Proposal from the expert of The Netherlands regarding the specifications of timing of warning modes, speed reduction and target speed for AEBS for vehicles of category M2 and N2 ≤ 8 t

Changes to the values of the current text of the draft regulation on AEBS (ECE/TRANS/WP.29/2011/93/Amend.1, Annex 3) are indicated in **bold** characters.

AEBS step 2

A	B	C	D	E	F	G	H	Row
	Stationary target			Moving target				
	Timing of warning modes		Speed reduction (ref. paragraph 6.4.4.)	Timing of warning modes		Speed reduction	Target speed (ref. paragraph 6.5.1.)	
	At least 1 haptic or acoustic (ref. paragraph 6.4.2.1.)	At least 2 (ref. paragraph 6.4.2.2.)		At least 1 haptic or acoustic (ref. paragraph 6.5.2.1.)	At least 2 (ref. paragraph 6.5.2.2.)	(ref. paragraph 6.5.3.)		
M3 [1], N2 > 8 t and N3	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	Not less than 20 km/h	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	No impact	12 ± 2 km/h	1
N2 ≤ 8 t [2] and M2 [2]	**Not later than [0,8] s before the start of the emergency braking phase.**		**Not less than [10] km/h**	**Not later than [0,8] s before the start of the emergency braking phase.**		**No impact**	**[67+/-2] km/h**	2

1/ Vehicles of category M3 with hydraulic braking system are subject to the requirements of row 2
2/ Vehicles with pneumatic braking systems are subject to the requirements of row 1"

Justification

- Document AEBS/LDWS-06-12 mentions a warning time of 0,8s being the driver reaction time to a warning. This value is based upon Japanese research. In literature (Winner, Handbuch Fahrerassistenzsysteme) values between 0,3s – 0,75s are mentioned.

- In document AEBS/LDWS-17-02-Rev.1Annex 2 for a steering manoeuver for collision avoidance a value for TTC = 2 seconds can be found in combination with an overlap ratio of 100%. That would, with a warning time of 0,8s leave 1,2s for the emergency braking. 1,2 seconds is enough to brake a vehicle from 80 km/h to 45 km/h with a deceleration of 4,0 m/s2.

-Literature (Winner, Handbuch Fahrerassistenzsysteme) makes reference to research done with passenger cars showing that drivers feel dangerous for TTC between 1 and 2 seconds. For TTC > 3 seconds they feel no danger. So a warning given at TTC is 2 seconds should not be experienced as annoying.

- A warning, given in time, provides the driver the opportunity to react to an impending collision by applying the brake pedal quicker (and with it the brake pressure) than current used hydraulic pumps apparently are able to do. Or the driver will have time to steer around the obstacle.

- Moderate requirements for the speed reduction , in a first stage, would give the manufacturers room for gaining experience.