ANNEX II

Requirements and tests for the type-approval of motor vehicles with regard to AEBS

1. Requirements

1.1. General requirements

1.1.1. Any vehicle covered by the scope of this Regulation shall, with regard to the AEBS fitted, meet the performance requirements set out in points 1.1 to 1.6.2 of this Annex and shall be equipped with an anti-lock braking function in accordance with the performance requirements of Annex 13 of UNECE Regulation No 13[(1)].

1.1.2. The effectiveness of the AEBS shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with UNECE Regulation No 10, 03 series of amendments.

1.1.3. Conformity with the safety aspects of complex electronic control systems shall be demonstrated by meeting the requirements of Annex III.

1.2. Performance requirements

1.2.1. The system shall provide the driver with appropriate warnings as described in points 1.2.1.1 to 1.2.1.3:

1.2.1.1. A collision warning when the AEBS has detected the possibility of a collision with a preceding vehicle of category M, N or O in the same lane which is travelling at a slower speed, has slowed to a halt or is stationary having not being identified as moving. The warning shall be as specified in point 1.5.1.

1.2.1.2. A failure warning when there is a failure in the AEBS that prevents the requirements of this Annex being met. The warning shall be as specified in point 1.5.4.

1.2.1.2.1. There shall not be an appreciable time interval between each self-check by the AEBS, and subsequently there shall not be an appreciable delay in illuminating the warning signal, in the case of an electrically detectable failure.

1.2.1.3. A deactivation warning, if the vehicle is equipped with a means to manually deactivate the AEBS, shall be given when the system is deactivated. This shall be as specified in point 1.4.2.

1.2.2. Subsequent to the warning(s) referred to in point 1.2.1.1, and subject to the provisions of points 1.3.1, 1.3.2 and 1.3.3, there shall be an emergency braking phase having the purpose of significantly decreasing the speed of the subject vehicle. This shall be tested in accordance with points 2.4 and 2.5.

1.2.3. The AEBS shall be active at least within the vehicle speed range of 15 km/h up to the maximum design speed of the vehicle, and at all vehicle load, unless manually deactivated in accordance with point 1.4.

1.2.4. The AEBS shall be designed to minimise the generation of collision warning signals and to avoid autonomous braking in situations where the driver would not recognise an impending forward collision. This shall be demonstrated in accordance with point 2.8.

1.3. Interruption by the driver

1.3.1. The AEBS may provide the means for the driver to interrupt the collision warning phase. However, when a vehicle braking system is used to provide a haptic warning, the system shall provide the driver with a means to interrupt the warning braking.

1.3.2. The AEBS shall provide the means for the driver to interrupt the emergency braking phase.

1.3.3. In the cases referred to in points 1.3.1 and 1.3.2, the interruption may be initiated by any positive action (e.g. kick-down, operating the direction indicator control) that indicates that the driver is aware of the emergency situation. The vehicle manufacturer shall provide a list of these positive actions to the technical service at the time of type-approval and it shall be annexed to the test report referred to in Section II of Part 2 of Annex I.

1.4. When a vehicle is equipped with a means to deactivate the AEBS function, the following conditions shall apply as appropriate:

1.4.1. The AEBS function shall be automatically reinstated at the initiation of each new ignition cycle.

1.4.2. A constant optical warning signal shall inform the driver that the AEBS function has been deactivated. The yellow warning signal specified in point 1.5.4 may be used for this purpose.

1.5. Warning indication

1.5.1. The collision warning referred to in point 1.2.1.1 shall be provided by at least two modes selected from acoustic, haptic or optical.

The timing of the warning signals shall be such that they provide the possibility for the driver to react to the risk of collision and take control of the situation, and shall also avoid nuisance for the driver by too early or too frequent warnings. This shall be tested in accordance with points 2.4.2 and 2.5.2.

1.5.2. A description of the warning indication and the sequence in which the collision warning signals are presented to the driver shall be provided by the vehicle manufacturer at the time of type-approval and recorded in the test report.

1.5.3. Where an optical means is used as part of the collision warning, the optical signal may be the flashing of the failure warning signal specified in point 1.2.1.2.

1.5.4. The failure warning referred to in point 1.2.1.2 shall be a constant yellow optical warning signal.

1.5.5. Each 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 (initial system (power-on)). This requirement does not apply to warning signals shown in a common space.

1.5.6. The optical warning signals shall be visible even by daylight; the satisfactory condition of the signals must be easily verifiable by the driver from the driver’s seat.

1.5.7. 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 point 1.5.4 may be used for this purpose.

1.6. Provisions for the periodic technical inspection

1.6.1. At a periodic technical inspection it shall be possible to confirm the correct operational status of the AEBS by a visible observation of the failure warning signal status, following a 'power-ON' and any bulb check.

In the case of the failure warning signal being in a common space, the common space must be observed to be functional prior to the failure warning signal status check.

1.6.2. At the time of type-approval, the means to protect against simple unauthorised modification of the operation of the failure warning signal chosen by the manufacturer shall be confidentially outlined.

Alternatively, this protection requirement is fulfilled when a secondary means of checking the correct operational status of the AEBS is available.

2. Test procedures

2.1. Test conditions

2.1.1. The test shall be performed on a flat, dry concrete or asphalt surface affording good adhesion.

2.1.2. The ambient temperature shall be between 0 °C and 45 °C.

2.1.3. The horizontal visibility range shall allow the target to be observed throughout the test.

2.1.4. The tests shall be performed when there is no wind liable to affect the results.

2.2. Vehicle conditions

2.2.1. Test weight

The vehicle shall be tested in a condition of load to be agreed between the manufacturer and the Technical Service. No alteration shall be made once the test procedure has begun.

2.3. Test targets

2.3.1. The target used for the tests shall be a regular high volume series production passenger car of category M_1 AA saloon, or alternatively a 'soft target' representative of such a vehicle in terms of its identification characteristics applicable to the sensor system of the AEBS under test[(2)].

2.3.2. Details that enable the target(s) to be specifically identified and reproduced shall be recorded in the vehicle type-approval documentation, as referred to in point 4.6 of the Addendum to Section II of Part 2 of Annex I.

2.4. Warning and activation test with a stationary target

2.4.1. The subject vehicle shall approach the stationary target in a straight line for at least two seconds prior to the functional part of the test with a subject vehicle to target centreline offset of not more than 0,5 m.

The functional part of the test shall start when the subject vehicle is travelling at a speed of 80 ± 2 km/h and is at a distance of at least 120 m from the target.

From the start of the functional part until the point of collision there shall be no adjustment to any control of the subject vehicle by the driver other than slight adjustments to the steering control to counteract any drifting.

2.4.2. The timing for the collision warning modes referred to in point 1.5.1 shall comply with the following:

2.4.2.1. At least one haptic or acoustic warning mode shall be provided no later than the values specified in:

For approval level 1: Column B of the table in Appendix 1

For approval level 2: Column B of the table in Appendix 2

These values are to be achieved before the start of the emergency braking phase.

2.4.2.2. At least two warning modes shall be provided no later than the values specified in:

For approval level 1: Column C of the table in Appendix 1

For approval level 2: Column C of the table in Appendix 2

These values are to be achieved before the start of the emergency braking phase.

2.4.2.3. Any speed reduction during the warning phase shall not exceed either 15 km/h or 30 % of the total subject vehicle speed reduction, whichever is higher.

2.4.3. The collision warning phase shall be followed by the emergency braking phase.

2.4.4. The emergency braking phase shall not start before a TTC equal to or less than 3,0 seconds.

Compliance shall be verified by either actual measurement during the test or using documentation provided by the vehicle manufacturer, as agreed between the Technical Service and the vehicle manufacturer.

2.4.5. The total speed reduction of the subject vehicle at the time of the impact with the stationary target shall be not less than the value specified in:

For approval level 1: Column D of the table in Appendix 1

For approval level 2: Column D of the table in Appendix 2

2.5. Warning and activation test with a moving target

2.5.1. The subject vehicle and the moving target shall travel in a straight line, in the same direction, for at least two seconds prior to the functional part of the test, with a subject vehicle to target centreline offset of not more than 0,5 m.

The functional part of the test shall start with the subject vehicle travelling at a speed of 80 ± 2 km/h, and the moving target at a speed of the value specified in:

For approval level 1: Column H of the table in Appendix 1

For approval level 2: Column H of the table in Appendix 2

The separation distance between the subject vehicle and the moving target shall be at least 120 m.

From the start of the functional part of the test until the subject vehicle comes to a speed equal to that of the target there shall be no adjustment to any subject vehicle control by the driver other than slight steering adjustments to counteract any drifting.

2.5.2. The timing for the collision warning modes referred to in point 1.5.1 shall comply with the following:

2.5.2.1. At least one haptic or acoustic warning mode shall be provided no later than the value specified in:

For approval level 1: Column E of the table in Appendix 1

For approval level 2: Column E of the table in Appendix 2

These values are to be achieved before the start of the emergency braking phase.

2.5.2.2. At least two warning modes shall be provided no later than the value specified in:

For approval level 1: Column F of the table in Appendix 1

For approval level 2: Column F of the table in Appendix 2

These values are to be achieved before the start of the emergency braking phase.

2.5.2.3. Any speed reduction during the warning phase shall not exceed either 15 km/h or 30 % of the total subject vehicle speed reduction, whichever is higher.

2.5.3. The collision warning phase shall be followed by the emergency braking phase, which shall result in the subject vehicle not impacting the moving target.

2.5.4. The emergency braking phase shall not start before a TTC equal to or less than 3,0 seconds.

Compliance shall be verified by either actual measurement during the test or using documentation provided by the vehicle manufacturer, as agreed between the Technical Service and the vehicle manufacturer.

2.6. Failure detection test

2.6.1. Simulate an electrical failure, for example by disconnecting the power source to any AEBS component or disconnecting any electrical connection between AEBS components. When simulating an AEBS failure, neither the electrical connections for the driver warning signal referred to in point 1.5.4 nor the optional manual AEBS deactivation control referred to in point 1.4 shall be disconnected.

2.6.2. The failure warning signal referred to in point 1.5.4 shall be activated and remain activated not later than 10 seconds after the vehicle has been driven at a speed greater than 15 km/h and be reactivated immediately after a subsequent ignition 'off' ignition 'on' cycle with the vehicle stationary as long as the simulated failure exists.

2.7. Deactivation test

2.7.1. For vehicles equipped with means to deactivate the AEBS, turn the ignition (start) switch to the 'on' (run) position and deactivate the AEBS. The warning signal referred to in point 1.4.2 shall be activated. Turn the ignition (start) switch to the 'off' position. Again, turn the ignition (start) switch to the 'on' (run) position and verify that the previously activated warning signal is not reactivated, thereby indicating that the AEBS has been reinstated as specified in point 1.4.1. If the ignition system is activated by means of a 'key', that requirement shall be fulfilled without removing the key.

2.8. False reaction test

2.8.1. Two stationary vehicles, of category M_1 AA saloon, shall be positioned:

(a) so as to face in the same direction of travel as the subject vehicle;

(b) with a distance of 4,5 m between them[3];

(c) with the rear of each vehicle aligned with the other.

2.8.2. The subject vehicle shall travel for a distance of at least 60 m, at a constant speed of 50 ± 2 km/h to pass centrally between the two stationary vehicles.

During the test there shall be no adjustment of any subject vehicle control other than slight steering adjustments to counteract any drifting.

2.8.3. The AEBS shall not provide a collision warning and shall not initiate the emergency braking phase.

Appendix 1

APPROVAL LEVEL 1: WARNING AND ACTIVATION
TEST REQUIREMENTS — PASS/FAIL VALUES

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Vehicle category	**Stationary target**			**Moving target**			
	Timing of warning modes		**Speed reduction of subject vehicle**	**Timing of warning modes**		**Speed reduction of subject vehicle**	**Target speed**
	At least 1 haptic or acoustic	**At least 2**		**At least 1 haptic or acoustic**	**At least 2**		
	(ref. point 2.4.2.1)	**(ref. point 2.4.2.2)**	**(ref. point 2.4.5)**	**(ref. point 2.5.2.1)**	**(ref. point 2.5.2.2)**	**(ref. point 2.5.3)**	**(ref. point 2.5.1)**
M_3, N_3 and N_2 > 8 t (equipped with pneumatic or air over hydraulic braking systems and with pneumatic rear axle suspension systems)	Not later than 1,4 s before start of emergency braking phase	Not later than 0,8 s before start of emergency braking phase	Not less than 10 km/h	Not later than 1,4 s before start of emergency braking phase	Not later than 0,8 s before start of emergency braking phase	Subject vehicle shall not impact with the moving target	32 ± 2 km/h

Appendix 2

APPROVAL LEVEL 2: WARNING AND ACTIVATION
TEST REQUIREMENTS — PASS/FAIL VALUES

A	B	C	D	E	F	G	H
Vehicle category	**Stationary target**			**Moving target**			
	Timing of warning modes		**Speed reduction of subject vehicle**	**Timing of warning modes**		**Speed reduction of subject vehicle**	**Target speed**
	At least 1 haptic or acoustic	**At least 2**		**At least 1 haptic or acoustic**	**At least 2**		
	(ref. point 2.4.2.1)	**(ref. point 2.4.2.2)**	**(ref. point 2.4.5)**	**(ref. point 2.5.2.1)**	**(ref. point 2.5.2.2)**	**(ref. point 2.5.3)**	**(ref. point 2.5.1)**
M_3, N_3 and N_2 > 8 t[a]	Not later than 1,4 s before start of emergency braking phase	Not later than 0,8 s before start of emergency braking phase	Not less than 20 km/h	Not later than 1,4 s before start of emergency braking phase	Not later than 0,8 s before start of emergency braking phase	Subject vehicle shall not impact with the moving target	12 ± 2 km/h
$N_2 \leq 8$ t and M_2[b]	[c]	[c]	[c]	[c]	[c]	[c]	[c]

a Vehicles of category M_3 with hydraulic braking system are subject to the requirements of the second row.

b Vehicles with pneumatic braking system are subject to the requirements of the first row.

c Values to be specified in accordance with Article 5.

(**1**) The Union acceded to that UNECE Regulation by Council Decision 97/836/EC (OJ L 346, 17.12.1997, p. 78).

(**2**) The identification characteristics of the soft target shall be agreed upon between the Technical Service and the vehicle manufacturer as being equivalent to a passenger car of category M_1 AA saloon.

(**3**) The point of reference of each stationary vehicle for establishing the distance between the two stationary vehicles, shall be determined in accordance with ISO 612: 1978.