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Item 7 of the provisional agenda

Advanced Emergency Braking System**Proposal for a supplement to the original version, the 01 series and the 02 series of amendments to UN Regulation No. 152 (AEBS for M₁ and N₁)****Submitted by the expert from International Organization of Motor Vehicle Manufacturers***

The text below was prepared by the experts from International Organization of Motor Vehicle Manufacturers (OICA). It is based on informal document GRVA-10-04, which was presented at the tenth session of the Working Party on Automated/Autonomous and Connected Vehicles (GRVA) in May 2021. The modifications of the existing 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 2021 as outlined in proposed programme budget for 2021 (A/75/6 (Sect.20), para 20.51), 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

Paragraph 2.12., amend to read:

“2.12. **"Dry road *affording good adhesion*"** means a road ~~with a nominal peak braking coefficient of 0.9 that would permit a mean fully developed deceleration of at least 9m/s².~~

Paragraph 2.14., shall be delete.

~~“2.14. **"Peak braking coefficient (PBC)"**: means the measure of tyre to road surface friction based on the maximum deceleration of a rolling tyre.”~~

Insert a new paragraph 2.18., to read:

“2.18. **"The mean fully developed deceleration (d_m)"** shall be calculated as the deceleration averaged with respect to distance over the interval v_b to v_e , according to the following formula:

$$d_m = \frac{v_b^2 - v_e^2}{25.92(s_e - s_b)}$$

Where:

v_o = **initial vehicle speed in km/h,**

v_b = **vehicle speed at 0.8 v_o in km/h,**

v_e = **vehicle speed at 0.1 v_o in km/h,**

s_b = **distance travelled between v_o and v_b in metres,**

s_e = **distance travelled between v_o and v_e in metres.**

The speed and distance shall be determined using instrumentation having an accuracy of ± 1 per cent at the prescribed speed for the test. The d_m may be determined by other methods than the measurement of speed and distance; in this case, the accuracy of the d_m shall be within ± 3 per cent.”

Paragraph 5.2.1.4., amend to read:

“5.2.1.4. Speed reduction by braking demand

In absence of driver’s input which would lead to interruption according to paragraph 5.3.2., the AEBS shall be able to achieve a relative impact speed that is less or equal to the maximum relative impact speed as shown in the following table:

- (a) For collisions with unobstructed and constantly travelling or stationary targets;
- (b) On flat, horizontal and dry roads **affording good adhesion**;
- (c) In maximum mass and mass in running order conditions;
- (d) In situations where the vehicle longitudinal centre planes are displaced by not more than 0.2 m;
- (e) In ambient illumination conditions of at least 1000 Lux without blinding of the sensors (e.g. direct blinding sunlight);
- (f) In absence of weather conditions affecting the dynamic performance of the vehicle (e.g. no storm, not below 0°C); and
- (g) When driving straight with no curve, and not turning at an intersection.

It is recognised that ...”

Paragraph 5.2.2.4, amend to read:

“5.2.2.4. Speed reduction by braking demand

In absence of driver's input which would lead to interruption according to paragraph 5.3.2., the AEBS shall be able to achieve an impact speed that is less or equal to the maximum relative impact speed as shown in the following table:

- (a) With unobstructed perpendicularly crossing pedestrians with a lateral speed component of not more than 5 km/h;
- (b) In unambiguous situations (e.g. not multiple pedestrians);
- (c) On flat, horizontal and dry roads **affording good adhesion**;
- (d) In maximum mass and mass in running order conditions;
- (e) In situations where the anticipated impact point is displaced by not more than 0.2 m compared to the vehicle longitudinal centre plane;
- (f) In ambient illumination conditions of at least 2000 Lux without blinding of the sensors (e.g. direct blinding sunlight);
- (g) In absence of weather conditions affecting the dynamic performance of the vehicle (e.g. no storm, not below 0°C) and
- (h) When driving straight with no curve, and not turning at an intersection.

It is recognised that ...”

Paragraph 6.1.1., amend to read (including the deletion of the footnote 3)

- 6.1.1. The test shall be performed on a flat, dry concrete or asphalt surface affording good adhesion.
- ~~6.1.1.1. The road test surface shall have a nominal[†] peak braking coefficient (PBC) of 0.9, unless otherwise specified, when measured using either:~~
- ~~6.1.1.2. The American Society for Testing and Materials (ASTM) E1136 standard reference test tyre, in accordance with ASTM Method E1337-90, at a speed of 40 mph; or~~
- ~~6.1.1.3. The k-test method specified in Appendix 2 to Annex 6 of Regulation No. 13-H.~~
- ~~6.1.1.4. The test surface has a consistent slope between level and 1 per cent.”~~

II. Justification

1. The aim of the PBC reference in this Regulation is to ensure that the adhesion of the road surface will not limit AEBS performance during test.
2. For AEBS for M₁/N₁ vehicles, the theoretical calculations performed to derive the achievable speed reduction assumed a deceleration of the AEBS vehicle of 9 m/s².
3. If the road surface permits the vehicle to reach this deceleration, then the adhesion of the road surface will not be the limiting factor.
4. The currently included PBC reference would not ensure that this required level of deceleration can be reached.
5. The proposal therefore aims to clarify the text to express that the adhesion of the road surface must permit the vehicle to achieve this minimum level of deceleration, which then no longer requires to include a specific PBC value.
6. In order to avoid confusion with other regulations that might refer to a “dry road” in a different context, this proposal additionally aims to consistently use the term “dry road affording good adhesion” throughout this regulation, as was previously introduced in paragraph 6.1.1.

[†] The "nominal" value is understood as being the theoretical target value.