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**Economic Commission for Europe**

Inland Transport Committee

**World Forum for Harmonization of Vehicle Regulations****Working Party on Pollution and Energy****Ninetieth session**

Geneva, 9–12 January 2024

Item 3 (a) of the provisional agenda

**Light vehicles:****UN Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M<sub>1</sub> and N<sub>1</sub> vehicles), 101 (CO<sub>2</sub> emissions/fuel consumption), 103 (Replacement pollution control devices) and 154 (Worldwide harmonized Light vehicles Test Procedures (WLTP))****Proposal for a new Supplement to 05 series of amendments to UN Regulation No. 83 (Emissions of M<sub>1</sub> and N<sub>1</sub> vehicles)****Submitted by the experts from the International Organization of Motor Vehicle Manufacturers\***

This document proposes to extend the option from the 06 and 07 to the 05 series of amendments allowing the calculation of road load values from those determined according to UN GTR No.15 (WLTP). The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2023 as outlined in proposed programme budget for 2024 (A/78/6 (Sect. 20), table 20.5), 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 4, paragraph 4.1.5.2., amend to read:*

- "4.1.5.2. Dynamometer with adjustable load curve: the load simulator shall be adjusted in order to absorb the power exerted on the driving wheels at steady speeds of 120, 100, 80, 60 and 40 and 20 km/h. The means by which these loads are determined and set are described in Appendix 3a to this annex. **In the case where the vehicle road load has already been determined according to WLTP procedures as defined in UN GTR No. 15, the methodology, described in Appendix 3b may alternatively be used.**"

*Annex 4, rename Appendix 3 to Appendix 3a.*

*Annex 4, insert a new Appendix 3b, to read:*

### "Annex 4 - Appendix 3b

#### Alternative procedure for determination of the total road load power of a vehicle

##### 1. Introduction

The purpose of this appendix is to provide the road load power calculation method that may be used, at the choice of manufacturer, when the vehicle road load has been determined according to WLTP procedures as defined in UN GTR No. 15.

##### 2. Method

##### 2.1. WLTP Road Load calculation of the vehicle

The WLTP Road Load of the vehicle shall be determined according to UN GTR No. 15 Annex 4 or in case the vehicle is part of an interpolation family, according to Annex 7 point 3.2.3.2.2. "Road Load calculation for an individual vehicle" considering as input parameters of the individual vehicle:

- (a) The Test Mass of the vehicle<sup>1</sup>, fitted with its standard equipment<sup>1</sup>;
- (b) The RRC value of the applicable tyre energy class according to Table A4/2 of UN GTR No. 15 Annex 4 or, if the tyres on the front and rear axles belong to different energy efficiency classes, the weighted mean using the equation in paragraph 3.2.3.2.2.3. of UN GTR No. 15 Annex 7;
- (c) The aerodynamic drag of the vehicle fitted with its standard equipment<sup>1</sup>.

##### 2.2. Calculation of the applicable (NEDC) road load of the vehicle

##### 2.2.1. Effect of different tyre pressure prescriptions

The tyre pressure to be taken into account for the purpose of calculating the NEDC road load shall be the average between the two axles of the average between the minimum and maximum tyre pressure permitted for the selected tyres on each axle for the NEDC reference mass of the vehicle. The calculation shall be carried out with the following formula:

$$P_{avg} = \left( \frac{P_{max} + P_{min}}{2} \right)$$

Where,

<sup>1</sup> As defined in UN GTR No.15

$P_{max}$ , is the average of the maximum tyre pressures of the selected tyres for the two axles;

$P_{min}$ , is the average of the minimum tyre pressures of the selected tyres for the two axles.

The corresponding effect in terms of resistance applied to the vehicle shall be calculated using the following formula:

$$TP = \left( \frac{P_{avg}}{P_{min}} \right)^{-0.4}$$

#### 2.2.2. Effect of tyre tread depth

The effect in terms of the resistance applied to the vehicle shall be determined in accordance with the following formula:

$$TTD = \left( 2 \cdot \frac{0.1 \cdot RM_n \cdot 9.81}{1000} \right)$$

Where,  $RM_n$  is the reference mass of the vehicle according to this Regulation

#### 2.2.3. Effect of different consideration of rotating parts

During the WLTP coastdown setting, coastdown times are to be transferred to forces and vice versa by taking into account the applicable test mass plus the effect of rotational mass (3 % of the sum of the MRO and 25 kg). For the NEDC coastdown setting, coastdown times are to be transferred to forces and vice versa by neglecting the effect of rotational mass.

#### 2.2.4. Determination of the NEDC road load coefficients

(a) The road load coefficient  $F_{0,n}$  expressed in Newton (N) for vehicle shall be determined as follows:

(i) Effect of different inertia:

$$F_{0n}^1 = F_{0w} \cdot \left( \frac{RM_n}{TM_w} \right)$$

Where:

$RM_n$  is the Reference Mass of the vehicle according to this Regulation

$F_{0w}$  is the road load coefficient  $F_0$  determined for the WLTP test of the vehicle;

$TM_w$  is the WLTP test mass of the vehicle fitted with its standard equipment.

(ii) Effect of different tyre pressure:

$$F_{0n}^2 = F_{0n}^1 \cdot TP$$

Where the factors  $TP$  in the formula are as defined in point 2.2.1.

(iii) Effect of the inertia of rotating parts:

$$F_{0n}^3 = F_{0n}^2 \cdot \left( \frac{1}{1.03} \right)$$

(iv) Effect of different tyre tread depth:

$$F_{0n} = F_{0n}^3 - TTD$$

Where the factors  $TTD$  in the formula are as defined in point 2.2.2.

- (b) The road load coefficient  $F_{1n}$  for the vehicle shall be determined as follows:

$$F_{1n} = F_{1w} \cdot \left( \frac{1}{1.03} \right)$$

- (c) The road load coefficient  $F_{2n}$  for the vehicle shall be determined as follows:

$$F_{2n} = F_{2w} \cdot \left( \frac{1}{1.03} \right)$$

Where the factor  $F_{2w}$  is the WLTP road load coefficient  $F_2$  determined of the vehicle fitted with its standard equipment."

*Delete Annex 4a*

## II. Justification

1. UN GTR No. 15 (WLTP) has introduced changes to some of the parameters in the process of road load determination.
  2. EU have defined in its correlation Regulation, the methodology to derive an NEDC Road Load from a WLTP Road Load.
  3. This amendment avoids the burden of a new road load determination when a WLTP road load has been performed.
  4. This concept has been adopted in the 06 and 07 series of amendments at 82nd GRPE and it is proposed to also include it in the 05 series which is also commonly used in some world markets.
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