

E/ECE/324
E/ECE/TRANS/505

Rev.2/Add.AEBS

30 January 20XX

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITION OF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS */

(Revision 2, including the amendments which entered into force on 16 October 1995)

Addendum AEBS: Regulation No. AEBS+1

Date of entry into force: XXX

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF MOTOR VEHICLES WITH REGARD TO THE ADVANCED EMERGENCY BRAKING SYSTEM



UNITED NATIONS

*/ Former title of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

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Regulation No. AEBS

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF MOTOR VEHICLES
WITH REGARD TO THE ADVANCED EMERGENCY BRAKING SYSTEM

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1. SCOPE AND PURPOSE

- 1.1. This Regulation applies to the advanced emergency braking system of vehicles of category M₂, N₂, M₃ and N₃^{1/}.

Proposal 1 by Japan (AEBS/LDWS-02-10):

insert a new paragraph 1.2 and to renumber existing paragraph 1.2 to 1.3:

- 1.2. *Contracting Parties may mandate the fitment of AEBS to specific category among M2, M3, N2 and N3 in their territory. In this case, at the time of application of this Regulation, Contracting Parties shall notify to the Secretary-General of the United Nations that they intend to mandate the fitment of AEBS specified in this regulation in their territory for which vehicle.*

Justification

Since the traffic accident situation in each country may differ, any Contracting Party may prefer mandating the fitment of AEBS specified by the technical requirement of this regulation to the specific vehicle. To achieving this demand under the mutual recognition under 1958 agreement, if Contracting Party want to require to install AEBS to the specific vehicle, it is necessary to declare it to other Contracting Party beforehand. This amendment proposal is based on ECE116 and the document ECE/TRANS/WP.29/2009/129 .

TF02:

- 1.2. Contracting Parties shall issue or accept approvals with respect to vehicles equipped with AEBS detecting both moving and stationary targets unless they notify to the Secretary-General of the United Nations their option to issue or accept approvals with respect to ~~for~~ vehicles equipped with AEBS detecting moving targets only. Such notification shall have effect in accordance with the time scales laid down in Article 1, paragraphs 6. and 7. of the 1958 Agreement (E/ECE/TRANS/505/Rev.2).

action point from TF01:

Japan to consider, for the purpose of developing a draft regulatory text for an AEBS for "moving targets", the possibility of accepting higher decelerations than the ones proposed in document AEBS/LDWS-02-10 (page 12, paragraph 5.2.1.2.1.5.).

^{1/} As defined in Annex 7 to the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev.1/Amend.2, as last amended by Amend.4).

2. DEFINITIONS

For the purposes of this Regulation:

- 2.1. "Approval of a vehicle type" means the full procedure whereby a Contracting Party to the Agreement certifies that a vehicle type meets the technical requirements of this Regulation;
- 2.2. "Vehicle type with regard to its Advanced Emergency Braking System" means a category of vehicles which do not differ in such essential respects as:
- (a) the manufacturer's trade name or mark,
 - (b) vehicle features which significantly influence the performances of the Advanced Emergency Braking System,
 - (c) the type and design of the Advanced Emergency Braking System.
- 2.3. "Advanced Emergency Braking System (AEBS)" means a system which can automatically detect ~~†~~a potentially forward collision ~~[an emergency situation]~~ [UR1] and activate the vehicle braking system to decelerate the vehicle with the purpose of avoiding or mitigating a collision.

Proposal 2 by Japan (AEBS/LDWS-02-10):

insert in the definition a provision to specify that the system shall avoid over-reliance by the driver.

Justification

The over-reliance of the driver is an important factor for the traffic safety

Agreed action (TF01):

To reflect this principle in the performance requirements (see point 5 below)

- 2.4. "Time to collision" means the delay remaining between the instant considered and the time of the collision between the subject vehicle and the target vehicle, notwithstanding any alteration of speeds and directions during that delay.
- 2.5. "Remaining reaction time" means the particular time to collision when the instant considered is defined by the vehicle manufacturer as permitting the driver to undertake an action successfully avoiding the collision.

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Proposal 3 by Japan (AEBS/LDWS-02-10):

Delete the definition of "remaining reaction time" in 2.5 and insert the following definitions to provide better clarity by separating "remaining reaction time" into "driver response time" and "collision avoidance limit":

- 2.5. "Collision avoidance limit by braking" means the minimum TTC during which the vehicle's collision with a forward obstacle can be avoided by braking, plotted against the relative speed (on the $V_r - TTC$ graph).
- 2.6. "Collision avoidance limit by steering" means the minimum TTC during which the vehicle's collision with a forward obstacle can be avoided by steering, plotted against the relative speed (on the $V_r - TTC$ graph).
- 2.7. "Collision avoidance limit" means the shorter one between the collision avoidable limit by braking and the collision avoidable limit by steering.
- 2.8. "Driver response time" means the time from the warning to the start of collision avoiding manoeuvre of the driver.
- 2.9. "Minimum time of braking for avoiding collision under ordinary driving" means the particular time to collision from the latest start of braking for collision avoidance under ordinary driving to collision.
- 2.10. "Minimum time of steering for avoiding collision under ordinary driving" means the particular time to collision from the latest start of steering for collision avoidance under ordinary driving to collision.
- 2.11. "Minimum time of manoeuvre for avoiding collision under ordinary driving" means the minimum time for avoiding collision under ordinary driving by braking or steering, whichever is shorter.

Justification

For better clarity, "Remaining reaction time" should be separated into the "Driver response time" and "Collision avoidance limit".

TF02:

- 2.5. “Subject vehicle” means the vehicle being subject to testing.
- 2.6. “Target vehicle” or “target” means a target simulating the bulk and the radar cross section of a regular passenger car of category M1 AA saloon 1/

Proposal 4 by Japan (AEBS/LDWS-02-10):

Rephrase the definition of "target vehicle" as follows:

“Target ~~vehicle obstacle~~” or “~~target~~” means a target simulating the bulk or ~~and~~ the radar cross section of a regular passenger car of category M1 AA saloon 1/”

Justification

Since there are bulk and a reflector as targets, “obstacle” is appropriate for this paragraph than “vehicle”. Either of bulk or a reflector can be used in a test. To specify the situation, the above paragraph is amended.

TF02:

- 2.7. “Stationary target” means a target fixed on the ground on the axis of the test course.
- 2.8. “Moving target” means a target having a speed of at least 15 km/h along the axis of the test course and in the same direction as the subject vehicle.

Comment by CLEPA (AEBS/LDWS-02):

CLEPA: attention: “moving” means “moving going to a stop” (still to be discussed);

“stationary” means always stopped.

Chair: those definitions must indeed be re-discussed.

TF02:

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- 2.9. “Radar cross section (RCS)” means a measure of how detectable an object is with a radar.
- 2.10. “Collision mitigation” means the actions taken by the system, such as the detection of a stationary obstacle, the computing of the relevant data and the activation of the service brakes, for significantly decreasing the impact speed.
- 2.11. “Collision avoidance” means the actions taken by the system, such as the obstacle detection, the computing of the relevant data and the activation of the service brakes, for slowing down the subject vehicle to a speed equal to or lower than the target vehicle speed.

3. APPLICATION FOR APPROVAL

- 3.1. The application for approval of a vehicle type with regard to the advanced emergency braking system shall be submitted by the vehicle manufacturer or by his authorized representative.
- 3.2. It shall be accompanied by the documents mentioned below in triplicate and include the following particulars:
- 3.2.1. a description of the vehicle type with regard to the items mentioned in paragraph 2 above, together with dimensional drawings and a documentation package which gives access to the basic design of the AEBS and the means by which it is linked to other vehicle systems or by which it directly controls output variables. The numbers and/or symbols identifying the vehicle type shall be specified; and
- 3.2.2. particulars of the primary reference marks in sufficient detail to enable them to be readily identified and the position of each in relation to the others and to the "R" point verified.
- 3.3. A vehicle representative of the vehicle type to be approved shall be submitted to the Technical Service conducting the approval tests.

4. APPROVAL

- 4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 5. below, approval of that vehicle shall be granted.
- 4.2. An approval number shall be assigned to each type approved; its first two digits (00 for the Regulation in its initial form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to the same vehicle type equipped with another type of AEBS, or to another vehicle type.

- 4.3. Notice of approval or of refusal or withdrawal of approval pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply this Regulation by means of a form conforming to the model in Annex 1 and photographs and/or plans supplied by the applicant being in a format not exceeding A4 (210 x 297 mm), or folded to that format, and on an appropriate scale.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark conforming to the model described in Annex 2, consisting of:
- 4.4.1 a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval 2/;
- 4.4.2 the number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1. above.
- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations, annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1. above.
- 4.6. The approval mark shall be clearly legible and be indelible.

2/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Serbia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32 for Latvia, 33 (vacant), 34 for Bulgaria, 35 (vacant), 36 for Lithuania, 37 for Turkey, 38 (vacant), 39 for Azerbaijan, 40 for The former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol), 43 for Japan, 44 (vacant), 45 for Australia, 46 for Ukraine, 47 for South Africa, 48 for New Zealand, 49 for Cyprus, 50 for Malta, 51 for the Republic of Korea, 52 for Malaysia, 53 for Thailand, 54 and 55 (vacant) and 56 for Montenegro. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

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4.7. The approval mark shall be placed close to or on the vehicle data plate.

5. SPECIFICATIONS

Action point from TF01:

OICA to draft text for a "moving target" test method (maximum deceleration, other criteria if necessary) and a possible approach for a draft regulatory text reflecting the system currently on the market in Europe.

TF02:

5.1. General

5.1.1. Subject to the requirements of paragraph 12, any vehicle fitted with a AEBS complying with the definition of paragraph 2.3 shall meet the performance requirements contained in paragraphs 5.1 to 5.5.4. of this regulation and shall be equipped with an anti-lock device.

5.1.2. Any AEBS fitted on a vehicle shall comply with the requirements of Regulation No. 10 on electromagnetic interferences.

Proposal 2 by Japan (AEBS/LDWS-02-10):

Insert in definition a provision to specify that the system shall avoid over-reliance by the driver.

Agreed action (TF01):

To reflect this principle in the performance requirements (see point 5 below)

Justification

The over-reliance of the driver is an important factor for the traffic safety

TF02:

5.2. Performance requirements

5.2.1. When tested in the conditions of paragraphs 6.1. to 6.5., the AEBS shall:

5.2.1.1. provide the driver with the warning specified in paragraph 5.5.1. when tested in accordance with the provisions of paragraph 6.6. (reaction time warning test);

Proposal 5 by Japan (AEBS/LDWS-02-10):

Rephrase the wording of point 5.2.1.1 as follows:

5.2.1.1. provide the driver with the warning specified in paragraph 5.5.1. **at the latest driver response time [0.8 s] prior to the activation of the service braking system. Notwithstanding the provision above, in case the system detects the situation where the activation of the service braking system is needed within the time shorter than driver response time [0.8 s], the driver may be warned at the time of the detection. Warning at the same time as the activation of the service braking system is also allowed if the prediction of the situation which needs the activation of the service braking system is completely infeasible. ~~when tested in accordance with the provisions of paragraph 6.6. (reaction time warning test);~~**

Justification

In principle, the first priority is to warn the driver at the time when the driver is able to take over the braking task. However, there is a case in the real field where it is not feasible to detect the future emergency situation which needs the automatic braking activation some time before it actually happens and secure the time for the driver to react to the warning. In this case, it is more profitable to allow the system to activate the service braking system when it detect the emergency situation without the specified preceding warning than to oblige the system to suspend the activation of the service braking system for the prior warning.

TF02:

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- 5.2.1.2. activate the subject vehicle service braking system when tested in accordance with the provisions of paragraph 6.7. (braking system activation test) and

Proposal 6 + 7 by Japan (AEBS/LDWS-02-10):

Rephrase the wording of point 5.2.1.2 as follows and add points 5.2.1.2.1 to 5.2.1.2.1.5:

- 5.2.1.2. activate the subject vehicle service braking system ~~when tested in accordance with the provisions of paragraph 6.7. (braking system activation test) and according to the provisions from 5.2.1.2.1 to 5.2.1.2.1.5.~~

5.2.1.2.1 Timing of braking control

5.2.1.2.1.1. Collision avoidance limit

5.2.1.2.1.1.1 Collision avoidance limit by braking

To determine the collision avoidance limit by braking, the deceleration shall be calculated from the shortest braking distance of the laden or unladen vehicle, and the TTC for each relative speed shall be calculated from this deceleration. The test conditions for determining the shortest braking distance are; flat asphalt or concrete straight lane, initial brake temperature is equal to or less than 100°C, vehicle speed is 5 km/h lower than maximum speed. However, the vehicle speed shall not exceed 80 km/h. The driver's brake operation is defined in the following.*

The brake operation for a vehicle with pneumatic brake system shall be such that the pressure in either output circuit of the valve reaches 586 kPa within 0.2 seconds after brake operation start or the maximum pedal stroke is achieved within 0.2 seconds after brake operation start. For a vehicle with hydraulic brake system, the brake operation shall ensure that the force applied to the brake pedal reaches 667 N within 0.3 seconds.

* In the case of the test, the collision avoidable limit line by braking may be equal to the TTC which is calculated for each relative velocity by fixing the deceleration in 0.6G.

5.2.1.2.1.1.2 Collision avoidance limit by steering

The collision avoidance limit by steering shall be 0.8 seconds.

Proposal 6 + 7 by Japan (AEBS/LDWS-02-10) - continued:

5.2.1.2.1.2. Minimum time of manoeuvre for avoiding collision under ordinary driving

5.2.1.2.1.2.1. Minimum time of braking for avoiding collision under ordinary driving

The minimum time of braking for avoiding collision under ordinary driving shall be determined by the formula: $T1 = 0.0317 \times V_r + 1.54$.

Where T1 is minimum time of braking (second) for avoiding collision under ordinary driving and Vr is relative speed (km/h).

5.2.1.2.1.2.2. Minimum time of steering for avoiding collision under ordinary driving

The minimum time of steering for avoiding collision under ordinary driving shall be 1.6 seconds.

5.2.1.2.1.3. AEBS shall start the braking control at the earliest from crossing the minimum time of manoeuvre for avoiding collision under ordinary driving.

5.2.1.2.1.4. AEBS shall start the braking control at the latest from the collision avoidance limit.

5.2.1.2.1.5. The AEBS shall be so designed that it operates on a flat road and generates an average deceleration equal to or greater than 3.3 m/s² after crossing the collision avoidance limit, if the collision avoidance limit by steering is lower than the collision avoidance limit by braking. However, if a braking control based on the minimum time of manoeuvre for avoiding collision under ordinary driving has not been operated, when the relative speed is 60 km/h or less, the phrase "after crossing the collision avoidance limit " in the above sentence may be replaced by "0.3 seconds after crossing the collision avoidance limit".

Justification

These paragraphs in respect to the AEBS activation timing are added as a measure for distrust of the AEBS. If a driver's operation is interfered by the AEBS function, the driver feels not to trust the AEBS function. Please refer to AEBS/LDW -01-06 in page 10-17 for our proposal of AEBS activation timing. And terms in AEBS/LDW -01-06 are reconsidered as follows;

- a) Collision judgment line --> Collision avoidance limit
- b) Collision avoidable limit line by braking --> Collision avoidance limit by braking
- c) Collision avoidable limit line by steering --> Collision avoidance limit by steering
- d) Collision risk judgment line --> Minimum time of maneuver for avoiding collision under ordinary driving
- e) Lower limit line for collision avoidance by normal braking --> Minimum time of braking for avoiding collision under ordinary braking
- f) Lower limit line for collision avoidance by normal steering --> Minimum time of steering for avoiding collision under ordinary driving

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Proposal 6 + 7 by Japan (AEBS/LDWS-02-10) - continued:

Related action point from TF01:

Japan to consider, for the purpose of developing a draft regulatory text for an AEBS for "moving targets", the possibility of accepting higher decelerations than the ones proposed in document AEBS/LDWS-02-10 (page 12, paragraph 5.2.1.2.1.5.).

TF02:

- 5.2.1.3. provide the driver with the warning specified in paragraph 5.5.2. when tested in accordance with the provisions of paragraph 6.8. (malfunction detection test).
- 5.2.2. The AEBS shall be active at least within the vehicle speed range of 15 km/h to 90 km/h, unless manually de-activated as per paragraph 5.4. below.

Action point from 2nd IG meeting:

OICA to provide a draft text proposal about speed range of system activation, taking into account the possible presence of a speed limiter

TF02:

5.3. The driver shall always have the capability of overriding the AEBS.

Proposal 8 by Japan (AEBS/LDWS-02-10):

Amend point 5.3 to read:

The driver ~~shall always have the capability of overriding the AEBS~~ may have the **capability of overriding the AEBS. Notwithstanding the provision above, the driver shall be able to override the brake applied by the AEBS when the driver operates the service brake to generate the bigger braking force than the one realized by the AEBS.**

Justification

**This paragraph is amended to specify that “may” is appropriate than “shall”.
If braking force by a driver is bigger than braking force by the AEBS, the braking force by a driver is set above the AEBS. This requirement is added.**

TF02:

Action point from 2nd IG meeting:

Alternative wording proposed at 2nd IG meeting

“The driver shall at all times be able to override the operation of the advanced emergency braking system. This override may be initiated by any reaction that indicates that the driver is aware of the pending situation”

OICA and UK to provide a draft text covering the overriding capabilities

TF02:

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- 5.4. When a vehicle is equipped with a means to disable the AEBS function, the following conditions shall apply as appropriate:
- 5.4.1. The AEBS function shall be automatically reinstated at the initiation of each new ignition cycle.
- 5.4.2. A constant optical warning signal shall inform the driver that the AEBS function has been disabled. The yellow warning signal specified in paragraph 5.5.2. below may be used for this purpose.
- 5.5. Warning requirements
- 5.5.1. The remaining reaction time warning referred to in paragraph 6.6. shall be by means of an optical, audible or haptic warning signal, or any combination thereof.

Proposal 9 by Japan (AEBS/LDWS-02-10):

Amend point 5.5.1 to read:

- 5.5.1. The ~~remaining reaction time collision~~ warning referred to in paragraph ~~6.6~~ **5.2.1.1.** shall **use at least two means among audible, haptic and optical warning signals** ~~be by means of an optical, audible or haptic warning signal, or any combination thereof.~~

Justification

From general HMI principle (it will be discussed at the ITS informal group in this September.) point of view, the warning signal for leaving very little margin for driver's maneuver delay or error should have more than one means.

TF02:

- 5.5.2. The malfunction warning referred to in paragraph 6.8. shall be by means of a yellow optical warning signal.
- 5.5.3. Any AEBS optical warning signal shall be activated either when the ignition (start) switch is turned to the "on" (run) position or when the ignition (start) switch is in a position between the "on" (run) and "start" that is designated by the manufacturer as a check position (bulb check). This requirement does not apply to tell-tales shown in a common space.
- 5.5.4. The optical warning signals shall be visible even by daylight; the satisfactory condition of the signal must be easily verifiable by the driver from the driver's seat.

6. TEST PROCEDURE

Action point from TF01:

OICA to draft text for a "moving target" test method (maximum deceleration, other criteria if necessary) and a possible approach for a draft regulatory text reflecting the system currently on the market in Europe.

TF02:

- 6.1. Test conditions
- 6.1.1. The test shall be performed on a flat surface affording good adhesion.
- 6.1.2. The ambient temperature shall be between 0° C and 45° C.
- 6.1.4. The horizontal visibility range shall be greater than 1 km.
- 6.2. Accuracy of measurements
- 6.2.1. Distances shall be measured with an accuracy of +/- 5%.
- 6.2.2. Speeds shall be measured with an accuracy of +/- 5%.
- 6.2.3. Time and delays shall be measured with an accuracy of +/- 1%.

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6.3. Test course

The course shall be a segment of straight road of sufficient length in order to maintain the subject vehicle speeds required below and to allow detecting a target vehicle moving at a minimum speed of 15 km/h and braking the subject vehicle up to collision avoidance.

Action point from TF01:

All Contracting Parties are kindly invited to verify their proving ground capabilities in terms of testing the systems performance on curved roads. As a reminder, 2 km can be considered a standard highway radius of curvature, and 250 m is considered the radius of curvature of a tight curve on motorways.

TF02:

6.4. Vehicle conditions

6.4.1. Test weight

The vehicle shall be tested in the unladen conditions of the Type-0 test as described in Annex 4 to Regulation N° 13. No alteration shall be made once the test procedure has begun.

6.4.2. The AEBS shall be configured in accordance with the instructions provided by the vehicle manufacturer. In the case where the AEBS is equipped with a user-adjustable warning threshold, each test shall be performed twice: once with the warning threshold set at its earliest setting, and once with the warning threshold set at its latest setting. No alteration shall be made once the test procedure has begun.

- 6.5. Target vehicle
- 6.5.1. The target used for the test shall have the bulk of a regular passenger car of category M1 AA saloon and a total radar cross section (RCS) of at least $2 \text{ m}^2 \pm 1 \%$.
- 6.5.2. When the target carries radar reflector(s),
- 6.5.2.1. the reflector(s) shall be oriented toward the subject vehicle;
- 6.5.2.2. the reflectors shall be placed between 0.09 m to 1.00 m height; and
- 6.5.2.3. the structure supporting the reflector(s) on the target shall not reflect radio waves emitted by the subject vehicle AEBS.

Proposal 10 by Japan (AEBS/LDWS-02-10):

Amend point 6.5 as follows:

- 6.5. Target ~~vehicle~~**obstacle**
- 6.5.1. The target used for the test shall have the bulk of a regular passenger car of category M1 AA saloon and/or a **radar reflector(s)total radar cross section (RCS) of at least $2 \text{ m}^2 \pm 1\%$.**
- 6.5.2. When the target carries radar reflector(s),
- 6.5.2.1. the reflector(s) shall be oriented toward the subject vehicle;
- 6.5.2.2. The target used for the test shall be made of two reflectors. Radar Cross Section (RCS) of each reflector is until 15 dBsm. If a radar reflectivity is smaller than two reflectors with each radar cross section (RCS) of 15 dBsm, the test may use the different target obstacle.**
- 6.5.2.3. The reflectors shall be placed on a horizontal line perpendicular to the axis of the test course, distant 1.7m from each other, and symmetrically to the axis of the test course, oriented toward the subject vehicle.**
- ~~6.5.2.24.~~ the reflectors shall be placed between 0.09 m to 1.00 m height. **However, if the height of the forward obstacle sensor of the test vehicle exceeds 1 m, the height of the reflector may be raised to the height of the sensor.;** and
- ~~6.5.2.35.~~ the structure supporting the reflector(s) on the target shall not reflect radio waves emitted by the subject vehicle AEBS.

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Proposal 10 by Japan (AEBS/LDWS-02-10)- continued:

Justification

These amendments are added to clarify requirements of (1) RCS of the reflector and (2) the height of the target.

(1) RCS of the reflector: Japan carried out the experiments which measured RCS. And we compared the passenger vehicle with the reflector in RCS. This result shows that RCS of two reflectors (15dBsm×2) is equal to the passenger vehicle.

(2) The corner reflector has stronger directivity than the actual vehicle. To simulate the real condition, the corner reflector may be placed up around the height of the radar.

TF02:

6.5.3. Stationary target

The stationary target shall be positioned such that its component nearest to the subject vehicle is positioned at the collision point on the axis of the test course.

6.5.4. Moving target

The moving target shall be moving on the axis of the test course at a constant speed comprised between 5 km/h and 70 km/h.

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

6.6. Remaining reaction time warning test

6.6.1. With the subject vehicle stationary and the ignition locking system in the "Lock" or "Off" position, activate the ignition locking system to the "On" or "Run" position. The AEBS shall perform a check of lamp function as specified in paragraph 5.5.3. of this Regulation.

6.6.2. Warning test with stationary target

6.6.2.1. Drive the vehicle, enter the vehicle the test course and smoothly track the lane so that the posture of the vehicle is stable. Perform three trials at the respective constant speeds of 20 km/h, 40 km/h and 80 km/h.

6.6.2.2. The AEBS shall warn the driver as mentioned in paragraph 5.2.1.1. at the latest when the remaining reaction time has fallen below 1,5 s.

6.6.2.3. If the AEBS did not warn the driver as mentioned in paragraph 6.6.2.2. above, discontinue the test.

6.6.3. Warning test with moving target

6.6.3.1. Drive the moving target as in paragraph 6.5.4.

6.6.3.2. Increase the subject vehicle speed and perform three trials at the relative speed between the subject vehicle and the target equalling to 20 km/h, 40 km/h and 60 km/h.

6.6.3.3. The AEBS shall warn the driver as mentioned in paragraph 5.2.1.1. at the latest when the remaining reaction time has fallen below 1,5 s.

6.6.3.4. If the AEBS did not warn the driver as mentioned in paragraph 6.6.3.3. above, discontinue the test.

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Proposal 11 by Japan (AEBS/LDWS-02-10):

Amend point 6.6 as follows:

- 6.6. ~~Remaining reaction time~~ Collision warning test
- 6.6.1. With the subject vehicle stationary and the ignition locking system in the "Lock" or "Off" position, activate the ignition locking system to the "On" or "Run" position. The AEBS shall perform a check of lamp function as specified in paragraph 5.5.3. of this Regulation.
- 6.6.2. Warning test with stationary target
- 6.6.2.1. Drive the vehicle, enter the vehicle the test course and smoothly track the lane so that the posture of the vehicle is stable. Perform three trials at the respective constant speeds of 20 km/h, 40 km/h and 80 km/h.
- 6.6.2.2. The AEBS shall warn the driver as mentioned in paragraph 5.2.1.1. ~~at the latest when the remaining reaction time has fallen below 1,5 s.~~
- 6.6.2.3. If the AEBS did not warn the driver as mentioned in paragraph 6.6.2.2. above, discontinue the test.
- 6.6.3. Warning test with moving target
- 6.6.3.1. Drive the moving target as in paragraph 6.5.4.
- 6.6.3.2. Increase the subject vehicle speed and perform three trials at the relative speed between the subject vehicle and the target equalling to 20 km/h, 40 km/h and 60 km/h.
- 6.6.3.3. The AEBS shall warn the driver as mentioned in paragraph 5.2.1.1. ~~at the latest when the remaining reaction time has fallen below 1,5 s.~~

Justification

The above paragraphs are amended so that the collision warning in paragraph 5.2.1.1 is referred.

TF02:

- 6.7. Braking system activation test
- 6.7.1. With the vehicle stationary and the ignition locking system in the "Lock" or "Off" position, activate the ignition locking system to the "On" or "Run" position. The AEBS shall perform a check of lamp function as specified in paragraph 5.5.3. of this Regulation.
- 6.7.2. Braking system activation with stationary target
- 6.7.2.1. Drive the vehicle, enter the vehicle the test course and smoothly track the lane so that the posture of the vehicle is stable. Perform three trials at the respective constant speeds of 20 km/h, 40 km/h and 80 km/h.
- 6.7.2.2. The AEBS shall:
- 6.7.2.2.1. activate the service braking system as mentioned in paragraph 5.2.1.2. at the latest at a time to collision equalling 0,8 s, and
- 6.7.2.2.2. provoke an average deceleration of at least 3,3 m/s².
- 6.7.2.3. If the AEBS did not activate the service braking system as mentioned in paragraph 6.7.2.2. above, discontinue the test.
- 6.7.3. Braking system activation with moving target
- 6.7.3.1. Drive the moving target as in paragraph 6.5.4. and drive the subject vehicle, enter the test course and smoothly track the lane so that the posture of the vehicle is stable.
- 6.7.3.2. Perform three trials at the relative speed between the subject vehicle and the target equalling to 20 km/h, 40 km/h and 60 km/h.
- 6.7.3.3. The AEBS shall:
- 6.7.3.3.1. activate the service braking system as mentioned in paragraph 5.2.1.2. at a time to collision equalling 0,8 s, and
- 6.7.3.3.2. provoke an average deceleration of at least 3,3 m/s².
- 6.7.3.4. If the AEBS did not activate the service braking system as mentioned in paragraph 6.7.3.3. above, discontinue the test.

AEBS/LDWS-TF02-03

Proposal 12 by Japan (AEBS/LDWS-02-10):

Amend point 6.7.2 as follows:

- 6.7.2. Braking system activation with stationary target
- 6.7.2.1. Drive the vehicle, enter the vehicle the test course and smoothly track the lane so that the posture of the vehicle is stable. Perform three trials at the respective constant speeds of 20 km/h, 40 km/h and 80 km/h.
- 6.7.2.2. The AEBS shall **activate the service braking system as mentioned in paragraph 5.2.1.2.1.5.**
- ~~6.7.2.2.1. activate the service braking system as mentioned in paragraph 5.2.1.2. at the latest at a time to collision equalling 0,8 s, and~~
- ~~6.7.2.2.2. provoke an average deceleration of at least 3,3 m/s².~~
- 6.7.2.3. If the AEBS did not activate the service braking system as mentioned in paragraph 6.7.2.2. above, discontinue the test.
- 6.7.3. Braking system activation with moving target
- 6.7.3.1. Drive the moving target as in paragraph 6.5.4. and drive the subject vehicle, enter it the test course and smoothly track the lane so that the posture of the vehicle is stable.
- 6.7.3.2. Perform three trials at the relative speed between the subject vehicle and the target equalling to 20 km/h, 40 km/h and 60 km/h.
- 6.7.3.3. The AEBS shall **activate the service braking system as mentioned in paragraph 5.2.1.2.1.5.÷**
- ~~6.7.3.3.1. activate the service braking system as mentioned in paragraph 5.2.1.2. at a time to collision equalling 0,8 s, and~~
- ~~6.7.3.3.2. provoke an average deceleration of at least 3,3 m/s².~~

Justification

The above paragraphs are amended so that the braking system activation in paragraph 5.2.1.2.1.5 is referred.

TF02:

Proposal 12 by Japan (AEBS/LDWS-02-10) - continued:

action point from TF01:

Japan to consider, for the purpose of developing a draft regulatory text for an AEBS for "moving targets", the possibility of accepting higher decelerations than the ones proposed in document AEBS/LDWS-02-10 (page 12, paragraph 5.2.1.2.1.5.).

TF02:

- 6.8. Malfunction detection
- 6.8.1. Simulate a AEBS malfunction, for example by disconnecting the power source to any AEBS component, disconnecting any electrical connection between AEBS components, or misaiming the sensor(s). When simulating an AEBS malfunction, the electrical connections for the telltale lamps shall not be disconnected.
- 6.8.2. Drive the vehicle for up to 60 minutes along any portion of the test course.
- 6.8.3. The sum of the total cumulative drive time under paragraph 6.8.2. shall be the lesser of 60 minutes or the time at which the AEBS malfunction telltale illuminates in accordance with paragraph 5.5.2.
- 6.8.4. If the AEBS malfunction indicator did not illuminate in accordance with paragraph 5.5.2. as required, discontinue the test.

AEBS/LDWS-TF02-03

Proposal 13 by Japan (AEBS/LDWS-02-10):

Add new point 6.9:

6.9. Verification test of deactivation of braking control to obstacle outside the test lane

6.9.1 Road test surface

6.9.1.1 Tests are conducted on a straight lane 3.5 m width with dry, flat, asphalt or concrete-paved surface.

6.9.2. Obstacle outside lane

6.9.2.1. The obstacle outside lane used for the test shall be a vehicle. The obstacle outside lane shall be set up in the same direction as the test vehicle. The side of the obstacle outside lane shall be set up at the symmetric position of outside 0.5m of the lane.

6.9.3. Test procedures

6.9.3.1. The test vehicle shall be driven at 40 ± 2 km/h speed, keeping its centerline on the lane center, from a point at least 60 m before the obstacles outside lane until the vehicle passes the obstacles. The test shall be repeated three times.

6.9.3.2. The vehicle speed shall be kept constant.

6.9.3.3. The driver shall not operate the brake system at such a timing as affecting the operation of the AEBS before and after passing the obstacles outside lane.

6.9.3.4. The test vehicle speed, deceleration, and the distance to obstacles outside lane shall be measured. In addition, no activation of the AEBS by passing through outside obstacles shall be confirmed.

6.9.4. AEBS functioning test to obstacle outside the test lane

6.9.4.1. The AEBS shall not activate any braking control, in the specified number of tests. Above provision does not be applied to a collision warning braking (refer to in paragraphs 2.25.).

Justification

The verification test of deactivation of braking control to obstacle outside the test lane is added. This deactivation test of AEBS is proposed as a minimum requirement. Please refer to AEBS/LDW-01-06 on page 34.

TF02:

7. MODIFICATION OF VEHICLE TYPE AND EXTENSION OF APPROVAL

7.1. Every modification of the vehicle type as defined in paragraph 2.2. above shall be notified to the Administrative Department which approved the vehicle type. The department may then either:

7.1.1. consider that the modifications made do not have an adverse effect on the conditions of the granting of the approval and grant an extension of approval;

7.1.2. consider that the modifications made affect the conditions of the granting of the approval and require further tests or additional checks before granting an extension of approval.

7.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.3. above to the Contracting Parties to the Agreement which apply this Regulation.

7.3. The Competent Authority shall inform the other Contracting Parties of the extension by means of the communication form which appears in Annex 2 to this Regulation. It shall assign a serial number to each extension, to be known as the extension number.

8. CONFORMITY OF PRODUCTION

8.1. Procedures concerning conformity of production shall conform to the general provisions defined in Appendix 2 to the Agreement (E/ECE/324-E/ECE/TRANS/505/Rev.2) and meet the following requirements:

8.2. A vehicle approved pursuant to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements of paragraph 5. above;

8.3. The Competent Authority which has granted approval may at any time verify the conformity of control methods applicable to each production unit. The normal frequency of such inspections shall be once every two years.

9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 8. above are not complied with.

9.2. If a Contracting Party withdraws an approval it had previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by sending them a communication form conforming to the model in Annex 1 to this Regulation.

AEBS/LDWS-TF02-03

10. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, he shall so inform the authority which granted the approval, which in turn shall forthwith inform the other Contracting Parties to the Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

11. NAMES AND ADDRESSES OF THE TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF ADMINISTRATIVE DEPARTMENTS

The Contracting Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Administrative Departments which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval are to be sent.

12. INTRODUCTORY PROVISIONS

12.1. As from the date of entry into force of this Regulation, Contracting Parties applying this Regulation shall not:

(a) Refuse to grant ECE approval for a type of vehicle under this Regulation; or

(b) Prohibit the sale or entry into service of a vehicle

if the vehicle falls within the scope of this Regulation and complies with the requirements of this Regulation.

Annex 1

COMMUNICATION

(Maximum format: A4 (210 x 297 mm))



issued by :

Name of administration:

.....
.....
.....

concerning: 2/

- APPROVAL GRANTED
- APPROVAL EXTENDED
- APPROVAL REFUSED
- APPROVAL WITHDRAWN
- PRODUCTION DEFINITELY DISCONTINUED

of a type of vehicle with regard to the lane departure warning system pursuant to Regulation No. AEBS

Approval No.: Extension No.:

1. Trademark:
2. Type and trade name(s):
3. Name and address of manufacturer:
4. If applicable, name and address of manufacturer's representative:
.....
5. Brief description of vehicle:
6. Data to enable the identification of reference point "R" of the seating position designated for the driver in relation to the primary reference marks:
.....
7. Identification, place and relative positions of the primary reference marks:
8. Date of submission of vehicle for approval:
9. Technical Service performing the approval tests:

10. Date of report issued by that service:
11. Number of report issued by that service:
12. Approval with regard to the AEBS is granted/refused: 2/
13. Place:
14. Date:
15. Signature:
16. Annexed to this communication are the following documents, bearing the approval number indicated above:

..... dimensional drawings

..... exploded view or photograph of the passenger compartment
17. Any remarks:

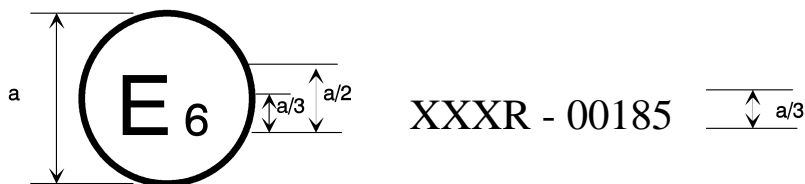
1/ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

2/ Delete what does not apply.

Annex 2

ARRANGEMENTS OF APPROVAL MARKS

(see paragraphs 4.4. to 4.4.2. of this Regulation)



$a = 8 \text{ mm min}$

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in Belgium (E6) with regard to the AEBS pursuant to Regulation No. AEBS. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No. XXX in its original form.
