Submitted by the Task Force amending UN Regulation No. 134

Informal document **GRSP-75-04**
(75th GRSP, 27-31 May 2024
agenda item 14)

Proposal for Supplement 1 to the 02 Series of Amendments to the UN Regulation No. 134 (Hydrogen and Fuel Cell Vehicles)

Submitted by the Task Force amending UN Regulation No. 134**

The text reproduced below was prepared by the task force involving France, Japan, the Netherlands, the European Commission, the European Association of Automotive Suppliers (CLEPA) and the International Organization of Motor Vehicle Manufacturers (OICA) as well as related industry experts on transposing amendment 1 to UN Global Technical Regulation No. 13, Phase 2 (GTR13-PH2) into the UN Regulation under the 1958 Agreement. The modifications to the existing text of the UN Regulation No, 134 are marked in bold for new or strikethrough for deleted characters and the modifications from ECE/TRANS/WP.29/GRSP/2024/13 (in **"bold** black") are given in "(**bold**) red" fonts.

** In accordance with the programme of work of the Inland Transport Committee for 2024 as outlined in proposed programme budget for 2024 (A/78/6 (Sect. 20), table 20.5), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraphs 2.3. to 2.4., amend to read:

"2.3. "*Compressed hydrogen storage system (CHSS)"* means a system designed to store compressed hydrogen fuel for a hydrogen-fuelled vehicle and composed of a container, container attachments (if any), ~~**[supply lines of additional Thermally activated Pressure Relief Device (TPRD) (if any),]**~~ and all primary closure devices required to isolate the stored hydrogen from the remainder of the fuel system and the environment.

2.4. "*Container*" (for hydrogen storage) means the pressure-bearing component on the vehicle that stores the primary volume of hydrogen fuel in a single chamber or in multiple permanently interconnected chambers.

***Note*: The high-pressure fuel lines interconnecting the multiple chambers and /or connecting to the primary closing device(s) are considered as part of the container as long as those parts hold the same pressure level as the chamber(s), and the permanent interconnections between the chambers are ensured. Such fuel lines are tested as integral elements of the container.**

Permanent interconnections are any physical solutions to pneumatically connect chambers, e.g. welded or screwed tubing, manifolds, etc.~~[, to allow a permanent flow passage with an invariable flow section for hydrogen between chambers during the entire CHSS service life].~~ that are designed to not change their initial flow resistance during the entire CHSS service life. Any disassembly of ~~a container~~ chambers and / or interconnections after manufacturing shall be visually detectable, e.g. by use of seals, and result in permanent removal of the CHSS from service."

Paragraph 5., amend to read:

"5. Part I – Specifications of the Compressed Hydrogen Storage System

This part specifies the requirements for the compressed hydrogen storage system.

(a) The primary closure devices shall include the following functions, which may be combined:

(i) TPRD;

(ii) Check valve; and

(iii) Shut-off valve

(b) The primary closure devices shall be mounted directly on or within each container. ~~**[If needed, manufacturers may choose to locate additional TPRDs in alternative locations on the container. However, any high-pressure supply lines for such additional TPRDs shall have demonstrated mechanical integrity and durability as part of qualification tests for the CHSS (verification tests for baseline metrics in paragraph 5.1., hydraulic sequential test in paragraph 5.2., pneumatic sequential test in paragraph 5.3. and fire test in paragraph 5.4.) as well as the specific loads related to the integration of this components to the vehicle (crash, vibration).] "**~~

…

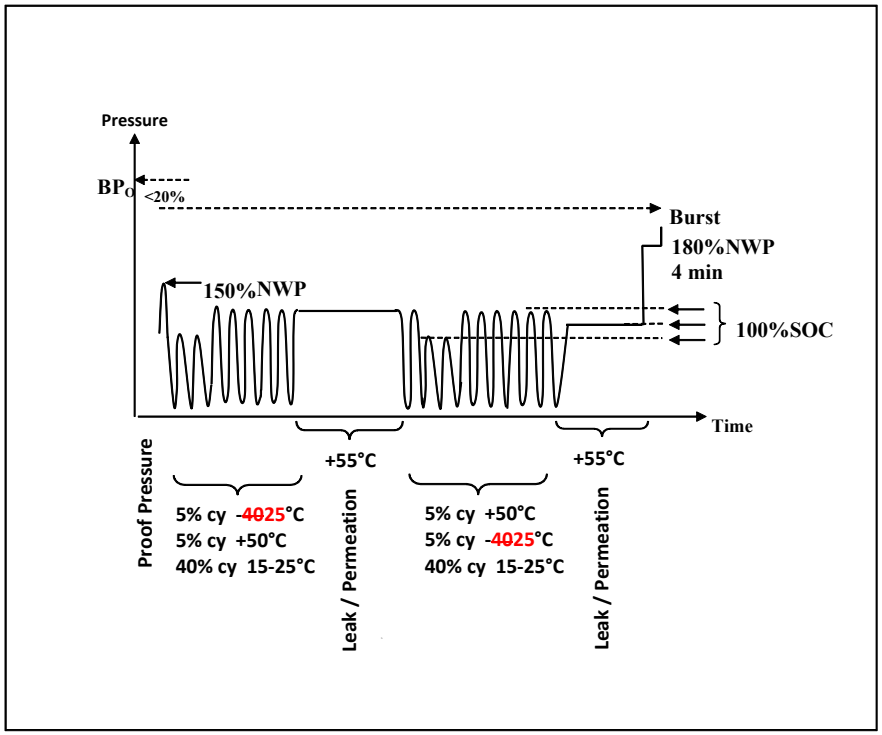
Table 2
Overview of Performance ~~E~~Requirements

Requirement section	*Test article*
5.1. Verification tests for baseline metrics	Container or container plus container attachments, as applicable
5.2. Verification test for performance durability	Container or container plus container attachments ~~[and supply lines,]~~ as applicable
5.3. Verification test for expected on-road performance	CHSS
5.4. Verification test for service terminating performance in fire	CHSS
5.5. Verification test for closure durability	Primary closure devices

"

Paragraphs 5 Figure 2., amend to read:

Figure 2
Verification test for expected on-road performance (pneumatic)



"

Paragraph 5.2., amend to read:

"5.2. Verification tests for performance durability (Hydraulic sequential tests)

If all three pressure cycle life measurements made in paragraph 5.1.2. are greater than 11,000 cycles, or if they are all within ± 25 per cent of each other, then only one (1) container is tested in paragraph 5.2. Otherwise, three (3) containers are tested in paragraph 5.2.

Unless otherwise specified, the tests in paragraph 5.2. shall be conducted on the container equipped with its container attachments (if any) ~~[as well as~~

~~supply lines for additional TPRDs (if any) through appropriate adaptors]~~ that represent the CHSS without the primary closures.

Annex 3, Paragraphs 3.3 to 3.4., amend to read:

"3.3. Surface damage test (unpressurized)

The surface damage tests and the chemical exposure tests (Annex 3, paragraph 3.4.) shall be conducted on the surface

…

Otherwise, the tests shall be conducted on the surface of the container attachments as indicated in Figure 2.

Note: **In case, the CHSS contains more than one chamber design (e.g. different size or material) the Technical Service shall determine whether to conduct the test on each design or whether to use the worst-case approach~~.~~, e.g worst case based on chamber material, and/or geometric characteristics differentiation affecting the burst pressure performance.** "

…

3.4. Chemical exposure and ambient-temperature pressure cycling test

Each of the 5 areas of the unpressurized container

…

Table 3
Pressure cycles and conditions - chemical exposure and ambient temperature pressure cycling test

Purpose	*Number of cycles*	*Target Pressure*	*Temperature*	*Rate*
Chemical exposure and ambient temperature pressure cycling test (paragraph 5.2.4.)	60 per cent the specified number of cycles determined in paragraph 5.1.2.	≥ 125 per cent NWP	Environment: 20 ± 15 °C Hydraulic fluid: 20 ± 15 °C	≤ 10 cycles per minute
	of which the last 10 cycles	≥ 150 per cent NWP		

Note: **In case, the CHSS contains more than one chamber design (e.g. different size or material) the Technical Service shall determine whether to conduct the test on each design or whether to use the worst-case approach~~.~~, e.g worst case based on chamber material, and/or geometric characteristics differentiation affecting the burst pressure performance.**"

II. Justification

1. Remote TPRDs and supply lines:

   The discussion on the remote TPRDs and their supply lines could not be finalised and will be continued within the Task Force. Therefore, all items in square brackets referring to these items need to be deleted.

2. Paragraph 2.3 to 2.4:

The notes in the definitions have been revised to clarify the matter of containers with multiple interconnected chambers.

3. Paragraph 5:

The title of Table 2 contains a spelling mistake that needs to be corrected.

In Figure 2 illustrating the sequence for the Verification test for expected on-road performance (pneumatic) the temperatures for the cold cycles need to be corrected due to a copy and paste error when transposing GTR 13 phase 2 into UN-R 134 series of amendments 2.

4. Annex 3:

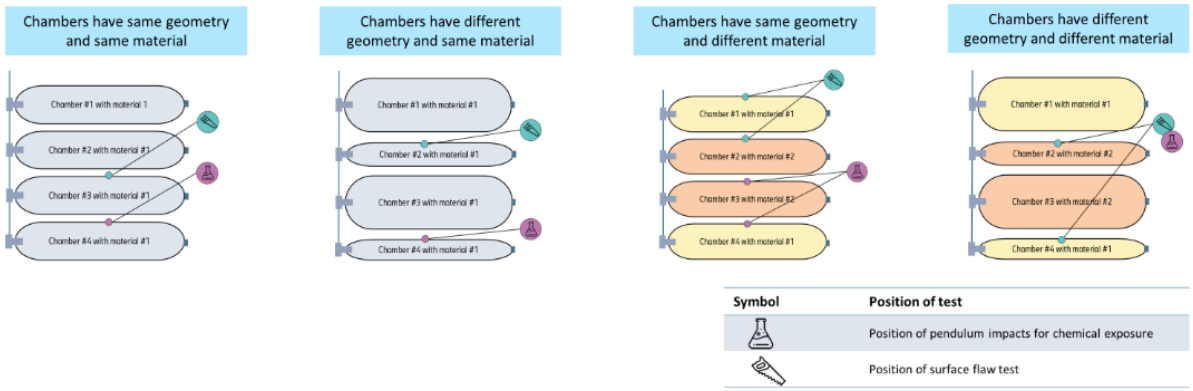
Multiple interconnected chambers: containers with multiple interconnected chambers are a more recent development for hydrogen storage systems. In case the development progresses to a design with more than one chamber design within the container, the technical services could find it necessary to test individual designs or use the worst-case approach. Therefore, phrases have been added to paragraphs 3.3. and 3.4. to address this need. It was agreed that slides shown during the TF meeting illustrating the worst-case approach for containers with multiple interconnected chambers should be included in the justification as guidance.

Guidance for worst-case approach:

CHAMBER CONFIGURATIONS.

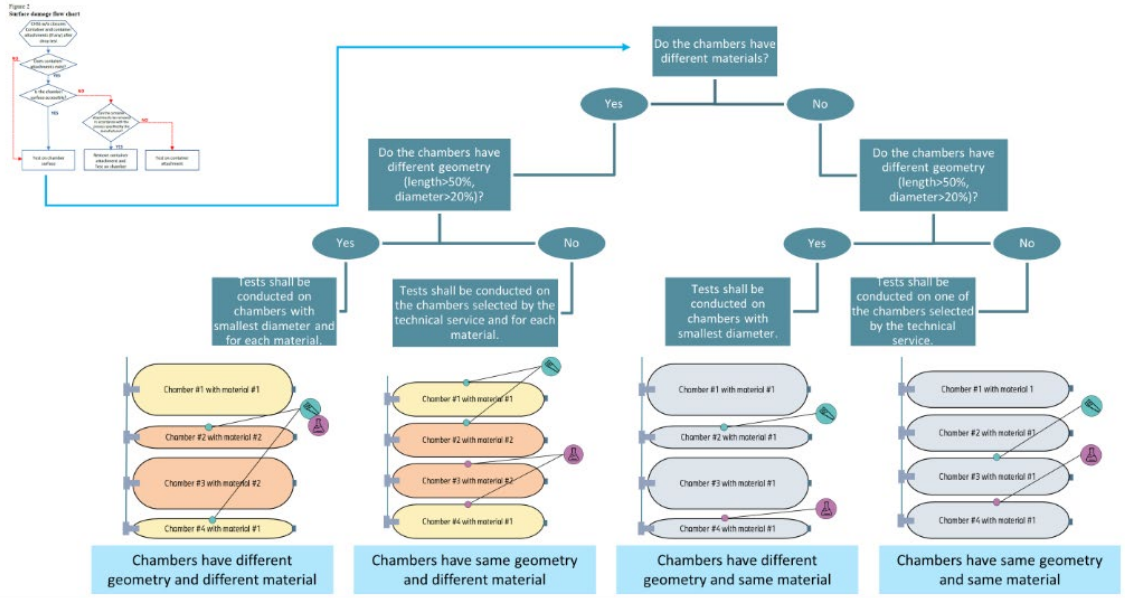
Premises:

- Container consists of several chambers.
- All chambers are designed for the same burst pressure.
- Container attachments are removable and chamber surfaces are accessible.



Symbol	Position of test
	Position of pendulum impacts for chemical exposure
	Position of surface flaw test

FLOW CHART AMENDMENT CONSIDERING CHAMBER MATERIAL AND GEOMETRY.



TYPE OF MATERIAL AND GEOMETRY CHANGES.

Material change	Affecting burst pressure performance	Affecting chemical exposure performance	Comment
Fiber material	Yes	Yes	Test shall be conducted for each material.
Resin material	Yes	Yes	Test shall be conducted for each material.
Fire proof protection	No	Yes	Test shall be conducted for each material.
Glass fiber protection	No	Yes	Test shall be conducted for each material.

Geometry change	Affecting burst pressure performance	Affecting chemical exposure performance	Comment
Length ≤ 50%	Not significantly	No	Different geometry, but no significant influence on burst pressure → no additional testing necessary.
Length > 50%	Yes	No	Test shall be conducted for each geometry. See R134 table “change of design”.
Diameter ≤ 20%	Not significantly	No	Different geometry, but no significant influence on burst pressure → no additional testing necessary.
Diameter > 20%	Yes	No	Test shall be conducted for each geometry. See R134 table “change of design”.