

## Proposal for amendments to ECE/TRANS/WP.29/GRVA/2020/36

Note: This informal document intends to amend to changes to the Regulation 13.11 proposed in ECE/TRANS/WP.29/GRVA/2020/36. The new amendments are highlighted in red.

### I. Proposal

*Insert new paragraph 2.40., to read:*

- 2.40.** **"Brake Estimator"** means a function being able to estimate the remaining brake vehicle deceleration due to brake heat, operating by models considering inputs such as for example type and position of the brakes, number and intensity of brake applications, vehicle speed or ambient temperature.

*Insert new paragraphs 5.1.2.4. and subparagraphs, to read:*

**5.1.2.4.** **Endurance braking system**

The endurance braking system shall make it possible to maintain a constant downhill speed over a long period of time without the use of the friction brakes.

- 5.1.2.4.1.** As an equivalent of a long period of time, a time duration of at least [12] min is deemed to be adequate.

- 5.1.2.4.2.** During the time duration specified in paragraph 5.1.2.4.1. the endurance braking system shall be able to maintain a constant speed of not more than [35] km/h and not less than [30] km/h on a 7 per cent down-gradient for a distance of 6 km.

- 5.1.2.4.3.** In the case of an endurance braking system incorporating electric regenerative braking systems, it shall be deemed to comply with the requirements in paragraphs 5.1.2.4.1. and 5.1.2.4.2., if the endurance braking system is able to store the energy of the maximum negative vertical height difference (requiring energy storage capacity in the traction battery) that can be reached by the vehicle (consuming stored energy in the traction battery on the journey towards the relevant negative vertical height difference), considering the current electric state of charge, using methods such as a global navigation satellite systems combined with a topography model and an intelligent battery management system.

This shall be demonstrated to the satisfaction of the Technical Service.

- 5.1.2.4.4.** As an alternative to paragraph 5.1.2.4.3., endurance braking systems incorporating electric regenerative braking systems may use the service braking system when the vehicle's traction battery is not able to store recuperated energy due to a high state of charge, provided that the service braking system is able to fulfil the requirements of Annex 4, paragraph 1.8.2.5.

In addition, a brake estimator shall warn the driver according to paragraph 5.2.1.29.7.

*Insert a new paragraph 5.2.1.29.7., to read:*

- 5.2.1.29.7.** Vehicles equipped with an electric regenerative braking system of Category A or B (as defined in paragraphs 2.21.2. and 2.21.3.), using the service braking system in addition to the endurance braking system only when the state of charge of the traction battery does not allow storing of

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the energy due to a high state of charge, shall warn the driver at the latest when the service braking performance is decreased below the minimum performance value specified in

- (a) Annex 4, paragraph 1.6.3. by the yellow warning signal according to paragraph 5.2.1.29.1.2. and
- (b) Annex 4, paragraph 2.2.1. by the red warning signal according to paragraph 5.2.1.29.1.1.

The method to assess the service braking performance [(e.g. by temperature/ energy calculation and/or deceleration control)] shall be described by the vehicle manufacturer together with the documentation package required in Annex 18 of this Regulation to the Technical Service.

*Annex 4,*

*Paragraph 1.5.1.8, amend to read:*

**1.5.1.8.** For vehicles equipped with an electric regenerative braking system of category B, the condition of the vehicle batteries at the start of the test, shall be such that the braking force contribution provided by the electric regenerative braking system does not exceed the minimum guaranteed by the system design.

This requirement is deemed to be satisfied if the batteries are at one of the state of charge conditions listed in the ~~fourth clause~~ **four clauses** of paragraph 1.4.1.2.2. above.

*Insert a new paragraph 1.6.5., to read:*

**1.6.5.** For vehicles equipped with an electric regenerative braking system, the condition of the vehicle batteries at the start of the test, shall be such that the braking force contribution provided by the electric regenerative braking system does not exceed the minimum guaranteed by the system design.

This requirement is deemed to be satisfied if the batteries are at one of the state of charge conditions listed in the four clauses of paragraph 1.4.1.2.2. above.

*Insert a new paragraph 1.8.2.4., to read:*

**1.8.2.4.** For vehicles equipped with an electric regenerative braking system, the condition of the vehicle batteries at the start of the test, shall be such that the braking force contribution provided by the electric regenerative braking system does not exceed the minimum guaranteed by the system design.

This requirement is deemed to be satisfied if the batteries are at one of the state of charge conditions listed in the four clauses of paragraph 1.4.1.2.2. above.

*insert a new paragraph 1.8.2.5., to read:*

**1.8.2.5.** For vehicles equipped with an endurance braking system incorporating electric regenerative braking systems and where the service braking system is used when storing of the energy in the traction battery is not possible only due to a high state of charge, two different types of tests shall be carried out:

(a) A test following paragraph 1.8. of Annex 4 where the state of charge of the traction battery is in a condition that allows the conduction of the test without the use of the service braking system (e.g. the state of charge of the traction battery is sufficiently low); and

(b) A test under the conditions of paragraph 1.4.1.2.2. above. After this test and under consideration that the service brakes shall not cool significantly down, an additional test following the provisions of

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**paragraph 1.6.3. of Annex 4 shall be performed. The mean fully developed deceleration shall correspond to a value not below 5m/s<sup>2</sup>.**

## **II. Justification**

1. This informal document intends to amend to changes proposed in ECE/TRANS/WP.29/GRVA/2020/36.
2. The background for introducing this proposal is a disagreement between the technical service and some manufacturers and in some cases also non-uniform approach of different approval authorities in the interpretation of the test methods according to the UN Regulation No. 13, Annex 4, par. 1.6. and 1.8. (type II and type IIA test) when testing a vehicle equipped with electric regenerative brake system (usually an electric bus).
3. Although the requirement on full charge of the traction battery at the beginning of the test is implicitly present in the current version of Regulation by worst-case principle, it is not explicitly mentioned there. If this is not applied, it can have substantial effect on the test results or on the costs to make the vehicle compliant with the requirements. Therefore we see a high need for clarification of the Regulation wording.
4. The wording used is analogous to what is already included in the Regulation in paragraphs concerning the type-I test. The only difference is that in case of type II/IIA test any electric regenerative braking system is relevant, not only the category B.
5. The issue addressed by this informal document is in principle independent from the main focus of the ECE/TRANS/WP.29/GRVA/2020/36. Nevertheless, considering that two working documents are on the agenda amending the same paragraphs of the Regulation 13.11, it is introduced as an amendment of the above mentioned working document.
6. The proposed amendment to par. 1.5.1.8 of Annex 4 is just a correction of the editorial error in the current text of the Regulation.