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Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Pollution and Energy****Eighty-fifth session**

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Item 4 (a) of the provisional agenda

Heavy duty vehicles:**UN Regulations Nos. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines) and 132 (Retrofit Emissions Control devices (REC))****Proposal for a new Supplement to the 07 series of amendments to UN Regulation No. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines)****Submitted by the United Kingdom of Great Britain and Northern Ireland***

The text reproduced below was prepared by the expert from the United Kingdom of Great Britain and Northern Ireland to introduce a new supplement relating to the approval of a vehicle type with an approved engine with regard to their emission of pollutants, and the reporting of the CO₂ emissions and fuel consumption for type approval of vehicles with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg. The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (Sect.20), para 20.76), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



I. Proposal

Annex 2A

Table 7, amend to read:

| <i>Test number</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> |
|---|----------|----------|----------|----------|----------|----------|----------|
| Measured engine speed (rpm) | | | | | | | |
| Measured fuel flow (g/h) | | | | | | | |
| Measured torque (Nm) | | | | | | | |
| Measured power (kW) | | | | | | | |
| Barometric pressure (kPa) | | | | | | | |
| Water vapour pressure (kPa) | | | | | | | |
| Intake air temperature (K) | | | | | | | |
| Power correction factor | | | | | | | |
| Corrected power (kW) | | | | | | | |
| Auxiliary power (kW) ¹ | | | | | | | |
| Net power (kW) | | | | | | | |
| Net torque (Nm) | | | | | | | |
| Corrected specific fuel consumption (g/kWh) | | | | | | | |

Annex 2B

Section II, amend to read:

“Section II

1. Additional information (where applicable): **see Addendum**
2. Technical Service responsible for carrying out the tests
3. Date of test report
4. Number of test report
5. Remarks (if any): **see Addendum**
6. Place
7. Date
8. Signature

Attachments: Information package.

Test report.”

Annex 2B

Insert a new Addendum, to read:

**"Addendum to type approval communication No ...
concerning the type approval of a vehicle type with an
approved engine with regard to the emission of pollutants
emissions pursuant to Regulation No. 49, 07 series of
amendments**

1. Additional information
 - 1.1. Particulars to be completed in relation to the type approval of a vehicle with an engine installed
 - 1.1.1. Make of engine (name of undertaking)
 - 1.1.2. Type and commercial description (mention any variants)
 - 1.1.3. Manufacturer's code as marked on the engine
 - 1.1.4. Category of vehicle
 - 1.1.5. Category of engine: Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/ Ethanol (E85)/dual-fuel ⁽¹⁾
 - 1.1.5.1. Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B ⁽¹⁾ ^(df)
 - 1.1.6. Name and address of manufacturer
 - 1.1.7. Name and address of manufacturer's authorised representative (if any)
 - 1.2. Vehicle
 - 1.2.1. Type approval number of the engine/engine family ⁽¹⁾
 - 1.2.2. Engine Control Unit (ECU) software calibration number
 - 1.3. Particulars to be completed in relation to the type approval of an engine/engine family ⁽¹⁾ as a separate technical unit (conditions to be respected in the installation of the engine on a vehicle)
 - 1.3.1. Maximum and/or minimum intake depression
 - 1.3.2. Maximum allowable back pressure
 - 1.3.3. Exhaust system volume
 - 1.3.4. Restrictions of use (if any)
 - 1.4. Emission levels of the engine/parent engine ⁽¹⁾

Deterioration Factor (DF): calculated/fixed ⁽¹⁾

Specify the DF values and the emissions on the WHSC (if applicable) and WHTC tests in the table below.

In case of engines tested on different reference fuels, the tables shall be reproduced for each reference fuel tested.

In case of Type 1B and Type 2B dual-fuel engines, the tables shall be reproduced for each mode tested (dual-fuel and diesel modes).

 - 1.4.1. WHSC test

¹ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

^{df} Dual fuel engines

Table 4
WHSC test

| <i>WHSC test (if applicable) *,**</i> | | | | | | | |
|--|------------------------------|-------------------------------|------------------------------------|--|-----------------------------------|-------------------------------------|------------------------------------|
| DF Mult/add⁽¹⁾ | CO | THC | NHMC (†) | NO_x | PM Mass | NH₃ | PM Number |
| Emissions | CO (mg/kWh) | THC (mg/kWh) | NHMC (†) (mg/kWh) | NO_x (mg/kWh) | PM Mass (mg/kWh) | NH₃ ppm | PM Number (#/kWh) |
| Test result | | | | | | | |
| Calculated with DF | | | | | | | |
| CO₂ emissions (mass emission, g/kWh) | | | | | | | |
| Fuel consumption ^(d) (g/kWh) | | | | | | | |

* In the case of engines considered in paragraphs 4.6.3. and 4.6.6. of this Regulation, repeat the information for all fuels tested, when applicable.

** In the case of dual-fuel engines of Type 1B, Type 2B, and type 3B, types as defined in Annex 15 to this Regulation, repeat the information in both dual-fuel and diesel mode.

† In the cases laid down in Table 1 of Annex 15 to this Regulation for dual-fuel engines, and for positive ignition engines

1.4.2. WHTC Test

Table 5
WHTC Test

| <i>WHTC test</i> | | | | | | | | |
|---|------------------------------|-------------------------------|------------------------------------|--|--|-----------------------------------|-------------------------------------|------------------|
| DF Mult/add¹ | CO | THC | NMHC (‡) | CH₄ (‡) | NO_x | PM Mass | NH₃ | PM Number |
| Emissions | CO (mg/kWh) | THC (mg/kWh) | NMHC (‡) (mg/kWh) | CH₄ (‡) (mg/kWh) | NO_x (mg/kWh) | PM Mass (mg/kWh) | NH₃ ppm | PM Number |
| Cold start | | | | | | | | |
| Hot start w/o regeneration | | | | | | | | |
| Hot start with regeneration¹ | | | | | | | | |
| k_{r,u} (mult/add)¹ | | | | | | | | |
| k_{r,d} (mult/add)¹ | | | | | | | | |
| Weighted test result | | | | | | | | |
| Final test result with DF | | | | | | | | |
| CO₂ emissions ^(d) (mass emission, g/kWh) | | | | | | | | |
| Fuel consumption ^(d) (g/kWh) | | | | | | | | |

‡ In the cases laid down in Table 1 of Annex 15 to this Regulation for dual-fuel engines, and for positive ignition engines.

^d When required by this Regulation.

1.4.3. Idle test

Table 6
Idle test

| <i>Test</i> | <i>CO value</i> (%vol) | <i>Lambda</i> ¹ | <i>Engine speed</i> (min ⁻¹) | <i>Engine oil temperature</i> (°C) |
|-----------------------|---------------------------|----------------------------|---|---------------------------------------|
| Low idle test | | N/A | | |
| High idle test | | | | |

1.4.4. PEMS demonstration test

Table 6a
PEMS demonstration test

| | | | | | | |
|---|---------|-----|-------|-----------------|-----------------|-----------|
| Vehicle type (e.g. M ₃ , N ₃ and application e.g. rigid or articulated truck, city bus) | | | | | | |
| Vehicle description (e.g. vehicle model, prototype) | | | | | | |
| Pass Fail Results ² : | CO | THC | NMHC | CH ₄ | NO _x | PM number |
| Work window conformity factor ⁵ | | | | | | |
| CO ₂ mass window conformity factor ⁵ | | | | | | |
| Trip information: | Urban | | Rural | | Motorway | |
| Shares of time of the trip characterised by urban, rural and motorway operation as described in paragraph 4.5. of Annex 8 | | | | | | |
| Shares of time of the trip characterised by accelerating, decelerating, cruising and stop as described in paragraph 4.5.5. of Annex 8 | | | | | | |
| | Minimum | | | Maximum | | |
| Work window average power (%) | | | | | | |
| CO ₂ mass window duration (s) | | | | | | |
| Work window: percentage of valid windows | | | | | | |
| CO ₂ mass window: percentage of valid windows | | | | | | |
| Fuel consumption consistency ratio | | | | | | |

⁵ CF_{final} needs to be stated, if applicable

1.5. Power measurement

1.5.1. Engine power measured on test bench

² Delete as appropriate.

Table 7
Engine power measured on test bench

| <i>Test number</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> |
|---|---|----------|----------|----------|----------|----------|----------|
| Measured engine speed (rpm) | | | | | | | |
| Measured fuel flow (g/h) | | | | | | | |
| Measured torque (Nm) | | | | | | | |
| Measured power (kW) | | | | | | | |
| Barometric pressure (kPa) | | | | | | | |
| Water vapour pressure (kPa) | | | | | | | |
| Intake air temperature (K) | | | | | | | |
| Power correction factor | | | | | | | |
| Corrected power (kW) | | | | | | | |
| Auxiliary power (kW) ¹ | | | | | | | |
| Net power (kW) | | | | | | | |
| Net torque (Nm) | | | | | | | |
| Corrected specific fuel consumption (g/kWh) | | | | | | | |
| 1.5.2. | Additional data | | | | | | |
| 1.6. | Special provisions | | | | | | |
| 1.6.1. | Granting approvals for vehicles for export (see paragraph 13.4.1. of this Regulation) | | | | | | |
| 1.6.1.1. | Approvals granted for vehicles for export in line with paragraph 1.6.1.: Yes/No (²) | | | | | | |
| 1.6.1.2. | Provide a description of approvals granted in paragraph 1.6.1.1., including the series of amendments of this Regulation and the level of emission requirements to which this approval applies | | | | | | |
| 1.6.2. | Replacement engines for vehicles in use (see paragraph 13.4.2. of this Regulation) | | | | | | |
| 1.6.2.1. | Approvals granted for replacement engines for vehicles in use in line with paragraph 1.6.2.: Yes/No (²) | | | | | | |
| 1.6.2.2. | Provide a description of approvals for replacement engines for vehicles in use granted in paragraph 1.6.2.1. including the series of amendments of this Regulation and the level of emission requirements to which this approval applies | | | | | | |
| 1.7. | Alternative approvals (see Annex 9A, paragraph 2.4.) | | | | | | |
| 1.7.1. | Alternative approvals granted in line with paragraph 1.7.: Yes/No (²) | | | | | | |
| 1.7.2. | Provide a description of alternative approvals in line with paragraph 1.7.1. " | | | | | | |

Final paragraph, amend to read:

"In the case of an extension to the type approval of a vehicle with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg, the reporting of the CO₂ emissions (g/km) and fuel consumption (l/100 km) shall be included in accordance with ~~Annex 8 of Regulation No. 101~~ **Appendix 1 to Annex 12.** "

Annex 2C

Table 7, amend to read:

| <i>Test number</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> |
|---|----------|----------|----------|----------|----------|----------|----------|
| Measured engine speed (rpm) | | | | | | | |
| Measured fuel flow (g/h) | | | | | | | |
| Measured torque (Nm) | | | | | | | |
| Measured power (kW) | | | | | | | |
| Barometric pressure (kPa) | | | | | | | |
| Water vapour pressure (kPa) | | | | | | | |
| Intake air temperature (K) | | | | | | | |
| Power correction factor | | | | | | | |
| Corrected power (kW) | | | | | | | |
| Auxiliary power (kW) ¹ | | | | | | | |
| Net power (kW) | | | | | | | |
| Net torque (Nm) | | | | | | | |
| Corrected specific fuel consumption (g/kWh) | | | | | | | |

Final paragraph, amend to read:

"In the case of an extension to the type approval of a vehicle with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg, the reporting of the CO₂ emissions (g/km) and fuel consumption (l/100 km) shall be included in accordance with ~~Annex 8 of Regulation No. 101~~ **Appendix 1 to Annex 12.** "

II. Justification

1. Currently, Annex 2B (communication concerning the approval of a vehicle type with an approved engine with regard to the emission of pollutants) does not include an addendum, unlike Annex 2A (communication concerning the approval of an engine type or family as a separate technical unit) and Annex 2C (communication concerning the approval of a vehicle type). Addendum for Annex 2A and Annex 2C provide relevant information that add on the administrative information required in the main body of Annex 2A and Annex 2C. Adopting a similar approach to Annex 2B (*id est* including an addendum modelled on the existing addendum to Annex 2A and Annex 2C) would therefore provide relevant additional information for the case of the approval of a vehicle type with an approved engine.

2. Annex 2B and Annex 2C reference Annex 8 of Regulation No. 101 for the reporting of the CO₂ emissions and fuel consumption in vehicles with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg. The recent 07 series of amendments introduced provisions relating to CO₂ determination from Annex A1 of Regulation No. 154 as new requirements for the above mentioned vehicles (as set out in Appendix 1 to Annex 12), amending the previous requirements based on provisions from Regulation No. 101. Amendment of Annex

2B and Annex 2C to reference Appendix 1 to Annex 12 instead of Annex 8 of Regulation No. 101 would therefore provide alignment with the 07 series of amendments.
