3 **or Appendix 3b (as applicable)** of this annex to be carried out. In particular, it shall be equipped with systems simulating inertia and resistance to progress"

Justification: Editorial correction

Appendix 3b

Paragraph 1., amend to read:

"1. Pattern A

	Driving pattern	Distance ratio
Normal driving	All elements (idling, acceleration, deceleration, steady speed) shall be operated within less than 60km/h	more than 60 %
High speed driving	Steady speed whichever lower 100km/h or V_max	more than 20 %
others	according to manufacture good engineering practice	no specific requirement as long as maintaining the above criteria

"

Justification: Editorial correction

Table C4/App3b.1., *mode 13*, amend to read:

"

13	repeat 1 to 12 until useful life is reached		
----	--	--	--

"

Justification: Editorial correction

Annex C5

Appendix 1

Insert new paragraph 2.4., to read:

"2.4. For OVC-HEVs, testing shall be carried out under charge-sustaining conditions."

Justification: introduce provision that was not transposed from UN Regulation No. 83 07 series of amendments

Paragraph 7.3.2.(g)., amend to read:

"(g) Manufacturers may request to use special denominator conditions for certain components or systems and this request can be approved only if it can be demonstrated to the Type Approval Authority by submitting data and/or an engineering evaluation that **those** other conditions are necessary to allow for reliable detection of malfunctions."

Justification: Editorial correction

II. Justification

See justifications provided following each proposed amendment, or group of amendments.