

Proposal for draft amendments to Regulation No. 13:

Advanced Emergency Braking Systems (AEBS)

The text reproduced below was prepared by the experts from CLEPA to add Annex 22 to Regulation No. 13 to include the requirements for advanced emergency braking systems (AEBS).

**A. PROPOSAL**

Insert new paragraph 2.33. (new definition):

- 2.33. "Advanced Emergency Braking System" means a system which will automatically detect the possibility of a collision with an obstacle, when travelling in a forward direction, provide the driver with a warning(s) and in the event of no corrective action by the driver shall automatically decelerate the vehicle and may take other corrective action(s) to avoid or mitigate the severity of the collision.

Insert new paragraph 5.2.1.33.:

- 5.2.1.33. Subject to the provisions of paragraph [12.5.] to this Regulation, vehicles of categories M2, M3, N2 and N3 being equipped with a Vehicle Stability Function according to paragraph 2.32., shall be equipped with an advanced emergency braking system.

Annex 2, insert new item 14.15.:

- 14.15. The vehicle is equipped with an advanced emergency braking system: Yes/No <sup>2/</sup>
- If yes:  
The advanced emergency braking system has been tested according to and fulfils the requirements of Annex 22: Yes/No <sup>2/</sup>  
The advanced emergency braking system is optional equipment: Yes/No <sup>2/</sup>

Insert new Annex 22:

Annex 22

SPECIAL REQUIREMENTS FOR VEHICLES EQUIPPED WITH A  
ADVANCE EMERGENCY BRAKING SYSTEM

1. GENERAL

This annex defines the special requirements for vehicles equipped with an advanced emergency braking system, pursuant to paragraph 5.2.1.33. of this Regulation.

2. REQUIREMENTS

2.1. Power-driven vehicles of categories N<sub>1</sub> (excluding vehicles with hydraulic transmission), M<sub>2</sub>, M<sub>3</sub>, N<sub>2</sub> and N<sub>3</sub>

2.1.1. Where a vehicle is equipped with an advanced emergency braking system as defined in paragraph 2.33. of this Regulation, the following shall apply:

2.2. General requirements

2.2.1. An advanced emergency braking system failure or defect shall be detected and indicated to the driver by the specific optical warning signal referred to in paragraph [5.2.1.29.] of this Regulation.

The warning signal shall be constant and remain displayed as long as the failure or defect persists and the ignition (start) switch is in the 'on' (run) position.

2.2.2. In the case that the advanced emergency braking system has the ability to shut itself down due to a non-failure loss of functionality, e.g. temporary sensor blindness, the driver shall be provided with a warning signal indicating that the system is temporarily unavailable.

The warning signal shall be constant, yellow in colour and remain displayed as long as the system shut-down persists and the ignition (start) switch is in the 'on' (run) position.

2.2.3. Prior to the autonomous activation of the brake as described in paragraph 2.2.4., the driver shall be provided with a warning(s). This warning(s) may be either acoustic, visual or haptic, or a combination.

If a short sharp brake application is to be used as a warning, it shall

- not exceed 0.8s and
- not result in a vehicle speed reduction greater than 5 km/h.

2.2.4. If the driver has not reacted to the warning specified in paragraph 2.2.3. and a collision is inevitable, the brakes shall be autonomously applied.

- 2.2.5. Until the moment of a collision, the driver shall at all times be able to override the operation of the advanced emergency braking system (as specified in paragraphs 2.2.3 and 2.2.4). The override may be initiated by:
- operation of the turn indicator
  - a change in the accelerator pedal position, or
  - any other reaction that indicates that the driver is aware of the pending situation.

- 2.2.6. The advanced emergency braking system shall operate within the speed range of 20 km/h to 130 km/h. The system may operate outside of this speed range.

### 2.3. Test requirements

#### 2.3.1. General

- 2.3.1.1. The target vehicle shall be a high volume series production M1 AA saloon category vehicle<sup>1</sup> for the tests detailed in paragraphs 2.3.2. to 2.3.6. and a ‘soft target’ for the test detailed in paragraph 2.3.7.

The ‘soft target’ shall be a shaped inflatable rubber device, or an equivalent device, representative of a M1 AA saloon category vehicle<sup>1</sup>. It shall be possible to move the ‘soft target’ and bring it to a halt under the conditions specified in paragraph 2.3.7.

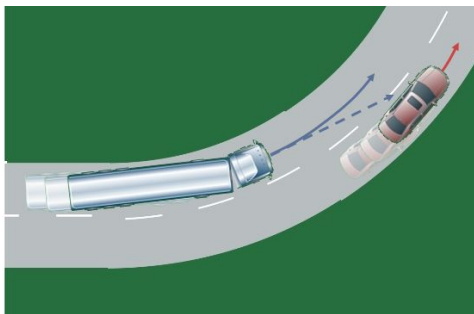
The soft target may have a radar reflective coating or a built-in radar reflective capability representative of an actual car if necessary.

Details that enable the target vehicles to be specifically identified shall be recorded in the vehicle type-approval documentation.

- 2.3.1.2. A tolerance of  $\pm 3$  km/h is allowable on all specified speeds and a tolerance of  $\pm 0.1$  m/s<sup>2</sup> on all specified decelerations.

- 2.3.1.3. All tests to be carried out with the test vehicle in the unladen condition. In the case of a vehicle equipped to tow a trailer, the tests described in paragraphs 2.3.2. to 2.3.7. shall be carried-out without a trailer attached.

#### 2.3.2. Adjacent vehicle curve test



The advanced emergency braking system shall not react in any way when the test vehicle is approaching and passing the target vehicle at a closing speed of 10 km/h

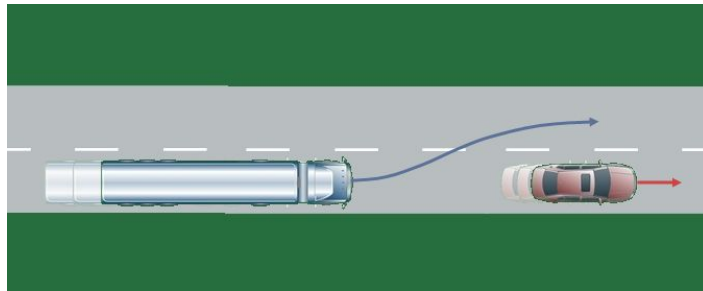
<sup>1</sup> as defined in annex 7 to the consolidated resolution on the construction of vehicles (R.E. 3) (TRANS/WP.29/78/Rev1/Amend2 as last amended by Amend4)

when both vehicles are travelling in adjacent lanes, each 3.5m wide, with the inner marking of the inside lane having a 150m radius of curvature.

The target vehicle shall have a constant speed of 40 km/h.

The test shall be conducted twice, once with a right hand curve and once with a left hand curve.

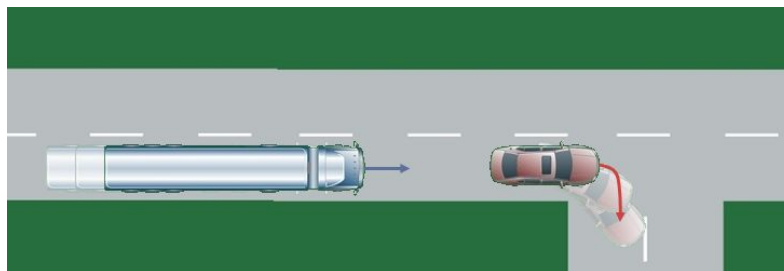
### 2.3.3. Overtaking manoeuvre test



The advanced emergency braking system shall not react in any way when the test vehicle is approaching and passing the target vehicle at a closing speed of 10 km/h when both vehicles are travelling initially in the same lane. Each lane to be straight and 3.5m wide.

The target vehicle shall have a constant speed of 40 km/h and the test vehicle shall start the overtaking manoeuvre when the time to collision is 4.0s.

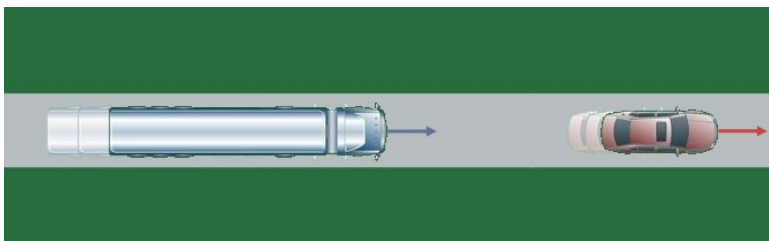
### 2.3.4. Road exit test



The advanced emergency braking system shall not react in any way when the test vehicle is approaching the target vehicle which is turning right in the case of a left hand drive test vehicle, or left in the case of a right hand drive test vehicle, from the direction of travel. The exit path travelled by the target vehicle shall follow a radius of curvature of between 10 and 20m.

Initially the test vehicle and the target vehicle shall travel at constant speed of 60 km/h with a separation distance of 60m. The target vehicle after braking at  $3\text{m/s}^2$  for 5s shall immediately turn right for a left hand drive test vehicle, or left for a right hand drive test vehicle, into the (imaginary) side road.

### 2.3.5. Closing gap test



The advanced emergency braking system shall provide the driver with the warning specified in paragraph 2.2.3., when the test vehicle and the target vehicle are travelling in a straight line one behind the other with a vehicle centreline offset of not more than 0.5m under the following conditions;

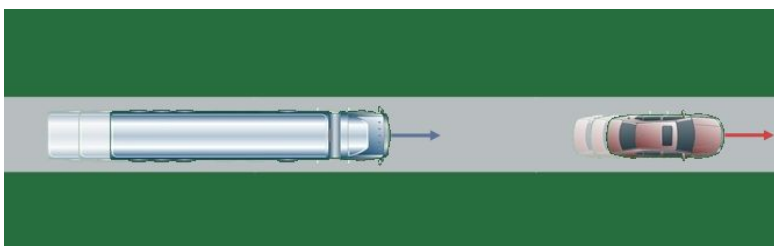
- test vehicle: 60 km/h, target vehicle: 40 km/h
- test vehicle: 80 km/h, target vehicle: 70 km/h

where the initial distance between the test vehicle and the target vehicle is at least 200m.

The warning(s) shall occur at a point in time, as identified by the vehicle manufacturer, such that the driver has a remaining reaction time of at least 1.5s to apply full braking to avoid a collision, under the conditions: unladen vehicle on a road surface having a coefficient of adhesion of about 0.8 (dry road).

Subsequent to the warning, the driver actions (a) to (c) of paragraph 2.2.5. shall result in the advanced emergency braking system reverting to its inactive state.

### 2.3.6. Braking vehicle test



The advanced emergency braking system shall provide the driver with the warning specified in paragraph 2.2.3., when the test vehicle and the target vehicle are travelling in a straight line one behind the other with a vehicle centreline offset of not more than 0.5m under the following conditions:

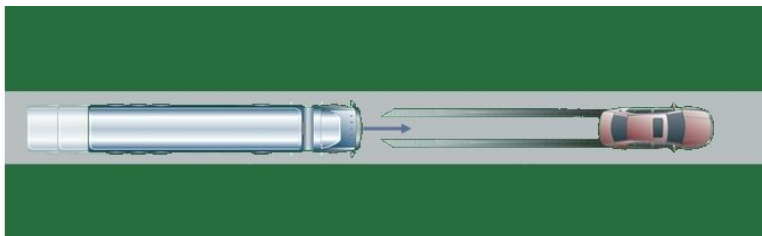
- the target vehicle brakes at 3 m/s<sup>2</sup> from a speed of 80 km/h
- the target vehicle brakes at 5 m/s<sup>2</sup> from a speed of 80 km/h

where the initial distance between the test vehicle and the target vehicle is 70±0.5m.

The warning(s) shall occur at a point in time, as identified by the vehicle manufacturer, such that the driver has a remaining reaction time of at least 1.5s to apply full braking to avoid a collision, under the conditions: unladen vehicle on a road surface having a coefficient of adhesion of about 0.8 (dry road).

Subsequent to the warning, the driver actions (a) to (c) of paragraph 2.2.5. shall result in the advanced emergency braking system reverting to its inactive state.

2.3.7. Slowing to a stop test



The advanced emergency braking system shall provide the driver with the warning specified in paragraph 2.2.3., and with the driver taking no action automatically apply the brakes<sup>2</sup> when a collision is inevitable.

In this case the target vehicle shall be a ‘soft target’ representative of a M1 AA saloon category vehicle.

The test vehicle and the target vehicle shall travel in a straight line one behind the other with a vehicle centreline offset of not more than 0.5m with the target vehicle coming to a standstill at a deceleration of [5 m/s<sup>2</sup>].

Prior to the deceleration, the test vehicle shall move at a speed of [50 km/h], the target vehicle shall move at a speed of [20 km/h] and the initial distance should be at least [50m].

The deceleration of the test vehicle shall be at least [3.0 m/s<sup>2</sup>] in the autonomous braking phase.

**B. JUSTIFICATION**

TBD

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<sup>2</sup> Additional interaction with other vehicle systems or components is allowed. Where these systems or components are subject to special Regulations, such interaction shall comply with the requirements of those Regulations, e.g. interaction with the steering system shall comply with the requirements set out in Regulation No. 79 for corrective steering.