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Progress on the development of new global technical regulations and of amendments to established global technical regulations:

Hydrogen and Fuel Cell Vehicles (HFCV)

(global technical regulation No. 13) – Phase 2

Authorization to develop the Phase 2 of the global technical regulation

Submitted by the representatives of Japan, Republic of Korea and the European Union *

The text reproduced below was prepared by the representatives of Japan, Republic of Korea and the European Union to develop Phase 2 of United Nations Global Technical Regulation (gtr) No. 13 by the informal working group on Hydrogen and Fuel Cell Vehicles - Sub group safety (HFCV-SGS). It was adopted by the Executive Committee (AC.3) of the 1998 Agreement at its March 2017 session (ECE/TRANS/WP.29/1129, para. 162). It is based on ECE/TRANS/WP.29/2017/56. This authorization is transmitted to the Working Party on Passive Safety (GRSP). In accordance with the provisions of paragraphs 6.3.4.2, 6.3.7 and 6.4 of the 1998 Agreement, this document shall be appended to any new and/or amended global technical regulation once adopted.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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I. Background

1. The Informal Working Group (IWG) on Hydrogen and Fuel Cell Vehicles - Sub group safety (HFCV-SGS) was set up in 2007. The original schedule and scope were described in ECE/TRANS/WP.29/AC.3/17. This document outlines the HFCV-SGS activities and their timeframes divided into two phases. The IWG submitted the global technical regulation (gtr) on Hydrogen and Fuel Cell Vehicle and it was adopted by the Working Party on Passive Safety (GRSP) as well as established by the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee of the 1998 Agreement (AC.3) in June 2013.

2. After the establishment in the Global Registry as gtr No. 13 in June 2013, the provisions were transposed into UN Regulation No 134 annexed to the 1958 Agreement.

II. Proposal

3. An extension of the mandate for the HFCV-SGS IWG, sponsored by the European Union, Japan and Republic of Korea, shall tackle the development of the remaining issues. Phase 2 activities should be started immediately after the endorsement of this authorization by WP.29 and AC.3 at their March 2017 sessions.

4. Since hydrogen fuelled vehicles and fuel cell technologies are in early stages of development of commercial deployment, it is expected that revisions to these requirements may be suggested by an extended time of on-road experience and technical evaluations. It is further expected that with additional experience or additional time for fuller technical consideration, the requirements presented as optional requirements in the gtr (LHSS Section G of the preamble) could be adopted as requirements with appropriate modifications.

5. Scope of work in Phase 2 should cover:

- (a) Original items described in ECE/TRANS/WP.29/AC.3/17 shall be kept;
- (b) Potential scope revision to address additional vehicle classes;
- (c) Requirements for material compatibility and hydrogen embrittlement;
- (d) Requirements for the fuelling receptacle;
- (e) Evaluation of performance-based test for long-term stress rupture proposed in Phase 1;
- (f) Consideration of research results reported after completion of Phase 1 – specifically research related to electrical safety, hydrogen storage systems, and post-crash safety;
- (g) Consideration of 200 per cent Nominal Working Pressure (NWP) or lower as the minimum burst requirement;
- (h) Consider Safety guard system for the case of isolation resistance breakdown.

6. In addition, the following test procedure will be considered for long-term stress rupture:

- (a) Three containers made from the new material (e.g. a composite fibre reinforced polymer) shall be burst; the burst pressures shall be within ± 10 per cent of the midpoint, BPo, of the intended application. Then,

- (i) Three containers shall be held at > 80 per cent BPo and at 65 (± 5) °C; they shall not rupture within 100 hrs; the time to rupture shall be recorded;
 - (ii) Three containers shall be held at > 75 per cent BPo and at 65 (± 5) °C; they shall not rupture within 1000hrs; the time to rupture shall be recorded;
 - (iii) Three containers shall be held at > 70 per cent BPo and at 65 (± 5) °C; they shall not rupture within one year;
 - (iv) The test shall be discontinued after one year. Each container that has not ruptured within the one year test period undergoes a burst test, and the burst pressure is recorded.
- (b) The container diameter shall be > 50 per cent of the diameter of intended application and of comparable construction. The tank may have a filling (to reduce interior volume) if >99 per cent of the interior surface area remains exposed;
- (c) Containers constructed of carbon fibre composites and/or metal alloys are excused from this test;
- (d) Containers constructed of glass fibre composites that have an initial burst pressure > 350 per cent NWP are excused from this test, in which case BP_{min} = 350 per cent NWP shall be applied in paragraph 5.1.1.1. (Baseline Initial Burst Pressure);
- (e) There are carbon fibre containers that use glass fibre as the protective layer, and some of these containers contribute about 2 per cent of rise in burst pressure. In this case, it shall be demonstrated, by calculation, etc., that the pressure double the maximum filling pressure or above can be ensured by carbon fibre excluding glass fibre. If it can be demonstrated that the rise in burst pressure due to the glass fibre protective layer is 2 per cent or below and if the burst pressure is $225 \text{ per cent NWP} \times 1.02 = 230 \text{ per cent NWP}$ or more, the said calculation may be omitted.

III. Timeline

7. The work of the IWG on HFCV-SGS Phase 2 should be completed by 2020. The work may continue until the end of 2020 without a formal modification of this mandate, unless otherwise needed due to circumstances.
8. A prolongation and extension of the mandate of the IWG on HFCV-SGS may be considered by GRSP in due time.
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