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World Forum for Harmonization of Vehicle Regulations

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Item 4.8.21 of the provisional agenda

1958 Agreement:

Consideration of draft amendments to existing

UN Regulations submitted by GRSP

Proposal for Supplement 4 to the original version of UN Regulation No. 153 (Fuel system integrity and electric power train safety at rear-end collision)

Submitted by the Working Party on Passive Safety *

The text reproduced below was adopted by the Working Party on Passive Safety (GRSP) at its seventy-third session (ECE/TRANS/WP.29/GRSP/73 para. 44). It is based on ECE/TRANS/WP.29/GRSP/2023/21, as amended by annex XII to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration at their November 2023 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2023 as outlined in proposed programme budget for 2023 (A/77/6 (Sect. 20), table 20.6), 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.



Paragraphs 2.1. to 2.1.9., amend to read:

- "2.1. "Vehicle type" means a category of power-driven vehicles which do not differ in such essential respects, in so far as they have an adverse effect on the result of the impact test prescribed in this UN Regulation, as:
- (a) The length and width of the vehicle;
 - (b) The structure, dimensions, lines and materials of the part of the vehicle rearward of the transverse plane through the "R" point of the rearmost seat.
 - (c) The lines and inside dimensions of the passenger compartment;
 - (d) The siting (front, rear or centre) and the orientation (transversal or longitudinal) of the engine;
 - (e) The unladen mass;
 - (f) The locations of the REESS;
 - (g) The structure, shape, dimensions and materials (metal/plastic) of the tank(s);
 - (h) The position of the tank(s) in the vehicle in so far as it has a negative effect on the requirements of paragraph 5.2.1
 - (i) The characteristics and location of the fuel feed system (pump, filters, etc.)
 - (j) The basic configuration and main characteristics of the compressed hydrogen storage system."

Paragraph 2.2., amend to read:

- "2.2. "Passenger compartment for electric safety and/or hydrogen safety assessment" means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead and rear bulkhead, or back door, as well as by the electrical protection barriers and enclosures provided for protecting the occupants from direct contact with high voltage live parts. "

Paragraph 2.4., amend to read:

- "2.4. "Tank" means the tank(s) designed to contain the liquid fuel, as defined in paragraph 2.6, used primarily for the propulsion of the vehicle excluding its accessories (filler pipe, if it is a separate element, filler hole, cap, gauge, connections to the engine or to compensate interior excess pressure, etc.);"

Insert new paragraphs 2.32. to 2.36, to read:

- "2.32. "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), and all primary closure devices required to isolate the stored hydrogen from the remainder of the fuel system and the environment.
- 2.33. "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.
- 2.34. "Container Attachments" mean non-pressure bearing parts attached to the container that provide additional support and/or protection to the container and that may be only temporarily removed for maintenance and/or inspection only with the use of tools.
- 2.35. "Hydrogen-fuelled vehicle" means any motor vehicle that uses compressed gaseous hydrogen as a fuel to propel the vehicle, including fuel cell and internal

combustion engine vehicles. Hydrogen fuel for the vehicles is specified in ISO 14687:2019 and SAE J2719_202003.

- 2.36. "Shut-off valve (for hydrogen-fuelled vehicles)" means a valve between the container and the vehicle fuel system that must default to the "closed" position when not connected to a power source."

Annex 4, paragraph 2.1., amend to read:

- "2.1. "Enclosed spaces" means the special volumes within the vehicle (or the vehicle outline across openings) that are external to the hydrogen system (storage system, fuel cell system, internal combustion engine (ICE) and fuel flow management system)."

Annex 4, paragraph 3.1.4., amend to read:

- "3.1.4. The main stop valve and shut-off valves for hydrogen gas, located in the downstream hydrogen gas piping, are in the normal driving condition kept open immediately prior to the impact."

Annex 6, paragraph 2 4.2. and 4.3., amend to read:

- "4.2. The initial mass of hydrogen in the storage system can be calculated as follows:

$$P_o' = P_o \times 288 / (273 + T_o)$$

$$\rho_o' = -0.0027 \times (P_o')^2 + 0.75 \times P_o' + 1.07$$

$$M_o = \rho_o' \times V_{CHSS}$$

- 4.3. Correspondingly, the final mass of hydrogen in the storage system, M_f , at the end of the time interval, Δt , can be calculated as follows:

$$P_f' = P_f \times 288 / (273 + T_f)$$

$$\rho_f' = -0.0027 \times (P_f')^2 + 0.75 \times P_f' + 1.07$$

$$M_f = \rho_f' \times V_{CHSS}$$

where P_f is the measured final pressure (MPa) at the end of the time interval, and T_f is the measured final temperature (°C)."