

**ECE/TRANS/WP.29/GRRF/2011/XX AEBS-M+A:
Explanatory and justifying document**

The present document aims at providing an easy understanding of the consolidation work tabled in documents AEBS/LDWS-11-02 and AEBS/LDWS-11-03. You will find hereunder the list of the main points which have been adapted for introduction of the AEBS provisions into the proposal for one unique AEBS regulation.

A. Justifications to the draft consolidated text of the Regulation – Step 1 (AEBS/LDWS-11-XX1)

1. Title: *“Regulation on uniform provisions concerning the approval of motor vehicles with regard to ~~a collision mitigation~~ an advanced emergency braking system”*

The draft text of the Regulation is based on the draft Regulation on AEBS-M. As this consolidated draft Regulation addresses any kind of AEBS meeting the requirements of the provisions, it is not necessary to specify neither “collision avoidance” nor “collision mitigation”.

2. Scope and purpose (paragraph 1): *“This Regulation applies to the approval of vehicles of category ~~M₂~~, M₃ and N₃¹ [equipped with a pneumatic braking system and pneumatic rear suspension] with regard to an on-board system to mitigate or avoid a rear-end in lane collision.”*
 - a) Deletion of references to vehicles of category 2: the AEBS informal group mandate to OICA focuses on a consolidation of the requirements into one unique Regulation along the lines of the staggered approach proposed in document AEBS/LDWS-07-06-Rev.1. This latter document proposes to address the vehicles of categories M3/N3 as a step 1, then subsequently provide provisions for vehicles of categories M2/N2, as a second step. These categories will hence be introduced via the procedures currently existing in the frame of the 58 Agreement.
 - b) Introduction of mandatory equipment of pneumatic braking system: this is added along the lines of the OICA proposal AEBS/LDWS-07-06-Rev.1, still in discussion within the informal group. The reason for OICA to introduce this additional restriction is that the fast response time required by the abrupt braking demand necessary for the proper operation of an AEBS implies a high quantity of energy immediately available in the braking system. For heavy vehicles, this is only available in the case of pneumatic braking systems, and no design research have started yet for expanding AEBS to heavy vehicles equipped with hydraulic braking systems. Should AEBS in the future be expanded to heavy vehicles equipped with hydraulic braking systems, the requirements would certainly need to be adapted. For this reason, it is important to limit the scope of the current regulation to pneumatic braking systems.
 - c) Introduction of mandatory equipment of pneumatic rear suspension: this is also added along the lines of the OICA proposal AEBS/LDWS-07-06-Rev.1, still in discussion within the informal group. The vertical field of view of the current sensor technology does not permit to equip the vehicles with an AEBS if they are not also equipped with a means to regulate the pitch angle.

3. Definitions (paragraph 2):

~~2.1.1. “Advanced Emergency Braking System Mitigation (AEBS M)” means a system which can automatically detect a potential forward collision and activate the vehicle braking system to decelerate the vehicle with the purpose of mitigating a collision.~~

~~2.1.2. “Advanced Emergency Braking System Avoidance (AEBS A)” means a system which can automatically detect a potential forward collision and activate the vehicle braking system to decelerate the vehicle with the purpose of avoiding a collision.~~

~~2.2. “Collision mitigation” means the actions taken by the system, such as obstacle detection, the computing of the relevant data and the automatic activation of the service brakes, aiming at significantly decreasing the speed of the vehicle at the time of the collision.”~~

- a) Deletion of the definitions of AEBS-M and AEBS-A: the AEBS informal group mandate to OICA focuses on a consolidation of the requirements into one unique Regulation capturing both the systems addressing collision mitigation and collision avoidance. Whether a system will mitigate or avoid an accident depends mainly on the test conditions. For example, even in the performance requirements for the first step, the system shall avoid the collision with a moving target. As a conclusion, keeping one unique definition for AEBS is appropriate in a regulation consolidating the requirements for all systems.
- b) Similarly, the definitions for collision avoidance and for collision mitigation should be deleted as well in such unique Regulation.

As a consequence, all references to AEBS-M, AEBS-A, collision mitigation and collision avoidance (e.g. in paragraphs 3.1. and 3.2.1.) are deleted from this draft Regulation.

4. Cross-references and numbering: where necessary, the proper numbering has been introduced.
5. Generation of a collision warning (paragraph 5.2.1.1.): “A collision warning when the AEBS has detected ~~the possibility of a high risk of~~ collision with a preceding vehicle of category M, N or O in the same lane...”
Using the word “possibility” also includes the situations with a low risk for a collision. There is a possibility for a collision as soon as the system detects a slower vehicle in the same lane. However, a long distance and a low relative speed to the target result in premature warnings and braking actions, which may not be understood by the driver.
6. Autonomous activation of the service braking system (paragraph 5.2.2.): as a consequence of the consolidation of the regulatory text, the wording of this paragraph was adapted to capture both avoidance and mitigation. This also applies to paragraph 6.3. (test course).
7. Description of the moving target (paragraph 6.5.3.): “The moving target shall be moving on the axis centre of the test course at a constant speed of $[30^{+4}/_{-0}$ km/h ~~for the vehicles of categories M₃ and N₃ and $XXX^{+4}/_{-0}$ km/h for the vehicles of categories M₂ and N₂].”
In accordance with the mandate received from the informal group, the proposal only addresses the values for the test with a moving target for vehicles of categories M3/N3 for step 1. This corresponds to the cell A5 in the document AEBSMLDWS-07-06-Rev.1.~~
8. Timing for the collision warning modes (paragraph 6.6.2.):
~~“6.6.2.1. —Where the warning signals are provided in a cascade,~~
 - a) ~~the first of the 2 warning modes at least one haptic or acoustic warning mode shall be provided no later than [2.0 / 1.5 / 1.4 / 0.8] s, [and shall occur not earlier than [2.5] s] and~~
 - b) ~~the last of the 2 warning modes the last warning mode shall be provided no later than [0.8]s~~~~before the start of the Emergency Braking phase.~~
6.6.2.1. At least one haptic or acoustic warning mode shall be provided not later than [1.4] s before the start of the Emergency Braking phase.
6.6.2.2. No warning mode shall be generated later than [0.8]s before the start of the Emergency Braking phase.
~~6.6.2.2. —Where the warning signals are not provided in a cascade, the 2 warning modes shall be provided no later than [2.0 / 1.5 / 1.4 / 0.8] s [and shall occur not earlier than [2.5] s] before the start of the Emergency Braking phase.”~~

As a result of the discussions and agreement held at the 10th meeting of the informal group (Paris, December 2010), it is considered more logical and less complicate to simply address these requirements via the two paragraphs proposed above. The obligation of providing at least two modes of warning is present in paragraph 5.5.1. and does not need to be repeated in an additional sub-paragraph in section 6.

The wording “generated” in paragraph 6.6.2.2. has been preferred to the current wording “provided” in order to clarify that the last warning must start before the 0.8 s delay.

The inclusion between square brackets of a unique figure indicating the latest permitted times is understood as being a value still subject to discussions and decision by the GRRF informal group. The indication of the figure “1.4 s” or “0.8 s” does not preclude any other figure to be decided by the informal group.

This justification is also valid for the test with a moving target (paragraph 6.7.2.).

9. Performance requirements: speed reduction (paragraph 6.6.3.)

“[6.6.3. The speed reduction of the subject vehicle at the time of the impact with the stationary target shall be:

6.6.3.1. not less than [10] km/h for a vehicle of Category N₃,

6.6.3.2. not less than [10] km/h for a vehicle of Category M₃,

~~6.6.3.3. not less than [X₁] km/h for a vehicle of Category N₂,~~

~~6.6.3.4. not less than [X₂] km/h for a vehicle of Category M₂.]”~~

In accordance with the mandate received from the informal group, the proposal only addresses the values for the performance requirements for vehicles of categories M3/N3 for step 1, along the lines proposed in document AEBS/LDWS-07-06-Rev.1.

This is also valid for the test with a moving target (paragraph 6.7.3.).

10. False reaction test (paragraph 6.10):

*“The obstacles outside lane shall be two stationary vehicles of category M₁ AA saloon ~~in the same direction~~ **having their central longitudinal axis oriented parallel to the direction of the axis of the test course** in both right and left lanes. The width of ~~a~~ **each lane is shall be** 3.5m; each vehicle ~~is being~~ located on the centre of the **respective** outside lane.”*

Editorial improvements, valid for both stationary / moving obstacle cases.

B. Justifications to the draft consolidated text of the Regulation – Step 2 (AEBS/LDWS-11-XX2)

1. Scope and purpose (paragraph 1.): Introduction of categories M2 and N2, as per the mandate received from the GRRF informal group.
2. Specific performance requirements have been introduced, as appropriate along the lines provided by the document AEBS/LDWS-07-06-Rev.1. Figures still subject to discussions within the informal group are indicated between square brackets.
3. Transitional provisions (paragraph 12.): The proposal for a step 2 is introduced via a draft 01 Series of amendments to the original text of the Regulation following the mandate to OICA of the GRRF informal group. The proposal follows the rules and procedures within the framework of the 58 Agreement to upgrade an existing Regulation. The dates indicated in square brackets reflect the proposal tabled by document AEBS/LDWS-07-06-Rev.1.