

United Nations

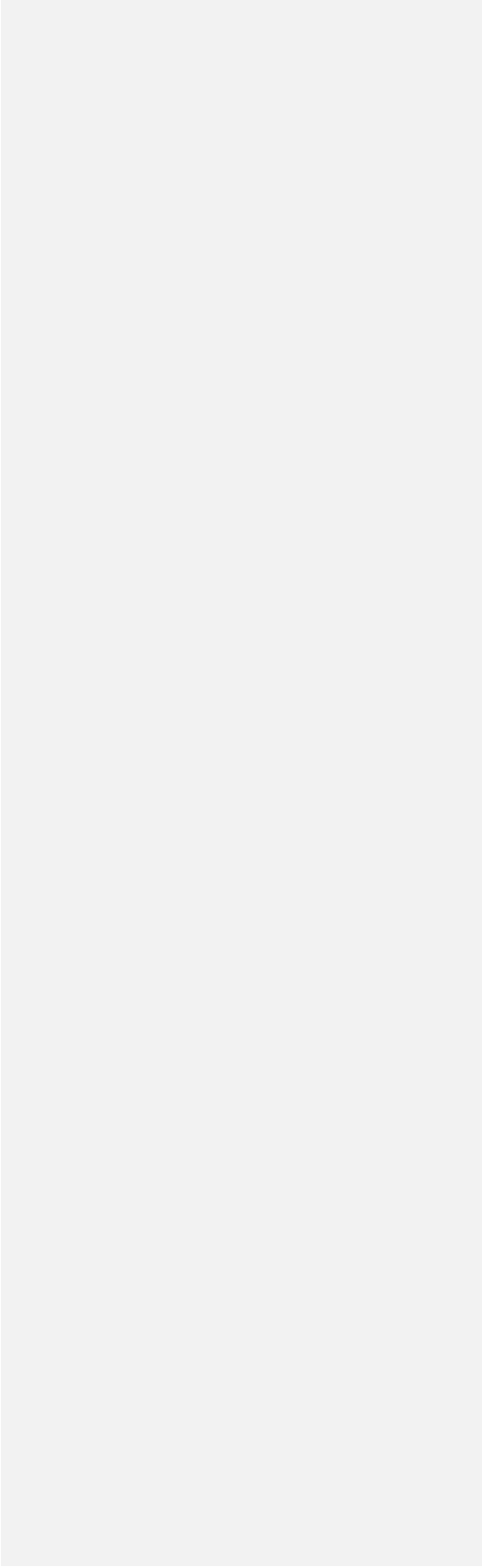
**ECE**/TRANS/WP.29/2019/62



**Economic and Social Council**

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## Note for reader

This document provides an initial proposal/structure for adding a new optional Low Temperature (Type 6) test to GTR15.

The document is based on the text of GTR15 Amendment 5 as submitted for vote at the June 2019 session of WP.29.

The general approach is to leave the Type 1 test paragraphs of Annexes 1-8 unaltered and to indicate in the optional annex where the Type 6 test would alter those requirements. Comments are provided at the relevant points of Annexes 1-8 which have been identified as being areas of GTR15 which may need to be amended via the Optional Annex.

There will however be some Type 6 related elements which are expected to be incorporated into the current GTR15 sections. These might include a definition of a Low Temperature Family in Section 5 of the GTR and specifications for Type 6 reference fuels in Annex 3.

This document provides a very early draft of the Optional Annex, as shown at the Low Temperature Task Force meeting on 8<sup>th</sup> November 2019. It shows the principle for how amendments to the Type 1 test requirements to align with the new Type 6 will be made – but is short of much detail at this stage.

NB: the majority of this work was undertaken in July 2019 and so it will not reflect any more recent developments from the work of the Low Temp TF.

The document is therefore very much a 'Work in Progress' for 'Information Only' purposes at this stage.

Rob Gardner  
13<sup>th</sup> November 2019

06-Jan-2020

### Standard GTR15 text deleted to just leave the Type 6 test relevant sections

Proposed text from document "PEV & Hybrid drafting V2\_JRCv2.xlsx" added.  
28-Jan-2020

Comments added during TF meeting on 29<sup>th</sup> January 2020

Updates during and following WLTP IWG and Low Temp TF meetings in Brussels (Feb 2020)

NB: EV requirements and Auxiliaries text in separate Word documents

Updates provide by Ricardo (JRC) – 7<sup>th</sup> March 2020. See User Names "JRC" and "JRC input 07-Mar-2020"

**Amendment 5 to UN GTR No. 15 (Worldwide harmonized  
Light vehicles Test Procedures (WLTP))**

## II. Text of the UN GTR

### 1. Purpose

Commented [RG-Jul191]: Low Temp

No need to change

### 2. Scope and application

Commented [RG-Jul192]: Low Temp

No need to change

### 3. Definitions

Commented [RG 0803203]: No change needed for Low Temp

### 4. Abbreviations

Commented [RG-Jul194]: Low Temp

Any new Abbreviations to add?

Commented [RG 0803205R4]: No change needed for Low Temp

### 5. General requirements

#### 5.14. Low temperature family definition

Commented [JPN\_Nick6]: Still under the discussion, right?

Only vehicles that are identical with respect to the technical criteria in paragraph 5.14.1. to 5.14.2 (as applicable) may be part of the same Type 6 family.

#### 5.14.1. Low temperature family for Pure ICE, NOVC-HEVs and OVC-HEVs Technical criteria

5.14.1.1. Powertrain (e.g. ICE, NOVC-HEV, OVC-HEV)

5.14.1.2. Type(s) of fuel(s) (e.g. petrol, diesel, LPG, NG, ...). Bi-fuelled or flex-fuelled vehicles may be grouped with other vehicles, with which they have one of the fuels in common.

5.14.1.3. Combustion process (e.g., four stroke)

5.14.1.4. Number of cylinders

5.14.1.5. Configuration of the cylinder block (e.g. in-line, V, radial, horizontally opposed)

5.14.1.6. Engine displacement

The vehicle manufacturer shall specify a value  $V_{eng\_max}$  (= maximum engine displacement of all vehicles within the Type 6 family). The engine displacement of vehicles in the Type 6 family shall not deviate more than – 22 % from  $V_{eng\_max}$  if  $V_{eng\_max} \geq 1\,500$  ccm and – 32 % from  $V_{eng\_max}$  if  $V_{eng\_max} < 1\,500$  ccm.

5.14.1.7. Method of engine fuelling (e.g. indirect or direct or combined injection)

5.14.1.8. Type of cooling system (e.g. air, water, oil)

- 5.14.1.9. Method of aspiration such as naturally aspirated, pressure charged, type of pressure charger (e.g. externally driven, single or multiple turbo, variable geometries [5])
- 5.14.1.10. Types and sequence of exhaust after-treatment components (e.g. three-way catalyst, oxidation catalyst, lean NO<sub>x</sub> trap, SCR, lean NO<sub>x</sub> catalyst, particulate trap).
- 5.14.1.11. Exhaust gas recirculation (with or without, internal/external, cooled/non-cooled, low/high combined pressure)]

[5.14.2. ~~Low temperature family for PEVs family~~

5.14.2.1. ~~Definition – under discussion~~]

**Commented [RG 1103207]:** Will need to be in square brackets for WD

## 6. Performance requirements

### 6.1. Limit values

When implementing the test procedure contained in this UN GTR as part of their national legislation, Contracting Parties to the 1998 Agreement are encouraged to use limit values that represent at least the same level of severity as their existing regulations, pending the development of harmonized limit values, by the Executive Committee (AC.3) of the 1998 Agreement, for inclusion in the UN GTR at a later date.

### 6.2. Testing

6.2.1. The Type 1 test ~~Testing~~ shall be performed according to:

- (a) The WLTCs as described in Annex 1;
- (b) The gear selection and shift point determination as described in Annex 2;
- (c) The appropriate fuel as specified in Annex 3;
- (d) The road load and dynamometer settings as described in Annex 4;
- (e) The test equipment as described in Annex 5;
- (f) The test procedures as described in Annexes 6 and 8;
- (g) The methods of calculation as described in Annexes 7 and 8.]

**Commented [RG-Jul198]:** Low Temp

Add a new bullet for Type 6 test in Annexes Part II

6.2.2. The Type 6 test shall be performed in accordance with the provisions specified in paragraph 6.2.1. ~~as amended by Part II Annex A~~ unless specified otherwise in Annex 13.]

**Commented [RG-Jul199]:** If included make it clear it is Optional

## 7. Rounding

**Commented [RG 08032010]:** No change needed for Low Temp

**Annex 1**

**Worldwide light-duty test cycles (WLTC)**

**Annex 2**

**Gear selection and shift point determination for vehicles equipped with manual transmissions**

[See Optional Annex for Type 6 amendments to Annex 2 requirements](#)

**Commented [RG-Jul1911]:** Low Temp  
No change needed for Low Temp

## Annex 3

**Reference fuels**

2. Specifications of reference fuel to be used for testing vehicles equipped with positive ignition engines at low ambient temperature – Type 6 Test

Table A3/1  
Gasoline/petrol (nominal 90 RON, E0)

Fuel property or substance name	Unit	Standard		Test method
		Minimum	Maximum	
Research octane number, RON		90	92	JIS K2280
Motor octane number, MON		80	82	JIS K2280
Density	g/cm <sup>3</sup>	0.720	0.734	JIS K2249
Vapour pressure	kPa	<del>5670</del>	<del>6090</del>	JIS K2258
Distillation:				
— 10 % distillation temperature	K (°C)	<del>318-309</del> (4536)	<del>328-326</del> (5553)	JIS K2254
— 50 % distillation temperature	K (°C)	<del>363-353</del> (8090)	373 (100)	JIS K2254
— 90 % distillation temperature	K (°C)	413 (140)	443 (170)	JIS K2254
— final boiling point	K (°C)		488 (215)	JIS K2254
— olefins	% v/v	15	25	JIS K2536-1 JIS K2536-2
— aromatics	% v/v	20	45	JIS K2536-1 JIS K2536-2 JIS K2536-3
— benzene	% v/v		1.0	JIS K2536-2 JIS K2536-3 JIS K2536-4
Oxygen content		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-6
Existent gum	mg/100ml		5	JIS K2261
Sulphur content	wt ppm		10	JIS K2541-1 JIS K2541-2 JIS K2541-6 JIS K2541-7
Lead content		not to be detected		JIS K2255
Ethanol		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-6
Methanol		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-5

**Commented [RG 06012012]:** Need to add a Diesel reference fuel table with a cloud point maximum of -15 instead of -10.

Will also need to add Low Temp fuels for JPN and Korea

Copy GTR15 tables with square brackets.

**Commented [RG 10012013R12]:** JPN to provide proposals

**Commented [RG 05022014R12]:** No modification needed in relation to the cloud point maximum

**Commented [RG 02032015]:** Copied from Ichikawa-san's "fuel properties" document

NB: only the tables which have changes to the Type 1 reference fuel tables have been copied from that document.

**Commented [JPN\_Nick16]:** updated

<i>Fuel property or substance name</i>	<i>Unit</i>	<i>Standard</i>		<i>Test method</i>
		<i>Minimum</i>	<i>Maximum</i>	
				JIS K2536-6
MTBE		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-5 JIS K2536-6
Kerosene		not to be detected		JIS K2536-2 JIS K2536-4



x.x. Gasoline/petrol (nominal 100 RON, E0)

Table A3/3

Gasoline/petrol (nominal 100 RON, E0)

Commented [JPN\_Nick17]: updated

Commented [RG 02032018]: Copied from Ichikawa-san's "fuel properties" document

Fuel Property or Substance Name	Unit	Standard		Test method
		Minimum	Maximum	
Research octane number, RON		99	101	JIS K2280
Motor octane number, MON		86	88	JIS K2280
Density	g/cm <sup>3</sup>	0.740	0.754	JIS K2249
Vapour pressure	kPa	<del>5670</del>	<del>6090</del>	JIS K2258
Distillation:				
— 10 % distillation temperature	K (°C)	<del>318-309</del> ( <del>4536</del> )	<del>328-326</del> ( <del>5553</del> )	JIS K2254
— 50 % distillation temperature	K (°C)	<del>363-353</del> ( <del>9080</del> )	373 (100)	JIS K2254
— 90 % distillation temperature	K (°C)	413 (140)	443 (170)	JIS K2254
— final boiling point	K (°C)		488 (215)	JIS K2254
— olefins	% v/v	15	25	JIS K2536-1 JIS K2536-2
— aromatics	% v/v	20	45	JIS K2536-1 JIS K2536-2 JIS K2536-3
— benzene	% v/v		1.0	JIS K2536-2 JIS K2536-3 JIS K2536-4
Oxygen content		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-6
Existent gum	mg/100ml		5	JIS K2261
Sulphur content	wt ppm		10	JIS K2541-1 JIS K2541-2 JIS K2541-6 JIS K2541-7
Lead content		not to be detected		JIS K2255
Ethanol		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-6
Methanol		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-5 JIS K2536-6
MTBE		not to be detected		JIS K2536-2 JIS K2536-4 JIS K2536-5 JIS K2536-6
Kerosene		not to be detected		JIS K2536-2 JIS K2536-4

**Type: Petrol (E5)**

**Commented [RG 02032019]:** Should we also delete Petrol (E5) from the Type 1 reference fuels for GTR15 Amnd 6?

Parameter	Unit	Limits <sup>1</sup>		Test method
		Minimum	Maximum	
Research octane number, RON <sup>2</sup>	-	95.0	98.0	EN ISO 5164
Motor octane number, MON <sup>2</sup>	-	85.0	89.0	EN ISO 5163
Density at 15 °C	kg/m <sup>3</sup>	743.0	756.0	EN ISO 12185
Vapour pressure (DVPE)	kPa	56.0/70.0	95.0/90.0	EN 13016-1
Water content		max 0.05		EN 12937
		Appearance at -7 °C: Clear & Bright		
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
- final boiling point	°C	170	195	EN ISO 3405
Residue	% v/v	==	2.0	EN ISO 3405
Hydrocarbon analysis:				
- olefins	% v/v	6.0	13.0	EN 22854
- aromatics	% v/v	25.0	32.0	EN 22854
- benzene	% v/v	-	1.00	EN 22854 EN 238
- saturates	% v/v	report		EN 22854
Carbon/hydrogen ratio	-	report		-
Carbon/oxygen ratio	-	report		-
Induction period <sup>3</sup>	minutes	480	==	EN ISO 7536
Oxygen content <sup>4</sup>	% m/m	3.3	3.7	EN 22854
Solvent washed gum (Existent gum content)	mg/100ml	==	4	EN ISO 6246
Sulphur content <sup>5</sup>	mg/kg	==	10	EN ISO 20846 EN ISO 20884
Copper corrosion 3hrs, 50 °C	-	==	Class 1	EN ISO 2160
Lead content	mg/l	==	5	EN 237
Phosphorus content <sup>6</sup>	mg/l	==	1.3	ASTM D 3231
Ethanol <sup>4</sup>	% v/v	9.0	10.0	EN 22854

<sup>1</sup> The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products - Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

<sup>2</sup> A correction factor of 0.2 for MON and RON shall be subtracted for the calculation of the final result in accordance with EN 228:2008.

<sup>3</sup> The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilise refinery gasoline streams, but detergent/dispersive additives and solvent oils shall not be added.

<sup>4</sup> Ethanol is the only oxygenate that shall be intentionally added to the reference fuel. The Ethanol used shall conform to EN 15376.

<sup>5</sup> The actual sulphur content of the fuel used for the Type 46 test shall be reported.

<sup>6</sup> There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

**Commented [IWG022022]:** Proposal from JPN to amend

Counter proposal from ACEA

**Commented [RG 02032023R22]:** For decision before 17<sup>th</sup> March

**Commented [RG 11032024]:** New proposal for 70 to 90

**Commented [RG 18121925]:** Error in UNR 83 – should say Type VI.

Will change to Type 6 for GTR15 Amnd 6

**Type: Ethanol (E75)**

Parameter	Unit	Limits <sup>1</sup>		Test method <sup>2</sup>
		Minimum	Maximum	
Research octane number, RON		95	-	EN ISO 5164
Motor octane number, MON		85	-	EN ISO 5163
Density at 15 °C	kg/m <sup>3</sup>	report		EN ISO 12185
Vapour pressure	kPa	50	60	EN ISO 1 30 16-1 (DVPE)
Sulphur content <sup>3, 4</sup>	mg/kg	-	10	EN ISO 20846 EN ISO 20884
Oxidation stability	minutes	360	-	EN ISO 7536
Existent gum content (solvent washed)	mg/100ml	-	4	EN ISO 6246
Appearance shall be determined at ambient temperature or 15 °C whichever is higher.		Clear and bright, visibly free of suspended or precipitated contaminants		Visual inspection
Ethanol and higher alcohols <sup>7</sup>	% (V/V)	70	80	EN 1601 EN 13132 EN 1451 7
Higher alcohols (C <sub>3</sub> - C <sub>8</sub> )	% (V/V)	-	2	
Methanol		-	0.5	
Petrol <sup>5</sup>	% (V/V)	Balance		EN 228
Phosphorus	mg/l	0.3 <sup>6</sup>		EN 15487 ASTM D 3231
Water content	% (V/V)	-	0.3	ASTM E 1064 EN 15 489
Inorganic chloride content	mg/l	-	1	ISO 6227 - EN 15492
pHe		6.5	9	ASTM D 6423 EN 15490
Copper strip corrosion (3h at 50 °C)	Rating	Class I		EN ISO 2160
Acidity (as acetic acid CH <sub>3</sub> COOH)	% (m/m)		0.005	ASTM 0161 3
	mg/l		40	EN 15491
Carbon/hydrogen ratio		report		
Carbon/oxygen ratio		report		

<sup>1</sup> The values referred to in the specifications are "true values". When establishing the value limits, the terms of ISO 4259 Petroleum products - Determination and application of precision data in relation to methods of test were applied. When fixing a minimum value, a minimum difference of 2R above zero was taken into account. When fixing a maximum and minimum value, the minimum difference used was 4R (R = reproducibility). Notwithstanding this procedure, which is necessary for technical reasons, fuel manufacturers shall aim for a zero value where the stipulated maximum value is 2R and for the mean value for quotations of maximum and minimum limits. Where it is necessary to clarify whether fuel meets the requirements of the specifications, the ISO 4259 terms shall be applied.

<sup>2</sup> In cases of dispute, the procedures for resolving the dispute and interpretation of the results based on test method precision, described in EN ISO 4259 shall be used.

<sup>3</sup> In cases of national dispute concerning sulphur content, either EN ISO 20846 or EN ISO 20884 shall be called up similar to the reference in the national annex of EN 228.

<sup>4</sup> The actual sulphur content of the fuel used for the Type V16 test shall be reported.

<sup>5</sup> The unleaded petrol content may be determined as 100 minus the sum of the percentage content of water and alcohols.

<sup>6</sup> There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

<sup>7</sup> Ethanol to meet specification of EN 15376 is the only oxygenate that shall be intentionally added to this reference fuel.

## 4. Gaseous fuels for positive ignition engines

## 4.1. LPG (A and B)

Table A3/8  
LPG (A and B)

Parameter	Unit	Fuel E1	Fuel E2	Fuel J	Fuel K	Test method
Composition:						ISO 7941
C3-content	% vol	30 ±2	85 ±2		Winter: min. 15, max. 35 Summer: max. 10	KS M ISO 7941
Propane and propylene content	% mole			Min 80		JIS K2240
C4-content	% vol	Balance			Winter: min.60, Summer: min. 85	KS M ISO 7941
Butane and butylene content				Max 20		JIS K2240
Butadiene					max. 0.5	KS M ISO 7941
< C3, > C4	% vol	Max. 2	Max. 2			
Olefins	% vol	Max. 12	Max. 15			
Evaporation residue	mg/kg	Max. 50	Max. 50			EN 15470
Evaporation residue (100ml)	ml	-			0.05	ASTM D2158
Water at 0 °C		Free				EN 15469
	mg/kg	Max. 10	Max 10			ASTM 6667
Total sulphur content					Max 40	KS M 2150, ASTM D4486, ASTM D5504
Hydrogen sulphide		None	None			ISO 8819
Copper strip corrosion	rating	Class 1	Class 1			ISO 6251 <sup>(1)</sup>
Copper corrosion	40 °C, 1h	-			1	KS M ISO 6251
Odour		Characteristic				
Motor octane number		Min. 89	Min. 89			EN 589 Annex B
Vapour pressure (40 °C)	MPa	-	1.27			KS M ISO 4256 KS M ISO 8973
Density (15 °C)	kg/m <sup>3</sup>	500			620	KS M 2150, KS M ISO 3993 KS M ISO 8973

Commented [JPN\_Nick26]: What does it mean by "A and B# ?

<sup>(1)</sup> This method may not accurately determine the presence of corrosive materials if the sample contains corrosion inhibitors or other chemicals which diminish the corrosivity of the sample to the copper strip. Therefore, the addition of such compounds for the sole purpose of biasing the test method is prohibited.

xxx

**Commented [LTF050327]:** JPN to provide proposal for LPG Type 6 reference fuel

Add diesel?

Point for GTR15 in general – bring in harmonised diesel ref fuel from UNR WLTP

**Commented [RG 11032028R27]:** No Type 6 diesel ref fuels required

**Annex 4**

**Road load and dynamometer setting**

[See Optional Annex for Type 6 amendments to Annex 4 requirements](#)

**Annex 5**

**Test equipment and calibrations**

[See Optional Annex for Type 6 amendments to Annex 5 requirements](#)

**Annex 6**

**Type 1 test procedures and test conditions**

[See Optional Annex for Type 6 amendments to Annex 6 requirements](#)

**Annex 7**

**Calculations**

[See Optional Annex for Type 6 amendments to Annex 7 requirements](#)

## **Annex 8**

### **Pure electric, hybrid electric and compressed hydrogen fuel cell hybrid vehicles**

[See Optional Annex for Type 6 amendments to Annex 8 requirements](#)



**Annex 9**

**Determination of method equivalency**

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## Annex 13

### WLTP Low Temperature Type 6 test (optional annex)

(Verifying the average exhaust emissions and measuring the CO<sub>2</sub>/FE/EC/Range of carbon monoxide and hydrocarbons after a cold start at low ambient temperature)

#### 1. Introduction

This annex describes the procedure for undertaking the Type 6 test defined in paragraph 6.x. of this GTR.

At the option of the Contracting Party this annex may be omitted.

#### 1.1. The test requirements for different categories of vehicle are set out in Table A13/1.

Table A13/1: Test requirements

Powertrain	Test requirement			
	Criteria emissions	CO <sub>2</sub> emissions	Electric energy consumption	Electric range
Pure ICE	Yes	Yes	N/A	N/A
NOVC-HEV	Yes	Yes	N/A	N/A
OVC-HEV	Yes	Yes	Yes	Yes
PEV	N/A	N/A	Yes	Yes
FCHV	N/A	N/A	Exempt from initial phase	



#### 2. Type 6 test requirements

The Type 6 shall be undertaken according to the definitions, requirements and tests set out in paragraphs 3 to 7 of this GTR and Annexes 1 to 8 inclusive of this GTR, unless different requirements are specified in paragraphs 2.1. to 2.8. of this annex. Where the Type 6 requirements differ from the Type 1 test requirements the term “shall be understood as follows” is used to specify the Type 6 test requirements.

##### 2.1. Worldwide light-duty test cycles (WLTC)

The requirements of Annex 1 shall apply for the purposes of this Annex with no exceptions or amendments

**Commented [JRC07032029]:** Not only. Following the ToR, the TF have agreed on verifying all criteria emissions as well as CO<sub>2</sub>, FC and EC (see table in paragh 1.1.

**Commented [RG 28012030]:** Ichikawa-san has sent a proposal to MLIT and EC for comment. May result in changes to this table.

Make it more specific

Relates to Excel row 117

**Commented [RG 07111931]:** Copied from “COM 20190917 IWG WLTP SG-EV LowT TA approach”

To be confirmed and updated

Need consistency of approach.

Provide the details later on. (e.g. EC<sub>DC</sub>)

**Commented [RG 16121932]:** Fuel efficiency?

**Commented [RG 11032033R32]:** MLIT to consider

**Commented [RG 12032034]:** Delete – as it is all said elsewhere

## 2.2. Gear selection and shift point determination for vehicles equipped with manual transmissions

The requirements of Annex 2 shall apply for the purposes of this Annex with no

## 2.3. Reference Fuels

The reference fuels to be used for the Type 6 test shall be those specified in paragraph 2 of Annex 3.

## 2.4. Road load and dynamometer setting

~~The requirements of paragraph 1. to 6. of Annex 4 are not applicable for the Type 6 test.~~

~~For the vehicle to be tested, the chassis dynamometer load setting road load determined in para. 8.1.4. or 8.2.3.3. for testing at 23 °C shall be modified as follows:~~

- 2.4.1. ~~Road load and dynamometer settings shall be as specified in Annex 4, with the exception of the requirement for the room temperature to be at 23 °C. The chassis dynamometer setting  $A^*_{d}$  and  $B^*_{d}$  shall be the same as those determined for the test at 23 °C, as specified in paragraphs 7. and 8.1.4. or 8.2.3.3. of Annex 4. To take account of the difference in air density at 7 °C when compared to the air density at 20 °C, the chassis dynamometer coefficient  $C^*_{d}$  shall be adapted in accordance with the following equation:~~

~~$C^*_{d} T_{low} = C_d + (f_2 T_{low} - f_2)$  or  $0.10 * f_2$  (then strike out unnecessary text)~~

~~and~~

~~$f_2 T_{low} = f_2 * (T_0 + 273)/(T_{low} + 273)$~~

~~Where:~~

~~$C^*_{d}$  is the dynamometer coefficient for the vehicle derived at 23 °C~~

~~$f_2$  is the second order road load coefficient, at reference conditions, N/(km/h)<sup>2</sup>;~~

~~$T_0$  is the road load reference temperature as specified in paragraph 3.2.10. of this UN GTR, °C,~~

~~$T_{low}$  is the Type 6 temperature, as defined in paragraph 3.1.1. of this annex, °C.~~

~~In the case that a valid chassis dynamometer setting of the 23 °C test is available,~~

- 2.4.3. ~~The same set of tyres shall be fitted to the test vehicle for the setting of the chassis dynamometer at 23 °C and for the setting of the chassis dynamometer at the temperature 7°C. Prior to the Type 6 test, the tyre pressure shall be adjusted to the same pressure as applied for the setting of the chassis dynamometer at 23 °C.~~

## 2.5. Test Equipment

The specifications for test equipment as set out in Annex 5 shall apply for the purposes of this Annex, with the exceptions set out in paragraphs 2.5.1. to 2.5.x.

**Commented [JRC07032035]:** On Feb 21<sup>st</sup> it was agreed that for the Type 6 test, gear selection and shift point determination for vehicles equipped with manual transmissions shall be done using Type 1 road load coefficients (i.e.,  $f_0$ ,  $f_1$ ,  $f_2$ , N, N/(km/h), and N/(km/h)<sup>2</sup> respectively) multiplied by 1.1 factor (i.e.,  $f_0 \times 1.1$ ,  $f_1 \times 1.1$ ,  $f_2 \times 1.1$ ).

**Commented [RG 11032036R35]:** For further consideration

**Commented [JPN\_Nick37R35]:** JRC comments is wrong. JPN proposal : manufacture recommendation. At the request of technical service, manufacture may provide its methodology.

**Commented [RG 11032038]:** The option for the manufacturer to use Type 1 ref fuels is included in the relevant section for Annex below.

**Commented [RG 12032040]:** Equation can be simplified including removal of  $T_{low}$  etc.

**Commented [RG 12032041]:** A new x-ref will be needed – but not if equation is simplified

2.5.1. Paragraph 2 (Chassis dynamometer) shall be understood as follows:

"The chassis dynamometer shall be warmed up in accordance with the dynamometer manufacturer's recommendations, or as appropriate, so that the frictional losses of the dynamometer are stabilized. The Type 6 test shall be started no longer than 30 minutes after: i) the completion of dynamometer warm up or ii) after an applicable WLTC cycle has been performed. If frictional losses of the dynamometer can be stabilized without warming the dynamometer, the test can start following the dynamometer manufacturer's recommendations. The manufacturer shall provide documentation on the validation of the systems upon request of the responsible authority."

**Commented [RG 12032042]:** Two points

a. is this relevant for Annex 5

b. what is it amending?

**Commented [RG 12032043]:** THIS IS AMENDING PARA 7.2.2. OF ANNEX 4.

2.5.2. Paragraph 3.3.1. (Connection to vehicle exhaust) shall be understood as follows:

3.3.1. Connection to vehicle exhaust

3.3.1.1. The start of the connecting tube is the exit of the tailpipe. The end of the connecting tube is the sample point, or first point of dilution.

For multiple tailpipe configurations where all the tailpipes are combined, the start of the connecting tube shall be taken at the last joint of where all the tailpipes are combined. In this case, the tube between the exit of the tailpipe and the start of the connecting tube may or may not be insulated or heated.

3.3.1.2. The connecting tube between the vehicle and dilution system shall be designed so as to minimize heat loss.

3.3.1.3. The connecting tube shall satisfy the following requirements:

(a) Be less than 6.1 metres long with an internal diameter not exceeding 105 mm and shall be heated to 70 °C or higher.

(b) Not cause the static pressure at the exhaust outlets on the vehicle being tested to differ by more than  $\pm 0.75$  kPa at 50 km/h, or more than  $\pm 1.25$  kPa for the duration of the test from the static pressures recorded when nothing is connected to the vehicle exhaust pipes. The pressure shall be measured in the exhaust outlet or in an extension having the same diameter and as near as possible to the end of the tailpipe. Sampling systems capable of maintaining the static pressure to within  $\pm 0.25$  kPa may be used if a written request from a manufacturer to the responsible authority substantiates the need for the tighter tolerance;

(c) No component of the connecting tube shall be of a material that might affect the gaseous or solid composition of the exhaust gas. To avoid generation of any particles from elastomer connectors, elastomers employed shall be as thermally stable as possible and have minimum exposure to the exhaust gas. It is recommended not to use elastomer connectors to bridge the connection between the vehicle exhaust and the connecting tube.

**Commented [RG 07111944]:** We could just have 3.3.1.3. here if that is the only text to be changed

**Commented [JPN\_Nick45]:** Confirm with Korean delegates whether it's acceptable or need longer length.

2.5.3. Paragraph 3.3.2. (Dilution air conditioning) shall be understood as follows:

3.3.2. Dilution air conditioning

3.3.2.1. The dilution air used for the primary dilution of the exhaust in the CVS tunnel shall pass through a medium capable of reducing

particles of the most penetrating particle size in the filter material by  $\leq 99.95$  per cent, or through a filter of at least Class H13 of EN 1822:2009. This represents the specification of High Efficiency Particulate Air (HEPA) filters. The dilution air may optionally be charcoal-scrubbed before being passed to the HEPA filter. It is recommended that an additional coarse particle filter be situated before the HEPA filter and after the charcoal scrubber, if used.

- 3.3.2.2. At the vehicle manufacturer's request, the dilution air may be sampled according to good engineering practice to determine the tunnel contribution to background particulate and, if applicable, particle levels, which can be subsequently subtracted from the values measured in the diluted exhaust. See paragraph 2.1.3. of Annex 6.

In accordance with the principles of CVS sampling and measurement, there shall be no water condensation after the mixing point of the exhaust gas and dilution air within the CVS system and within any systems sampling or measuring from the CVS system. To ensure this, all parts and pipes connecting the mixing device to the CVS when in the cold environment may be insulated and/or heated. This also applies to any part of the CVS which may be in the cold environment.

**Commented [RG28022046]:** New paragraph agreed at Low Temp TF 21\* Feb 2020

## 2.6. Test procedures and test conditions

The test procedures and test conditions specified in Annex 6 shall apply for the purposes of this Annex, with the exceptions set out in paragraphs 2.6.1. to 2.6.x.

- 2.6.1. Table A6/2 of Annex 6 shall be understood as follows:

Table A6/2

### Criteria for number of tests

For pure ICE vehicles, NOVC-HEVs and OVC-HEVs charge-sustaining Type 6 test.

	Test	Judgement parameter	Criteria emission
Row 1	First test	First test results	$\leq$ Regulation limit $\times 0.9$
Row 2	Second test	Arithmetic average of the first and second test results	$\leq$ Regulation limit $\times 1.0^a$

<sup>a</sup> Each test result shall fulfil the regulation limit.

For OVC-HEVs charge-depleting Type 1 test.

	Test	Judgement parameter	Criteria emissions
Row 1	First test	First test results	$\leq$ Regulation limit $\times 0.9^a$
Row 2	Second test	Arithmetic average of the first and second test results	$\leq$ Regulation limit $\times 1.0^b$

<sup>a</sup> "0.9" shall be replaced by "1.0" for charge-depleting Type 1 test for OVC-HEVs, only if the charge-depleting test contains two or more applicable WLTC cycles.

<sup>b</sup> Each test result shall fulfil the regulation limit.

For PEVs

	Test	Judgement parameter	Electric energy consumption	PER
Row 1	First test	First test results	$\leq \text{Declared value} \times 1.0$	$\geq \text{Declared value} \times 1.0$
Row 2	Second test	Arithmetic average of the first and second test results	$\leq \text{Declared value} \times 1.0$	$\geq \text{Declared value} \times 1.0$

Commented [JRC07032047]: Criteria needs to be clarified

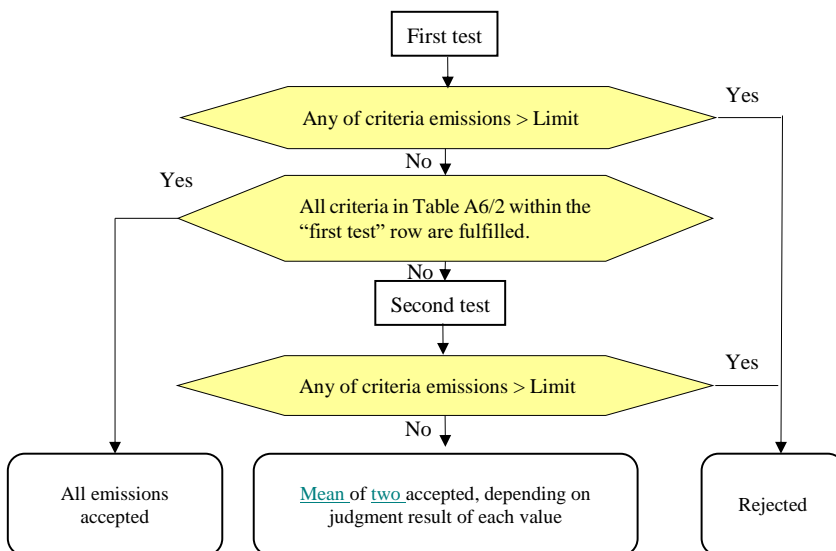
Commented [RG 11032048R47]: How to move from first to second test?

Commented [JPN\_Nick49R47]: 1.0 is OK for only PER

2.6.x. Figure A6/1 of Annex 6 shall be understood as follows:

Figure A6/1

Flowchart for the number of Type 6 tests



2.6.x. Paragraph 2.2.1. of Annex 6 (Parameter to be measured) of Annex 6 shall be understood as follows:

2.2.1.1. The following temperatures shall be measured with an accuracy of  $\pm 1.5$  °C:

- (a) Test cell ambient air;
- (b) Dilution and sampling system temperatures as required for emissions measurement systems defined in Annex 5.

2.2.1.2. Atmospheric pressure shall be measurable with a precision of  $\pm 0.1$  kPa.

2.2.1.3. Specific humidity H shall be measurable with a precision of  $\pm 1$  g H<sub>2</sub>O/kg dry air.

Commented [RG 06012050]: Paragraph not applicable for Type 6 test (see Row 55)

[or just say "Paragraph 2.2.1.3. shall not apply]  
 2.6.x. Paragraph 2.2.2. of Annex 6 (Test cell and soak area) shall be understood as follows:

2.2.2. Test cell and soak area

2.2.2.1. Test cell

2.2.2.1.1. The test cell shall have a temperature set point of  $-7^{\circ}\text{C}$ . The tolerance of the actual value shall be within  $\pm 5^{\circ}\text{C}$ . The air temperature and humidity shall be measured at the test cell's cooling fan outlet at a minimum frequency of 0.1 Hz. At the start of the test, the test cell shall have a temperature set point of  $-7^{\circ}\text{C}$  and the tolerance of the actual value shall be within  $\pm 3^{\circ}\text{C}$ .

2.2.2.1.2. The specific humidity  $H$  of either the air in the test cell or the intake air of the engine shall be such that:

$$5.5 \leq H \leq 12.2 \text{ (g H}_2\text{O/kg dry air)}$$

2.2.2.1.3. Humidity shall be measured continuously at a minimum frequency of 0.1 Hz.

2.2.2.2. Soak area

The soak area shall have a temperature set point of  $-7^{\circ}\text{C}$  and the tolerance of the actual value shall be within  $\pm 3^{\circ}\text{C}$  on a 5-minute running arithmetic average and shall not show a systematic deviation from the set point. The temperature shall be measured continuously at a minimum frequency of 0.033 Hz (every 30 s).

2.6.x. Paragraph 2.3. of Annex 6 (Test vehicle) shall be understood as follows:

2.3.1. General

The test vehicle shall conform in all its components with the production series, or, if the vehicle is different from the production series, a full description shall be recorded. In selecting the test vehicle, the manufacturer and the responsible authority shall agree which vehicle model is representative for the interpolation family.

~~For the measurement of emissions, the road load as determined with test vehicle H shall be applied. In the case of a road load matrix family, for the measurement of emissions, the road load as calculated for vehicle  $H_M$  according to paragraph 5.1. of Annex 4 shall be applied.~~

1.2.1. For each combination of fuels (e.g., petrol-LPG, petrol-NG, petrol only), on which some vehicle of the Type 6 family can operate, at least one vehicle that can operate on this combination of fuels shall be selected for Type 6 testing.

1.2.2. The manufacturer shall specify a value PMRH (= highest power-to-mass-ratio of all vehicles in the Type 6 family) and a value PMRL (= lowest power-to-mass-ratio of all vehicles in the Type 6 family). Here the 'power-to-mass-ratio' corresponds to the ratio of the maximum net power of the internal combustion engine as declared by the manufacturer and of the reference mass, where "reference mass" means the mass of the vehicle in

Commented [RG 11032051]: Tolerances may be updated

Commented [RG 08032052]: JRC propose a different formulation:

"The test cell shall have a temperature set point of  $-7^{\circ}\text{C}$  and the tolerance of the actual value shall be within  $\pm 5^{\circ}\text{C}$ ."

TBD. If we change this then do the same for Type 1 test.

Commented [RG 28012053]: Nico comment

-12 deg C would cause an issue for AdBlue freezing

Amend to +/- 3 deg C?

To be decided

Commented [RG 06012054]: Paragraph not applicable for Type 6 test (see Row 55)

Commented [JRC07032055]: Not needed for Type 6

Commented [RG 12032056]: Need to integrate the text on selection of the vehicle from Paragraph 1.2.

Commented [JPN\_Nick57]: Do we need this ?

Commented [JPN\_Nick59]: This is against the agreement (test vehicle configuration is same as Type I test). Wait for discussion of family definition. [] at this stage para. 1.2.6.

running order plus 25 kg. At least one vehicle configuration representative for the specified PMRH and one vehicle configuration representative for the specified PMRL of a Type 6 family shall be selected for testing. If the power-to-mass ratio of a vehicle deviates by not more than 5 % from the specified value for PMRH, or PMRL, the vehicle should be considered as representative for this value.

1.2.3. At least one vehicle for each transmission type (e.g., manual, automatic) installed in vehicles of the Type 6 family shall be selected for testing.

1.2.4. At least one four-wheel drive vehicle (4x4 vehicle) shall be selected for testing if such vehicles are part of the Type 6 family.

1.2.5. For each internal combustion engine displacement of a vehicle within the Type 6 family at least one representative vehicle shall be tested.

1.2.6. Notwithstanding the provisions in points 2.1. to 2.5., at least the following number of vehicle emission types of a given Type 6 family shall be selected for testing:

Number of vehicle emission types (N) in a Type 6 family	Minimum number of vehicle emission types (NT) selected for Type 6 testing
1	1
from 2 to 4	2
from 5 to 7	3
from 8 to 10	4
from 11 to 49	$NT = 3 + 0.1 \times N^{(1)}$
more than 49	$NT = 0.15 \times N^{(1)}$
<sup>(1)</sup> NT shall be rounded to the next higher integer number.	

2.6.x. Paragraph 2.4.2.1. of Annex 6 [covering auxiliary devices] shall be understood as follows:

[Include here the text proposal from the Auxiliary Sub-Group]

2.4.2.1. xxx.

Test Procedure:

The vehicle's interior Thermal Comfort system must be operated by adjusting the comfort setting as indicated in following paragraphs.

During the entire Type 6 test procedure, the vehicle cabin shall not be heated by any external heating device.

Thermal comfort preconditioning function, if available, shall not be activated during this test.

**Commented [RG 08032060]:** NB: 2.4.2.1. in Annex 6 is as follows:

*“Auxiliary devices shall be switched off or deactivated during dynamometer operation unless their operation is required by regional legislation.”*

**Commented [JPN\_Nick61]:** What does this para means ?



#### 1. Thermal Comfort System setting.

1.1. The temperature control shall be set to 22°C within 0-9 seconds after the start of the first applicable WLTC. For vehicles with a thermal comfort system not allowing the selection of 22°C, maximum heat shall be set within 0-9 seconds after the start of the first applicable WLTC. This setting shall remain unchanged for the whole test procedure.

1.2. The blower speed control system shall be set to the auto mode within 0-9 seconds after the start of the first applicable WLTC.

If no auto mode is available, the blower speed control system shall be set as follows.

The fan speed control shall be set to the minimum setting, above the setting where the fan is switched off, within 0-9 seconds after the start of the test. After the second 100 and before the second 105 of the test, fan speed shall be set to maximum setting. After the second 987 and before the second 992 of the test, the fan speed shall be reduced to the minimum setting, not being the setting where the fan is switched off.

1.3. The airflow direction control shall be set to the auto mode within 0-9 seconds after the start of the first applicable WLTC. If no auto mode is available, the airflow direction control shall be set the feet compartment and to the front windscreen. If that setting is not available, the airflow direction control shall be set to the front windscreen.

1.4. The air recirculation control shall be set to the auto mode within 0-9 seconds after the start of the first applicable WLTC. If no auto mode is available, it shall be set to the recirculation off position.

1.5. Air Conditioning control button, if present, shall be pressed to set to ON position within 0-9 seconds after the start of the first applicable WLTC.

1.6. Multiple-zone systems. For vehicles that have separate (left & right) driver and front passenger controls, all temperature and blower controls shall be set as described in paragraphs 1.1 and 1.2 of this section. Rear Thermal Comfort Systems, if available, shall be set to off position.

1.7. Assessment of activation of Thermal comfort. The responsible authority shall verify that the thermal comfort system is representative of serial production intent and operating as intended during the test. The responsible authority may request the manufacturer to install a measurement device for the duration of the test at a designated location to record the warm-up profile as evidence for the verification.

2. Passing-beam (dipped-beam) headlamp and lamps required by regional legislations shall be switched ON within 0-9 seconds after the start of the test. If the vehicle is equipped with an automatic activation system for dipped-beam headlamp without user selectable settings, actions shall be taken to simulate driving in the hours of darkness (i.e. sufficient to activate at least the dipped beam headlamps). The lights shall remain ON during the test.

3. If the vehicle is equipped with electrical system(s) to defrost (rear window and/or windscreen), these systems shall be switched on within 0-9 seconds after the start of the first test.

2.6.x. Paragraph 2.4.6. of [Annex 6](#) shall be understood as follows:

2.4.6. Reference fuel

The appropriate reference fuel as specified in paragraph 2. of Annex 3 shall be used for testing. At the option of the manufacturer [and approval of the responsible authority] a reference fuel as specified in paragraph 1. of Annex 3 may be used.

**Commented [RG 11032062]:** Is this needed

2.6.x. Paragraph 2.6.1.1. (Fuel tank filling) shall be understood as follows:

2.6.1.1. Fuel tank filling

The fuel tank(s) shall be filled with the specified test fuel. If the existing fuel in the fuel tank(s) does not meet the specifications contained in paragraph 2.4.6. of ~~this annex Annex 6~~, the existing fuel shall be drained prior to the fuel fill. The test fuel shall be at a temperature of  $\leq 16$  °C. The evaporative emission control system shall neither be abnormally purged nor abnormally loaded.

**Commented [RG 07111963]:** Should we change the reference?  
Possibly not.

[Gaseous fuel vehicles – para 2.6.1.4.]

**Commented [RG 07111964]:** Under discussion.  
Is this more of UNR issue?

2.6.x. Paragraph 2.6.2. of Annex 6 (Test cell) shall be understood as follows:

2.6.2. Test cell

2.6.2.1. Temperature

During preconditioning, the test cell temperature shall have a temperature set point of  $-7$  °C and the tolerance of the actual value shall be within  $\pm 5$  °C ~~the same as defined for the Type I test (paragraph 2.2.2.1.1. of this annex).~~

**Commented [RG 28012065]:** Amend tolerance?  
See comment for 2.2.2.1.1. above  
**For decision**

2.6.2.2. Background measurement

In a test facility in which there may be possible contamination of a low particulate emitting vehicle test with residue from a previous test on a high particulate emitting vehicle, it is recommended, for the purpose of sampling equipment preconditioning, that a 120 km/h steady state drive cycle of 20 minutes duration be driven by a low particulate emitting vehicle. Longer and/or higher speed running is permissible for sampling equipment preconditioning if required. Dilution tunnel background measurements, if applicable, shall be taken after the tunnel preconditioning, and prior to any subsequent vehicle testing.

**Commented [RG 07111966]:** To confirm. We have amend the 2.2.2.1.1. temperature above but it is probably clearer to spell it out again here.

**Commented [JPN\_Nick67]:** No change from Type I, then just refer to para.

2.6.x. Paragraph 2.6.3. of Annex 6 shall be understood as follows:

2.6.3. Procedure

2.6.3.1. The test vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through the applicable WLTCs. [The vehicle need not be cold, and may be used to set the dynamometer load.]

**Commented [JPN\_Nick68]:** Depend on the agreement.

2.6.3.2. Test cell and soak area

2.6.3.2.1. Test cell

2.6.3.2.1.1. The test cell shall have a temperature set point equal to  $-7$  °C. The tolerance of the actual value shall be within  $\pm 3$  °C at the start of the test and within  $\pm 5$  °C during the test.

**Commented [JRC69]:** Suggest to move after soak area

2.6.3.2.1.3. The air temperature shall be measured at the cooling fan outlet at a rate of [0.1] Hz.

2.6.3.2.2. Soak area

2.6.3.2.2.1. The soak area shall have a temperature set point of -7 °C and the tolerance of the actual value shall be within  $\pm 3$  °C on a 5 minute running arithmetic average and shall not show a systematic deviation from the set point. The temperature shall be measured continuously at a minimum frequency of 0.033 Hz.

2.6.3.2.2.2. The location of the temperature sensor for the soak area shall be representative to measure the ambient temperature around the vehicle and shall be checked by the technical service. The sensor shall be at least 10 cm away from the wall of the soak area and shall be shielded from direct air flow. The air-flow conditions within the soak room in the vicinity of the vehicle shall represent a natural convection flow representative for the dimension of the room (no forced convection).

2.6.3.3. Test vehicle

The vehicle to be tested shall be representative of the family for which the Type 6 data are determined, as described in paragraph [xxx] of this annex.

2.6.3.3.2. From the Type 6 family, the Interpolation Family [with the lowest engine capacity] shall be selected (see paragraph [xxx] of this annex), [and the test vehicle shall be in the 'vehicle H' configuration of this family].

[Where applicable, the vehicle with the lowest enthalpy of the active heat storage device and the slowest heat release for the active heat storage device from the Type 6 Family shall be selected.]

2.6.3.4. Preconditioning-soak (precond-soak)

2.6.3.4.1. Before preconditioning, vehicles shall be kept in a soak area with the ambient conditions described in paragraph 3.2.2.1. of this annex. The vehicle shall not be exposed to a different temperature than -7 °C for longer than [10] minutes.

[2.6.3.4.2. Pure ICE vehicles, NOVC-HEVs and OVC-HEVs tested under charge-sustaining Type 6 test as described in paragraph 3.2.2.2 and 3.2.2.4 of Annex XX shall be kept in an area with ambient conditions as specified in paragraph XX of this Annex for a minimum of 6 hours and a maximum of 12 hours before preconditioning. This time will be referred as  $t_{\text{precond-soak}}$ ]

2.6.3.4.3. PEVs and for charge-depleting Type 6 test of OVC-HEVs shall be kept in an area with ambient conditions as specified in paragraph XX of this Annex for a minimum of 9 hours and a maximum of 36 hours before preconditioning. This time will be referred as  $t_{\text{precond-soak-PEV}}$  and  $t_{\text{precond-soak-CD}}$  for PEVs and charge-depleting Type 6 test of OVC-HEVs, respectively.

2.6.3.4.4. The soak shall be performed without using a cooling fan and with all body parts positioned as intended under normal parking operation.

2.6.3.4.5. ~~In case that the vehicle is exposed to a temperature higher than -4°C, the transfer from the soak area to the test cell shall be undertaken as quickly as possible, without any unjustified delay and . The vehicle shall not be exposed to a temperature different from -7°C  $\pm$ 3°C for no longer than [10] minutes.~~

**Commented [RG 12032070]:** To be reviewed in light of the proposed amendment relating to para 2.3. of Annex 6

**Commented [JPN\_Nick71]:** I propose 20min, for paractical lab operation

#### 2.6.3.5. Preconditioning

The preconditioning phase shall be undertaken with the vehicle and the test cell at the temperature of  $-7^{\circ}\text{C} \pm 5$ , and in accordance with the specifications in paragraph 3.5.1. to 3.5.4.,

~~The engine oil temperature and coolant temperature, if any, shall be within  $\pm 2^{\circ}\text{C}$  of the set point of  $-7^{\circ}\text{C}$ .~~

Commented [JPN\_Nick72]: Propose delete

2.6.3.5.1. Pure ICE vehicles shall be preconditioned [over one WLTCs] and in accordance with paragraph 2.6. of Annex 6.

2.6.3.5.2. NOVC-HEVs shall be preconditioned [over one WLTC] and in accordance with paragraph 3.3.1.1. of Annex 8.

2.6.3.5.3. OVC-HEVs shall be preconditioned over a maximum of [one] WLTC and in accordance with paragraph 2.1.1. or 2.1.2. of Appendix 4 to Annex 8. ~~During the WLTC at the end of preconditioning, the REEC<sub>1</sub> value defined paragraph 3.2.4.5.2, shall be below  $41\% \pm 0.06$ . This criteria applies to only discharge side.~~ The manufacturer is allowed to set the SoC to such a level prior to the precond-soak period that this criterion can be met.

2.6.3.5.4. [PEVs shall be preconditioned ~~at a constant speed defined in paragraph 3.4.4.2.1.2. ver one WLTC, one WLTC City cycle, and a maximum of  $100$  km at a speed of  $100$  km/h or less, and in accordance with paragraph 3. of Appendix 4 to Annex 8. ] Before the end of the preconditioning phase, the REESS should reach the break-off criterion as specified in paragraph 3.4.4.1.3. of Annex 8. The manufacturer is allowed to set the SoC to such a level prior to the soak period that this criterion can be met.]~~

Commented [JPN\_Nick73]: Propose 50km

#### 2.6.3.6. Test-Soak procedure

2.6.3.6.1. After preconditioning and before testing, vehicles shall be kept in a soak area with the ambient conditions described in paragraph 3.2.2.1. of this annex.

2.6.3.6.2. ~~In case that the vehicle is exposed to a temperature higher than  $-4^{\circ}\text{C}$  From the end of the preconditioning until the soaking at  $-7^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , the duration exposed to a temperature higher than  $-4^{\circ}\text{C}$  shall be minimized but vehicle shall not be exposed to a different temperature than  $-7^{\circ}\text{C} \pm 3^{\circ}\text{C}$  for no longer than  $10$  minutes.~~

Commented [JPN\_Nick74]: Propose 20min

2.6.3.6.3. The vehicle shall then be kept in the soak area such that the soaking time ( $t_{\text{test-soak}}$ ) from the end of the preconditioning test to the beginning of the Type 6 test is equal to a minimum soaking time of 12 hours and a maximum of 36 hours.

2.6.3.6.4. The soak shall be performed without using a cooling fan and with all body parts positioned as intended under normal parking operation. The time  $t_{\text{test-soak}}$  shall be recorded.

2.6.3.6.5. ~~The transfer from the soak area to the test cell shall be undertaken as quickly as possible, without any unjustified delay. The vehicle shall not be exposed to a temperature different from  $-7^{\circ}\text{C} \pm 3^{\circ}\text{C}$  for longer than  $10$  minutes.~~

Commented [JPN\_Nick75]: Same para. as 2.6.3.4.5.

2.6.3.6.6. If a stabilized vehicle is moved through a warm area when transporting it to the dynamometer for testing, the vehicle shall be restabilised by holding it at an ambient temperature of  $-7^{\circ}\text{C} \pm 3^{\circ}\text{C}$  for at least six times as long as the vehicle was exposed to warmer temperatures.

~~2.6.3.6.7. The vehicle shall be soaked for a minimum of 12 hours and a cooling may be accomplished by forced cooling down to the set point temperature.  $-7\text{ }^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . If cooling is accelerated by fans, the fans shall be placed so that the maximum cooling of the drive train, engine and exhaust after-treatment system is achieved in a homogeneous manner.~~

Commented [JPN\_Nick76]: Coolant and oil temp ?

~~2.6.3.6.8. After forced cooling period and once the vehicles reaches the set point temperature,  $-7\text{ }^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the vehicle shall be cold-soaked within the stabilized temperature,  $-7\text{ }^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , for at least one hour before starting the emission test. During this time, the ambient temperature shall be kept at  $-7\text{ }^{\circ}\text{C} \pm 3^{\circ}\text{C}$ .~~

Commented [JPN\_Nick77]: Coolant and oil temp ?

Commented [JPN\_Nick78]: Coolant and oil temp ?

2.6.x. Paragraph 2.6.4.3. of Annex 6 shall be understood as follows:

~~2.6.4.3. For preconditioning, the applicable WLTC shall be driven.~~

2.7. Soaking

2.7.1. After preconditioning and before testing, the test vehicle shall be kept in an area with ambient conditions as specified in paragraph 2.2.2.2. of this annex.

2.7.2. The vehicle shall be soaked for a minimum of ~~12 hours~~ and a maximum of 36 hours with the engine compartment cover opened or closed. If not excluded by specific provisions for a particular vehicle, cooling may be accomplished by forced cooling down to the set point temperature. If cooling is accelerated by fans, the fans shall be placed so that the maximum cooling of the drive train, engine and exhaust after-treatment system is achieved in a homogeneous manner.

[This amendment is now incorporated in the new para 2.6.3. text above – so in theory paragraph 2.7. could become ‘not applicable’]

2.6.x. Paragraph 2.8.1. of Annex 6 shall be understood as follows:

2.8.1. The test cell temperature at the start of the test shall be  ~~$-723\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$~~ . The engine oil temperature and coolant temperature, if any, shall be within  $\pm 2\text{ }^{\circ}\text{C}$  of the set point of  ~~$-723\text{ }^{\circ}\text{C}$~~ . ~~The test cell temperature during testing shall be  $-7\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ .~~

[This amendment is now incorporated in the new para 2.6.3. test above – so in theory paragraph 2.8.1. could become ‘not applicable’.

NB: this is a repetition of paragraph 2.2.2.1.1. – so is it needed in Annex 6 in any case?]

2.6.x. Paragraph 2.13.2. of Annex 6 shall be understood as follows:

~~2.13.2. The constant volume sampler, CVS, or other suction device shall be turned off, and the exhaust tube from the tailpipe or tailpipes of the vehicle shall be disconnected.~~

Commented [JPN\_Nick81]: This os for after test completion, not soaking

Commented [JRC82]: Change “or” for “and”

[An alternative approach would be to just say:

“During soaking the exhaust tube from the tailpipe or tailpipes of the vehicle shall be disconnected”]

## 2.7. Calculations

The calculations specified in Annex 7 shall apply for the purposes of this Annex, with the exceptions set out in paragraphs 2.7.1. to 2.7.x.

2.7.1. [Paragraph 1.3. shall be understood as follows:](#)

‘1.3. Rounding of test results

1.3.1. Intermediate steps in the calculations shall not be rounded unless intermediate rounding is required.

1.3.2. The final criteria emission results shall be rounded according to paragraph 7. of this UN GTR in one step to the number of places to the right of the decimal point indicated by the applicable emission standard plus one additional significant figure.

1.3.3. The NO<sub>x</sub> correction factor KH shall be reported rounded according to paragraph 7. of this UN GTR to two places of decimal.

1.3.4. The dilution factor DF shall be reported rounded according to paragraph 7. of this UN GTR to two places of decimal.

1.3.5. For information not related to standards, good engineering judgement shall be used.’

**Commented [RG 16121983]:** Or

“1.3.3. Reserved”

2.7.2. [Paragraph 3.2.1. shall be understood as follows:](#)

‘3.2.1. Mass emissions of gaseous compounds per cycle phase shall be calculated using the following equations:

$$M_{i,phase} = \frac{V_{mix,phase} \times \rho_i \times KH_{phase} \times C_{i,phase} \times 10^{-6}}{d_{phase}}$$

where:

$M_i$  is the mass emission of compound i per test or phase, g/km;

$V_{mix}$  is the volume of the diluted exhaust gas per test or phase expressed in litres per test/phase and corrected to standard conditions (273.15 K (0 °C) and 101.325 kPa);

$\rho_i$  is the density of compound i in grams per litre at standard temperature and pressure (273.15 K (0 °C) and 101.325 kPa);

**KH** is a humidity correction factor applicable only to the mass emissions of oxides of nitrogen, NO<sub>2</sub> and NO<sub>x</sub>, per test or phase;

$C_i$  is the concentration of compound i per test or phase in the diluted exhaust gas expressed in ppm and corrected by the amount of compound i contained in the dilution air;

$d$  is the distance driven over the applicable WLTC, km;

$n$  is the number of phases of the applicable WLTC.’

2.7.2. [Paragraph 3.2.1.2. shall be understood as follows:](#)

‘3.2.1.2. Calculation of the NO<sub>x</sub> humidity correction factor

[For the Type 6 test the calculation of NO<sub>x</sub> humidity correction factor shall not be applied.](#)

~~In order to correct the influence of humidity on the results of oxides of nitrogen, the following calculations apply:~~

$$KH = \frac{1}{1 - 0.0329 \times (H - 10.71)}$$

where:

**Commented [RG 16121984]:** Takes a similar approach to CFR 1066

This is an alternative approach for explaining how the Type 6 test differs from the Tye 1 test

$$H = \frac{6.211 \times R_a \times P_d}{P_d - P_d \times R_a \times 10^{-2}}$$

and:

H is the specific humidity, grams of water vapour per kilogram dry air;

R<sub>a</sub> is the relative humidity of the ambient air, per cent;

P<sub>d</sub> is the saturation vapour pressure at ambient temperature, kPa;

P<sub>g</sub> is the atmospheric pressure in the room, kPa.

The KH factor shall be calculated for each phase of the test cycle.

The ambient temperature and relative humidity shall be defined as the arithmetic average of the continuously measured values during each phase.'

## 2.8. Pure electric and hybrid electric vehicles

The test requirements for pure electric and hybrid electric vehicles specified in Annex 8 shall apply for the purposes of this Annex, with the exceptions set out in paragraphs 2.8.1. to 2.8.x.

2.8.1. xxx

Xxx

## 3. Other requirements

### 3.1. Irrational emission control strategy

3.1.1. Any irrational emission control strategy which results in a reduction in effectiveness of the emission control system under normal operating conditions at low temperature driving, so far as not covered by the standardised emission tests, may be considered a defeat device.]

**Commented [RG 06012085]:** Separate documents being prepared by SG-EV drafting group (PEV and OVC-HEV and NOVC-HEV requirements being led by Sam Tripathy and Bryan Roos and Ricardo)

**Commented [RG-Jul1986]:** Copied from UNR83

**Commented [RG28022087R86]:** Do we need to include?

Is there anything else which needs to be added here?

**Commented [JPN\_Nick88R86]:** No need