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Working Party on the Construction of Vehicles

Meeting of Experts on Brakes and Running Gear  
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**PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 13-H**  
(Braking)

Transmitted by the Expert from the United States

Note: The text below was prepared by the Expert from the United States in order to assist the Meeting of Experts in the consideration of amendments to this Regulation

Note: This document is distributed to the Experts on Brakes and Running Gear only.

## A. **PURPOSE**

The purpose of this informal document is to propose amendments to Regulation 13-H in the area of electric vehicle (EV) requirements so as to enhance and harmonize the requirements for the state of charge of the propulsion batteries during brake testing. This document also addresses the testing of electrically-actuated brakes when there is a failure of the source of electric power to those brakes. These proposed amendments will bridge the major differences that exist in the electric vehicle requirements between FMVSS No. 135 and R13-H.

## B. **JUSTIFICATION**

With the exception of the Heating Procedure (Annex 3, 1.5.1.6.), ECE R13-H does not include procedures for testing an electric vehicle with the propulsion battery depleted such that the vehicle cannot attain the required test speed. Paragraph 1.5.1.6. allows the heating procedure to be conducted at whatever “respecting speed” is achieved during the first brake application, and then at speeds reached at the end of each 45-second cycle duration. The U.S. believes that brake testing should be conducted at or close to the specified speed for that particular test so that brake performance could be properly evaluated. The proposed amendments include specific procedures so that an electric vehicle’s brake performance throughout R13-H could be properly evaluated even if the propulsion battery is in a depleted condition.

Electrically-actuated service brakes represent a technology for light vehicles (electric vehicles and non-electric vehicles) that is expected to be made available to consumers in greater number over the next few years. These are service brakes that utilize electrical energy to actuate the foundation brakes without the use of hydraulics. FMVSS No. 135 includes procedures for testing electrically-actuated service brakes when the battery that provides electrical power for those brakes is at a low state of charge. The U.S. believes that similar requirements should be considered for Regulation 13-H and proposes such language accordingly.

## C. PROPOSAL

### 2. DEFINITIONS

2.16.1. “Electrically-actuated brakes” means brakes that utilize electrical energy to actuate the service brakes.

#### 5.2.18. *Additional requirements for electric vehicles*

##### 5.2.18.6. State of charge of batteries for EVs

5.2.18.6.1. The state of charge of propulsion batteries is determined in accordance with SAE Recommended Practice J227a, Electric Vehicle Test Procedure, FEB 1976. The applicable sections of J227a are 3.2.1 through 3.2.4, 3.3.1 through 3.3.2.2, 3.4.1 and 3.4.2, 4.2.1, 5.2, 5.2.1 and 5.3.

5.2.18.6.2. At the beginning of each performance test in the test sequence, unless otherwise specified, an EV's propulsion batteries are at the state of charge recommended by the manufacturer, as stated in the vehicle operator's manual or on a label that is permanently attached to the vehicle, or if the manufacturer has made no recommendation, at a state of charge of not less than 95 percent using the procedure described in paragraph 5.2.18.6.1. No further charging of any propulsion battery occurs during any of the performance tests in the test sequence of this regulation. If the propulsion batteries are depleted during a test sequence such that the vehicle reaches automatic shutdown, will not accelerate, or the low state of charge brake warning lamp is illuminated, the vehicle shall be accelerated to brake test speed by auxiliary means. If a battery is replaced rather than recharged, the replacement battery shall be charged and measured for state of charge in accordance with these procedures.

##### 5.2.21. *Brake failure and defect warning signals (general requirements):*

5.2.21.5. For a vehicle with electrically-actuated service brakes, a red warning signal shall indicate failure of the source of electric power to those brakes, or the diminution of state of charge of the batteries to less than a level specified by the manufacturer, for the purpose of warning a driver of degraded brake performance.

## Annex 3

- 1.2. *For the approval of any vehicle, the braking performance shall be measured during road tests conducted in the following conditions:*
- 1.2.11. State of charge of batteries for electrically-actuated service brakes. For vehicles equipped with electrically-actuated brakes, each battery providing power to the electrically-actuated service brakes shall be in a depleted state of charge for conditions 1.2.11.1. or 1.2.11.2. of this paragraph as appropriate when tested to paragraph 2.1.3. of this annex. An auxiliary means may be used to accelerate an electric vehicle to test speed.
- 1.2.11.1. For an electric vehicle, the propulsion batteries are at an average of not more than five percent above the electric vehicle automatic shut-down critical value or above the actual state of charge at which the brake failure warning signal, required in 5.2.21.5. is illuminated. The critical value is determined by measuring the state of charge of each propulsion battery at the instant that automatic shut-down occurs.
- 1.2.11.2. For a vehicle which has one or more auxiliary batteries that provides electrical energy to operate the electrically actuated service brakes, each auxiliary battery is at not more than five percent above the actual state of charge at which the brake failure warning signal, required by 5.2.21.5. of this regulation is illuminated.
- 1.5.1. *Heating procedure*
- 1.5.1.6. For electric vehicles not having sufficient autonomy to carry out the cycles of heating, the tests shall be carried out by **accelerating the vehicle to brake test speed by auxiliary means.**
- 1.5.2.5. **Deleted.**
- 2.1 *Service braking system*
- 2.1.3. A vehicle equipped with electrically-actuated service brakes also performs the following test series, with the batteries in a depleted condition as described in paragraph 1.2.11. of this annex. Conduct 10 stopping tests from a speed of 100 km/h or the maximum vehicle speed, whichever is less. At least two of the ten stopping distances must be less than or equal to 70 meters. The vehicle is at its laden weight and the transmission is in the neutral position when the service brake control is actuated and throughout the remainder of the test.