

## Amendments to ECE/TRANS/WP.29/GRRF/2011/5 - Proposal for amendments to Regulation No. 13-H (Brakes of M1 and N1 vehicles)

The text supersedes ECE/TRANS/WP.29/GRRF/2011/5. The modifications ECE/TRANS/WP.29/GRRF/2011/5 are marked in red.

### I. Proposal

*Paragraphs 2.34.1 & 2.34.2., amend to read (with the addition of a footnote \*/):*

2.34.1. "Category A Brake Assist System" means a system which detects an emergency braking condition based **primarily\*** on the brake pedal force applied by the driver;

2.34.2. "Category B Brake Assist System" means a system which detects an emergency braking condition based **primarily\*** on the brake pedal speed applied by the driver;

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**\*/ as declared by the vehicle manufacturer**

*Paragraph 2.34.3., should be deleted*

~~2.34.3. "Category C Brake Assist System" means a system which detects an emergency braking condition based on multiple criteria, one of which must be the rate at which the brake pedal is applied."~~

*Annex 1*

*Paragraph 22.1., amend to read:*

"22.1. Category of Brake Assist System A / B ~~2/~~"

*Paragraph 22.1.3., should be deleted*

~~"22.1.3. — For category C systems, define the input variables affecting the decision to activate the Brake Assist System, the relationship between them and the pedal application required to activate the Brake Assist System for the tests described in Part B of Annex 9. 2/"~~

*Annex 9, section B*

*Paragraph 1.2., amend to read:*

"1.2. General performance characteristics for category "B" ~~and category "C"~~ BAS systems

When an emergency condition has been sensed, at least by a very fast application of the pedal, the BAS system shall raise the pressure to deliver the maximum achievable braking rate or cause full cycling of the ABS.

Compliance with this requirement is demonstrated if the provisions of paragraphs 4.1. to 4.3. of this section are met."

*Paragraph 2.1.6., amend to read:*

~~"2.1.6 Brake pedal travel,  $S_p$ , speed,  $v_p$ , measured at the centre of the pedal plate or at a position on the pedal mechanism where the displacement is proportional to the displacement at the centre of the pedal plate allowing simple calibration of the measurement."~~

*Paragraphs 5. to 5.2., should be deleted*

~~"5. ASSESSMENT OF THE PRESENCE OF A CATEGORY "C" BAS~~

~~5.1. A category "C" BAS shall meet the test requirements of paragraphs 4.1. and 4.2. of this section.~~

~~5.2. Data evaluation~~

~~— A category "C" BAS shall meet the requirements of paragraph 4.3. of this section."~~

*Annex 9, Appendix 4, Paragraph 1.2., amend to read:*

1.2. The brake pedal shall be applied slowly (without activating the BAS in the case of category B ~~or category C~~ systems) providing a constant increase of deceleration until ABS is fully cycling (Figure 3).

*Annex 9, Appendix 4, paragraph 1.3., amend to read:*

"1.3. The full deceleration must be reached within the timeframe of  $2.0 \pm 0.5$  s. The deceleration curve, recorded against time, must be within a corridor of  $\pm 0.5$  s around the centre line of the deceleration curve corridor. The example in Figure 3 has its origin at the time  $t_0$  crossing the  $a_{ABS}$  line at 2 seconds. Once full deceleration has been achieved, ~~the pedal travel  $S_p$  shall not be decreased for at least 1 s~~ **the brake pedal shall be operated so that the ABS continues fully cycling**. The time of full activation of the ABS system is defined as the time when pedal force  $F_{ABS}$  is achieved. The measurement shall be within the corridor for variation of increase in deceleration (see Figure 3)."

## II. Justification

1. The definitions of the categories of Brake Assist Systems (BAS) have been fundamentally based on the emergency braking detection. The principal selected criteria has been the pedal force or pedal speed. Category A is based on the pedal force criterion and Category B is based on the pedal speed criterion.
  2. Category C, had the aim of permitting future technologies or combinations of Category A and B, which may not be strictly classifiable as A or B. However there seems to be some confusion in the interpretation of category C amongst Technical Services.
  3. The reason is the interpretation of the wording "multiple criteria" used in the current definition of Category C. For example, the system of pedal speed criteria which has a variable threshold value based on the vehicle speed has been classified as Category C by some Technical Services, simply because it has "multiple criteria". In this case, the pedal speed threshold is adjusted based on vehicle speed so as to avoid the unintentional activation of BAS rather than strictly the detection of an emergency situation. In consequence, in this case, the introduction of vehicle speed should be deemed as sub parameter tuning.
  4. Some Category B systems similarly use pedal force to avoid the unintentional activation. From a principle point of view, these systems should still be classified as Category B because the additional criteria does not help in detecting the emergency situation, but rather helps in avoiding unintentional activation of BAS.
  5. From a practical point of view, Category C requires exactly the same performance criteria as Category B. In consequence, the distinction between Category B and C does not change the type approval test and does not bring any safety benefit.
  6. After lengthy discussions with different Technical Services, the experts arrived at the conclusion that the definition of Category C does not fulfil the purpose it was aimed for, and, on the contrary, jeopardizes the clarity of the regulation. For this reason, it is proposed to delete Category C from the text of the Regulation.
  7. Annex 9 contains the provisions for ESC and BAS, Appendix 4 describes the procedure for obtaining  $F_{ABS}$  and  $a_{ABS}$  where:
    - $F_{ABS}$  "is the minimum pedal force that has to be applied for a given vehicle in order to achieve maximum deceleration which indicates that ABS is fully cycling", and
    - $a_{ABS}$  is the deceleration for a given vehicle during ABS deceleration.
  8. The aim of the original requirement "*Once full deceleration has been achieved ...*" is to maintain ABS at fully cycling for at least 1 second so as to obtain steady value of  $a_{ABS}$ .
  9. However, in actual tests, there are some cases where it is difficult to conduct the test according to this requirement because the brake pedal travel or force is momentarily decreased by the influence on the pedal operation of the test driver caused by the frequent change of brake line pressure while ABS is fully cycling.
  10. Therefore, it is more realistic to prescribe directly "*the pedal should be operated so that ABS can continue fully cycling*" than indirectly "*the pedal travel should not be decreased*". In this case, based on the time change of brake pedal stroke, force or vehicle deceleration as appropriate, it can be demonstrated that ABS continues fully cycling.
  11. It is believed this amendment can lead to appropriate test result and expand the realistic choice of test method.
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