# Proposal for Supplement 3 to the original text to UN Regulation No. 152 (Advanced Emergency Braking Systems for $M_1$ and $N_1$ vehicles)

## Submitted by the experts from the Informal Working Group on Advanced Emergency Braking Systems for vehicles of Categories $M_1$ and $N_1$**

The text reproduced below was prepared by the experts from the Informal Working Group on Advanced Emergency Braking Systems (AEBS) for vehicles of Categories $M_1$ and $N_1$ in order in order to supplement the proposals of document GRVA/2020/26 to improve the text on a number of issues. The modifications to the text of document GRVA/2020/26 are marked in bold for new and strikethrough for deleted characters.

# I. PROPOSAL

*Insert a new paragraph 5.1.4.1.3., to read:*

"**5.1.4.1.3. Upon detection of any non-electrical failure condition (e.g. sensor blindness or sensor misalignment), the warning signal as defined in paragraph 5.1.4.1. shall be illuminated.**"

*Paragraph 5.1.4.3*., delete.

*Paragraph 5.1.6.,* amend to read:

"5.1.6. False reaction avoidance

The system shall be designed to minimise the generation of collision warning signals and to avoid advanced emergency braking in situations where **there is no risk of an imminent collision** ~~the driver would not recognise an impending collision~~. This shall be demonstrated in the assessment carried out under Annex 3, and this assessment shall include in particular scenarios listed in Appendix 2 of Annex 3."

*Paragraph 5.2.1.4 (f),* amend to read:

"5.2.1.4. Speed reduction by braking demand

In absence of

…

(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 …"

*Paragraph 5.4.2.,* amend to read:

"5.4.2. When the vehicle is equipped with a means to automatically deactivate the AEBS function, for instance in situations such as off-road use, being towed, being operated on a dynamometer, being operated in a washing plant, ~~in case of a non-detectable misalignment of sensors,~~ the following conditions shall apply as appropriate:"

*Insert a new Paragraph 5.4.2.3.*, to read:

"**5.4.2.3. Where automatic deactivation of the AEBS function is a consequence of the driver manually switching off the ESC function of the vehicle, this deactivation of the AEBS shall require at least two deliberate actions by the driver.**"

*Paragraph 5.5.7.,* amend to read:

"5.5.7. When the driver is provided with an optical warning signal to indicate that the AEBS is temporarily not available, for example due to inclement weather conditions, the signal shall be constant ~~and yellow in colour~~. The failure warning signal specified in paragraph 5.5.4. above may be used for this purpose."

Paragraph 6.1.1.1., amend to read (including in the footnote):

"6.1.1.1. The road test surface shall have a nominal[3] peak braking coefficient (PBC) of ~~at least~~ 0.9. unless otherwise specified. when measured using either:

…

Footnote 3: The "nominal" value is understood as being the ~~minimum~~ theoretical target value."

*Insert a new paragraph 6.1.6.,* to read:

"**6.1.6. At the request of the manufacturer and with the agreement of the Technical Service tests may be conducted under deviating test conditions (suboptimal conditions, e.g. on a not dry surface; below the specified minimum ambient temperature), whilst the performance requirements are still to be met.**"

*Paragraph 6.4.*, amend to read (including the addition of one column in each table):

"6.4. Warning and Activation Test with a Stationary Vehicle Target

The subject vehicle …

…

… in stationary target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 20 | 20 | **+2/-0** |
| 40 | 42 | **+0/-2** |
| 60 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

… in stationary target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 20 | 20 | **+2/-0** |
| 38 | 42 | **+0/-2** |
| 60 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

The functional part …".

*Paragraph 6.5.*, amend to read (including the addition of one column in each table):

"6.5. Warning and Activation Test with a Moving Vehicle Target

The subject vehicle …

Tests shall be conducted with a vehicle travelling at 30 and 60 km/h speeds shown in tables below for respectively $M_1$ and $N_1$ categories and target

travelling at 20 km/h (with a tolerance of +0/-2 km/h for ~~both the subject and~~ the target vehicle~~s~~). If this is deemed justified, …

… in moving target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 30 | 30 | **+2/-0** |
| 60 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

… in moving target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 30 | 30 | **+2/-0** |
| 58 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

The functional part …".

*Paragraph 6.6.1.*, amend to read (including the addition of one column in each table):

"6.6. Warning and Activation Test with a Pedestrian Target

6.6.1. The subject vehicle …

…

The pedestrian target shall travel in a straight line perpendicular to the subject vehicle's direction of travel at a constant speed of 5 km/h **+0/-0,4** ~~± 0.2~~ km/h, starting not before the functional part of the test has started. The pedestrian target's positioning shall…

… in pedestrian target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 20 | 20 | **+2/-0** |
| 40 | 42 | **+0/-2** |
| 60 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

… in pedestrian target scenario

| *Maximum mass* | *Mass in running order* | ***Tolerance*** |
|---|---|---|
| 20 | 20 | **+2/-0** |
| 38 | 42 | **+0/-2** |
| 60 | 60 | **+0/-2** |

All values in km/h ~~with a tolerance of +0/-2 km/h~~

From the start…"

*Annex 3, Appendix 2*

*Move the definitions as a new introductory paragraph,* to read:

"The manufacturer shall provide …

… of each scenario shall be used as guidance if the Technical Service deems a demonstration of the scenario necessary.

**(a) Definition of overlap ratio between the subject vehicle and the related vehicle**

**Overlap ratio between the subject vehicle and the related vehicle is calculated by the following formula.**

$$\mathbf{R_{overlap} = L_{overlap} / W_{vehicle} * 100}$$

**Where:**

**$R_{overlap}$ : Overlap ratio [%]**

**$L_{overlap}$ : Amount of overlap between extended lines of the width of the subject vehicle and the related vehicle [m]**

**$W_{vehicle}$ : Width of the subject vehicle [m] (sensors, devices for indirect vision, door handles and connections for tyre-pressure gauges are not included when measuring the width of the vehicle)**

**(b) Definition of offset ratio between the subject vehicle and the stationary object**

**Offset ratio between the subject vehicle and the stationary object is calculated by the following formula.**

$$R_{offset} = L_{offset} / (0.5*W_{vehicle}) * 100$$

**$R_{offset}$ : Offset ratio [%]**

**$L_{offset}$ : Amount of offset between the centre of the subject vehicle and the centre of the stationary object, and the direction of offset to the driver's seat side is defined as plus (+) [m]**

**$W_{vehicle}$ : Width of the subject vehicle [m] (sensors, devices for indirect vision, door handles and connections for tyre-pressure gauges are not included when measuring the width of the vehicle)**

…"

*Paragraph 1.2.*, amend to read:

"Scenario 1: Left turn or Right turn at the intersection

…

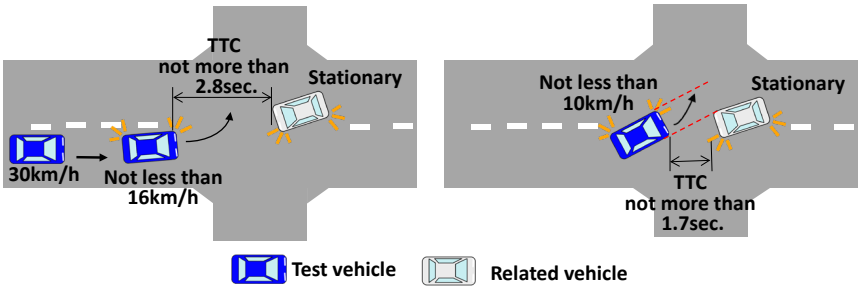
1.2. An example of the detail scenario:

The subject vehicle …

The TTC to the oncoming vehicle is not more than 1.7 seconds at when the ~~wrap~~ **overlap** ratio between the subject vehicle and the oncoming vehicle becomes 0%.

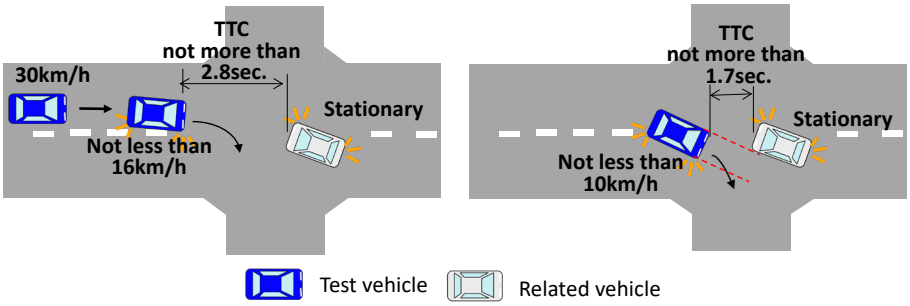
**Figure 1: LEFT TURN OR RIGHT TURN AT THE INTERSECTION**

**(A) DRIVING ON RIGHT SIDE OF THE ROAD**




1) Beginning to steer for **left** turn 2) **Overlap** ratio 0%

**(B) DRIVING ON LEFT SIDE OF THE ROAD**




**1) Beginning to steer for right turn** 2) **Overlap** ratio 0%

*Paragraph 2.2.*, amend to read:

"Scenario 2: Right turn or Left turn of a forward vehicle

…

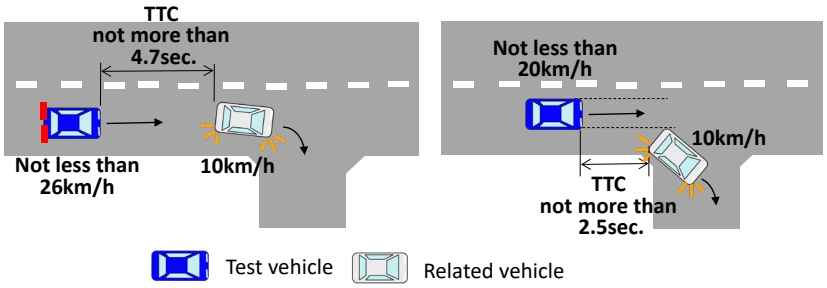
**2.2.** An example of the detail scenario:

Both the forward vehicle and …

The TTC to the forward vehicle is not more than 2.5 seconds at when the ~~wrap~~ **overlap** ratio between the subject vehicle and the forward vehicle becomes 0%."

Figure 2: right turn or left turn of a forward vehicle

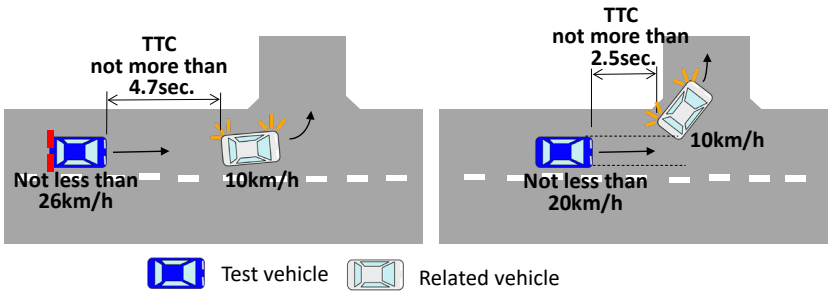
(A) Driving on right side of the road




1) Beginning of **right** turn (related vehicle)

2) **Overlap** ratio 0%

(B) Driving on left side of the road




**1) Beginning of left turn (related vehicle)**

2) **Overlap** ratio 0%

*Paragraph 3.2.*, amend to read:

"Scenario 3: Curved road with guard pipes and a stationary object

…

3.2. An example of the detail scenario:

The subject vehicle drives …

The TTC to the stationary object is not more than 1.1 second at when the ~~wrap~~ **overlap** ratio between the subject vehicle and the stationary vehicle becomes 0%, or at when the offset ratio between the subject vehicle and the centre of the stationary pedestrian target or the stationary bicycle target becomes -100%.

~~Note: offset ratio between the subject vehicle and the stationary object is calculated by the following formula.~~

~~$R_{offset} = L_{offset} / (0.5*W_{vehicle}) * 100$~~

~~$R_{offset}$ : Offset ratio [%]~~

~~$L_{offset}$ : Amount of offset between the centre of the subject vehicle and the centre of the stationary object, and the direction of offset to the driver's seat side is defined as plus (+) [m]~~

~~$W_{vehicle}$ : Width of the subject vehicle [m]~~

# II. JUSTIFICATIONS

## A. Response to failures

Proposal to move the current paragraph 5.1.4.3. up as a 3rd subparagraph of 5.1.4.1.

The latter states that any failure that leads the system to no longer meet the requirements, shall be indicated to the driver. The following sub-paragraphs address the individual failure response to an electrical failure (5.1.4.1.1.) to a delayed initialization (5.1.4.1.2.) and the third sub-paragraph should be non-electrical failure conditions (which is currently a separate paragraph).

## B. Paragraph 5.1.6. – False reaction avoidance

This amendment aims to clarify that warning or emergency brakings shall not be given in situations where the driver would not assess the situation to be critical. With the original wording "where the driver would not recognise an impending collision" it could be misunderstood that interventions were only justified where the criticality of a situation was obvious to the driver, which is not always the case.

## C. Sensor misalignement (paragraph 5.4.2.)

This provision is already covered by the new paragraph 5.1.4.1.3.: need to avoid confusion with the warning.

## D. Automatic deactivation (paragraph 5.4.2.3.)

- ESC is well accepted by drivers.
- There is no known evidence that drivers switch off ESC just in order to be able to deactivate AEBS.
- Depending on the vehicle and its operating use cases, switching off AEBS when ESC is deactivated can be the safest strategy, because the AEBS cannot detect each any every circumstance that indicates unsuitable conditions, it needs that input by the driver.
- This proposal keeps the logics of AEBS deactivation strategy

## E. Delete the mandatory yellow colour for signaling AEBS temporary deactivation (paragraph 5.5.7.)

Proposal to avoid a confusion by the driver of the conditions of paragraph 5.4.3. (AEBS deactivation) and of paragraph 5.5.7. (function not available).

## F. Test track PBC (Peak Braking Coefficient)

Paragraph 6.1.1.1.: "at least" in the sentence and "minimum" in the footnote3 should be erased.

Since it is the provisions regarding road to be used in other tests ( R140 / R78), PBC value should be in the same sentence as the R140 / R78 in accordance with GTR3 / GTR8.

As a practical issue according to ASTM, there are several test surfaces that do not exceed a PBC value of 0.9 per year check. Taking into account this, the simple wording "nominal" is suitable according to ASTM method.

## G. Permitting deviating test conditions (paragraph 6.1.6.)

This amendment aims to carry over the amendment to UN-R79 ACSF B1 already adopted by GRVA-04, which reads "At the manufacturer's discretion and with the agreement of the Technical Service, a lane with a width of less than 3.5 m may be used, if the correct function of the system on roads with wider lanes can be demonstrated.", to the AEBS Regulation as well.

In order to ensure type approval testing also during the winter months it should be possible to test vehicles also on wet surfaces or at lower temperatures. Since both influences tend to result in lower adhesion, this results in a more challenging situation to the system than the standard test conditions defined by the Regulation, and additional demonstration of system behavior within the specified range is not necessary because it would already be covered by the performed tests.

## H. Tolerances in the test section

At low test speeds, the current tolerance would force testing at e.g. 18 km/h, i.e. at speeds beyond the operating design domain of the system or of the frame of testing coditions. The tolerance must hence be shifted into the domain of operation and/or the defined test conditions.

## I. Recommended testing scenarios

Change of “wrap ratio” into “overlap ratio” and introduction of a definition of “overlap ratio”. The proposed drawings are improved accordingly.