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World Forum for Harmonization of Vehicle Regulations**Working Party on Passive Safety****Sixty-first session**

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Item 18 of the provisional agenda

Regulation No. 134 (Hydrogen and Fuel Cell Vehicles (HFCV))**Draft Supplement 3 to Regulation No. 134 (Hydrogen and Fuel Cell Vehicles (HFCV))****Submitted by the expert from Japan***

The text reproduced below was prepared by the expert from Japan to improve testing conditions of the Regulation. It is based on GRSP-60-07 which was distributed without a symbol at the sixtieth session of the Working Party on Passive Safety (GRSP) (ECE/TRANS/WP.29/GRSP/60, para. 37). The modifications to the text of Regulation No. 134 are marked in bold for new characters or strikethrough for deleted characters.

* 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. Proposal

Paragraphs 5.1.1. and 5.1.2., amend to read:

- "5.1.1. Baseline initial burst pressure
Three (3) containers shall be hydraulically pressurized until burst (**Annex 3, paragraph 2.1. test procedure**). The manufacturer ...
..."
- 5.1.2. Baseline initial pressure cycle life.
Three (3) containers shall be hydraulically pressure cycled **at the ambient temperature of 20 (±5) °C** to 125 per cent NWP (+2/-0 MPa) without rupture for 22,000 cycles or until a leak occurs (**Annex 3, paragraph 2.2. test procedure**). Leakage shall not occur within 11,000 cycles for a 15-year service life."

Paragraph 9.3.1., amend to read:

- "9.3.1. Every container shall be tested in accordance with paragraph 5.2.1. of this Regulation. **The test pressure is ≥ 150 per cent of NWP.**"

Paragraphs 9.3.2.1. and 9.3.2.2., amend to read:

- "9.3.2.1. Rupture test in batch testing
The test shall be performed according to paragraph 2.1. (hydrostatic pressure rupture test) of Annex 3. The required rupture pressure shall be at least **BP_{min}** ~~BPO-10 per cent, and in no case less than the value necessary to meet the stress ratio requirements.~~
- 9.3.2.2. Ambient temperature pressure cycling test in batch testing
The test shall be performed according to paragraph 2.2. **(a) to (c)** (hydrostatic pressure cycling test) of Annex 3, **except that the temperature requirements for the fueling fluid and the container skin, and the relative humidity requirement, do not apply.** The cylinder shall be pressure cycled using hydrostatic pressures **≥ up to** 125 per cent of NWP (~~+2/-0 MPa~~), to 22,000 cycles in case of no leakage or until leakage occurs. ~~The relative humidity shall not be specified.~~ For the service life of 15 years, the cylinder shall not leak or rupture within the first 11,000 cycles."

Annex 3,

Paragraphs 2.1. to 2.2., amend to read:

- "2.1. Burst test (hydraulic)
The burst test is conducted **at the ambient temperature of 20 (±5) °C** using a non-corrosive fluid.
- "2.2. Pressure cycling test (hydraulic)
...
(c) The container is pressure cycled between ~~2 (±1) MPa~~ **≤ 3 MPa** and the target pressure at a rate not exceeding 10 cycles per minute for the specified number of cycles; ..."

II. Justification

A. Paragraphs 5.1.1., 5.1.2., and paragraph 2.1. of Annex 3

1. These amendments are editorial improvements to specify the chapter of test procedure or to clarify the ambient temperature.

B. Paragraphs 9.3.1., 9.3.2.2. and paragraph 2.2. of Annex 3

2. The narrow pressure tolerances are specified in the test conditions of the hydraulic pressure tests. It is not necessary for the COP tests to be managed so strictly. The manufacturers need careful pressure control to keep the pressure within the narrow tolerance. It results in increases of testing time and cost for testing devices. The stringency of the test conditions can be increased by the proposed amendments because the width of pressure cycles can be wider or the tested pressure can be higher. The proposed amendments are the same or similar to those of the European Union regulation, United States of America standard and Japanese regulation.

Summary of the rationale:

3. Significant reductions of testing time and device settings are possible by these proposals. To keep the pressure within the narrow tolerance requires careful pressure control.

4. The stringency of the conditions can be increased by these proposals because the width of test cycle pressure is no less than current condition or can be wider.

5. The proposed amendment is reliable because it is the same or similar to those of the European Union regulation, United States of America standard and Japanese regulation.

C. Paragraph 9.3.2.1.

6. Current Conformity of Production (COP) only requires the manufacturer to provide mid-burst pressure with specified variation. If a manufacturer sets the mid-burst pressure lower, the limit of the Burst Pressure (BP) can be below the allowable minimum value of BP min. If a manufacturer sets the mid-burst pressure higher, then a significant ratio of products of which the burst pressure is more than BP min and less than the limit of minus 10 per cent cannot comply with the requirement, although they can be used safely. The proposed amendment to solve these problems is reliable and commonly used in the same or similar way as the European Union regulation, standards of United States of America and Japanese regulation. It is also common to specify the minimum burst pressure in the case of the design of the high pressure containers. The proposed amendment is also commonly and historically applied without problems for the other high pressure containers such as steel containers and composite containers, including for compressed natural gas (CNG) vehicles. It is also noted that the production quality or variation of pressure resistance is managed by required pressure check with 150 per cent Nominal Working Pressure (NWP) for all products in this regulation.

7. The deletion of "and in no case less than the value necessary to meet the stress ratio requirements" is a correction of the wrong sentence. The stress ratio is not required in this regulation. The deleted sentence was unintendedly copied while creating this regulation.

Summary of the rationale: Amendment of "BPO-10 per cent" to "BPmin"

8. The products with less burst pressure than the intended minimum burst pressure (BPmin) can be allowed by the current requirement.
9. A significant percentage of the products with practically safe burst pressure can not comply with the current requirement.
10. The proposed amendment is reliable because it is the same or similar to those of European Union regulation, United States of America standard and Japanese Regulation.
11. It is common to specify the minimum burst pressure in the case of the design of the high pressure containers. The proposed amendment is also commonly and historically applied without problems for the other high pressure containers such as steel containers and composite containers, including for CNG vehicles.

Note: The production quality of pressure resistance is also managed by the pressure check with 150 per cent NWP for all produced containers by this regulation.
12. Amendment to delete "and in no case less than the value necessary to meet the stress ratio requirements".
13. This amendment is to correct the editorial error. There is no requirement about the stress ratio in this document. This part was unintendedly copied and pasted from the other documents while creating the sentences.

D. Paragraph 9.3.2.2.

14. The specific temperature controls are required in the test conditions of the ambient temperature hydraulic pressure cycling test. It is not necessary for the COP tests to be managed so strictly. The manufacturers need careful temperature control to keep the temperature within the narrow tolerance. It results in increases of testing time and cost for testing devices. The stringency of the test conditions can be increased by the proposed amendments because the test temperatures can be higher. It is also noted that the effects of temperature on the container reliability is tested in the type approval section under more stringent conditions. The proposed amendments are the same or similar to those of the European Union regulation, United States of America standard and Japanese regulation.

Summary of the rationale:

15. The proposed amendment is reliable because it is the same or similar to those of the European Union regulation, United States of America standard and Japanese regulation:
 - (a) The stringency of the conditions can be increased by these proposals because the temperatures of the tests become higher.
 - (b) The effects of temperature on the container reliability are tested in the type approval section under more stringent conditions.
 - (c) Significant reductions of testing time and device settings are possible by this proposal.
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