

4<sup>th</sup> IWG Meeting of GTR13 Phase2

## TF1. Vehicle Classes

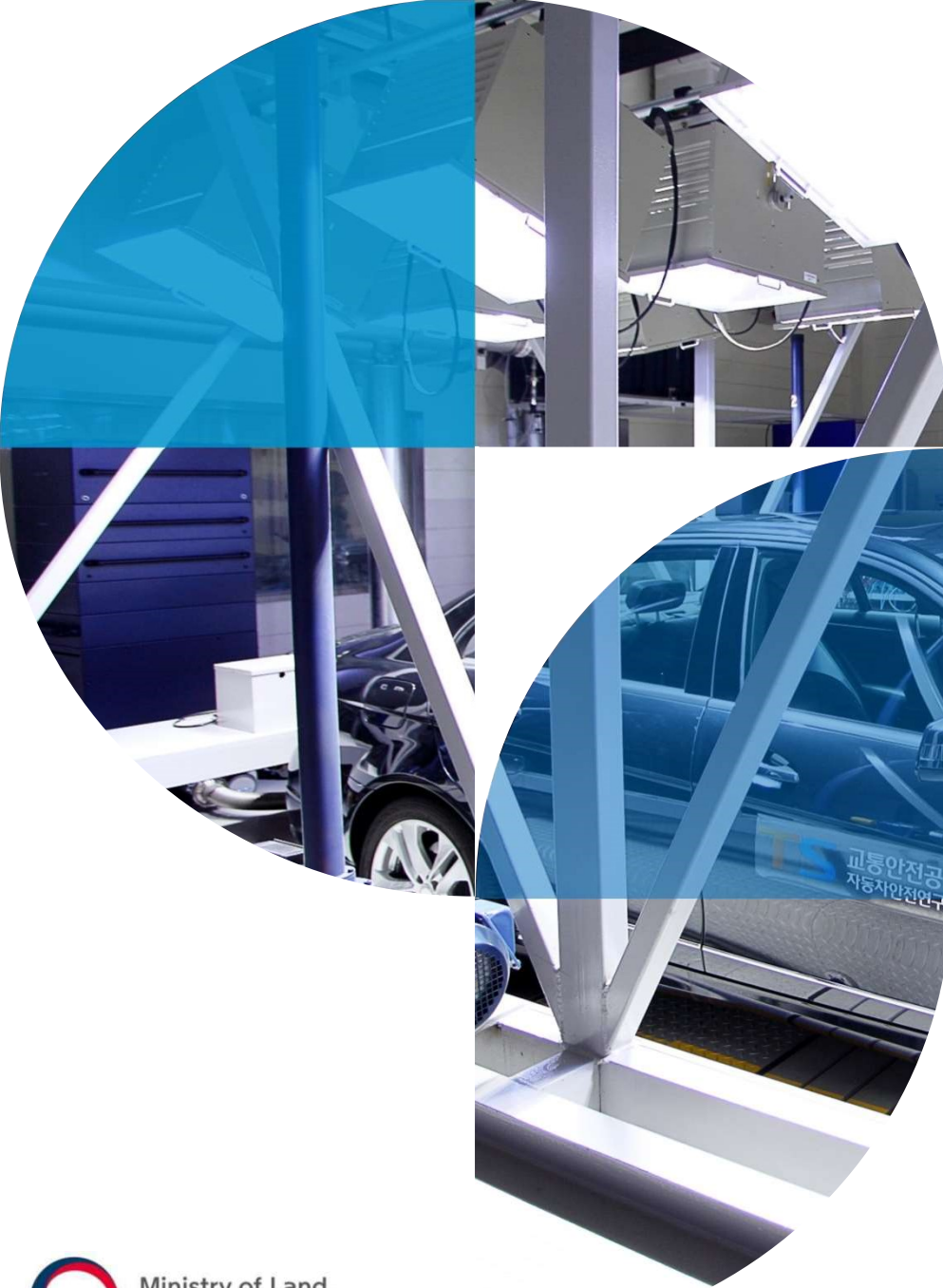
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# 01 Scope of vehicle category

## Current GTR13

### 2. Scope

This regulation applies to all hydrogen fuelled vehicles of Category 1-1 and 1-2, with a gross vehicle mass (GVM) of 4,536 kilograms or less.

## Previous Discussions

Refer EVS-GTR classification standards

EVS-GTR	Category 1-1	Category 1-2			Category 2		
	nonHD	GVM ≤3500	3500 < GVM ≤4536	4536 < GVM	GVM ≤3500	3500 < GVM ≤4536	4536 < GVM
	nonHD	nonHD/ HD by CP	HD	nonHD	nonHD/ HD by CP	HD	

# 01 Scope of vehicle category

## Agenda

EVS-GTR have a separate paragraphs for LDV and HDV.

To revise in the same way as EVS-GTR, GTR13 should separate paragraphs of requirement.

## Current EVS-GTR

2.2. This regulation includes the following two sets of requirements that may be selected by Contracting Parties according to the category and gross vehicle mass (GVM) of the vehicles:

- (a) For all vehicles of Category 1-1 and vehicles of Categories 1-2 and 2 with GVM of 4,536 kg or less, the requirements of paragraphs 5 and 6 shall apply in accordance with the general requirements specified in paragraph 4;
- (b) For vehicles of Category 1-2 and Category 2 with GVM exceeding 3,500 kg , the requirements of paragraphs 7 and 8 shall apply in accordance with the general requirements specified in paragraph 4.

# 01 Scope of vehicle category

## Agenda

EVS-GTR has separately defined the types of vehicles excluded from the regulations.

2.1 This regulation applies to vehicles of Category 1 and Category 2 with a maximum design speed exceeding 25 km/h, equipped with electric power train containing high voltage bus, excluding vehicles permanently connected to the grid.

2.3 Contracting Parties may exclude the following vehicles from the application of this regulation:

(a) A vehicle with four or more wheels whose unladen mass is not more than 350 kg, not including the mass of traction batteries, whose maximum design speed is not more than 45 km/h, and whose engine cylinder capacity and maximum continuous rated power in the case of hybrid electric vehicles do not exceed 50 cm<sup>3</sup> for spark (positive) ignition engines and 4 kW for electric motors respectively; or whose maximum continuous rated power in the case of battery electric vehicles does not exceed 4 kW; and

(b) A vehicle with four or more wheels, other than that classified under (a) above, whose unladen mass is not more than 450 kg (or 650 kg for vehicles intended for carrying goods), not including the mass of traction batteries and whose maximum continuous rated power does not exceed 15 kW.

## 02 Post-crash fuel system integrity



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### Previous Discussions

1. If the CHSS is located on the roof, static rollover test would be needed
2. If the CHSS is located at the lower position, side impact test would be needed
3. If crash tests are not applicable to the vehicle, CHSS shall be subject to Acceleration test.

### Agenda(Rollover test)

If the vehicle range of the GTR13 is expanded, the rollover test will be carried out according to standards of contracting party.

But, For example, in the UN Regulation, the rollover test does not apply if there are standing passengers.

Therefore, Vehicles to be subjected to rollover tests shall be separately identified.





### UN R134 Requirement

1.1 This Regulation applies to single-deck rigid or articulated vehicles belonging to categories M2 or M3, **Classes II or III or class B** having more than 16 passengers.

1.2 At the request of the manufacturer, this Regulation may also apply to any other M2 or M3 vehicle that is not included in paragraph 1.1.

**"Class II"**: Vehicles constructed principally for the carriage of seated passengers, and designed to allow the carriage of standing passengers in the gangway and/or in an area which does not exceed the space provided for two double seats.(exceeding 22 passengers + driver)

**"Class III"**: Vehicles constructed exclusively for the carriage of seated passengers.(exceeding 22 passengers + driver)

**"Class B"**: Vehicles not designed to carry standing passengers; a vehicle of this class has no provision for standing passengers.(not exceeding 22 passengers + driver)

## 02 Post-crash fuel system integrity

### Agenda(Side impact test)

If the CHSS is located at the lower position, there is the probability of hydrogen leakage in case of side impact crash. So, side impact test would be needed



### Agenda(Acceleration test)

If crash tests are not applicable to the vehicle, CHSS shall be subject to Acceleration test.

If establish, It would be a good to harmonize with UN Regulation.

### Comments

JAMA: Manufacture may verify the post-crash fuel system integrity by using an appropriate scientific calculation(such as simulation)



## 02 Post-crash fuel system integrity



### UN R134 Requirement

Accelerations for vehicles of categories  $M_1$  and  $N_1$ :

- (a) 20 g in the direction of travel (forward and rearward direction);
- (b) 8 g horizontally perpendicular to the direction of travel (to left and right).

Accelerations for vehicles of categories  $M_2$  and  $N_2$ :

- (a) 10 g in the direction of travel (forward and rearward direction);
- (b) 5 g horizontally perpendicular to the direction of travel (to left and right).

Accelerations for vehicles of categories  $M_3$  and  $N_3$ :

- (a) 6.6 g in the direction of travel (forward and rearward direction);
- (b) 5 g horizontally perpendicular to the direction of travel (to left and right).

## 02 Post-crash fuel system integrity



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### Agenda(Installation)

If crash tests are not applicable to the vehicle, requirement of the hydrogen container installation shall be necessary.

If establish, It would be a good to harmonize with UN Regulation.

### UN R134 Requirement

#### 7.2.4. Additional installation requirements

7.2.4.1. Requirements on installation of the hydrogen storage system not subject to the frontal impact test: The container shall be mounted in a position which is rearward of a vertical plane perpendicular to the centre line of the vehicle and located 420 mm rearward from the front edge of the vehicle.

7.2.4.2. Requirements on installation of the hydrogen storage system not subject to the lateral impact test: The container shall be mounted in a position which is between the two vertical planes parallel to the centre line of the vehicle located 200 mm inside from the both outermost edge of the vehicle in the proximity of its container(s).

## 02 Post-crash fuel system integrity



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### Agenda(Installation)

Also need rear installation in case of rear collision.

7.2.4.3. Requirements on installation of the hydrogen storage system not subject to the rear impact test:

The container shall be mounted in a position which is rearward of a vertical plane perpendicular to the centre line of the vehicle and located 300 mm rearward from the rear edge of the vehicle.

### Comments

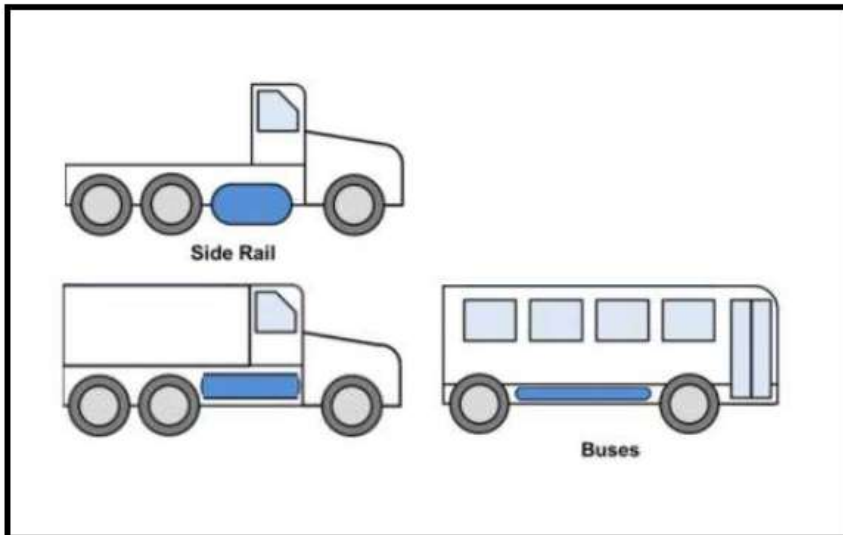
JAMA: “Container” should be replaced with “Container assembly”(incl. shut-off valve, TPRD)

## Agenda(Discharge direction)

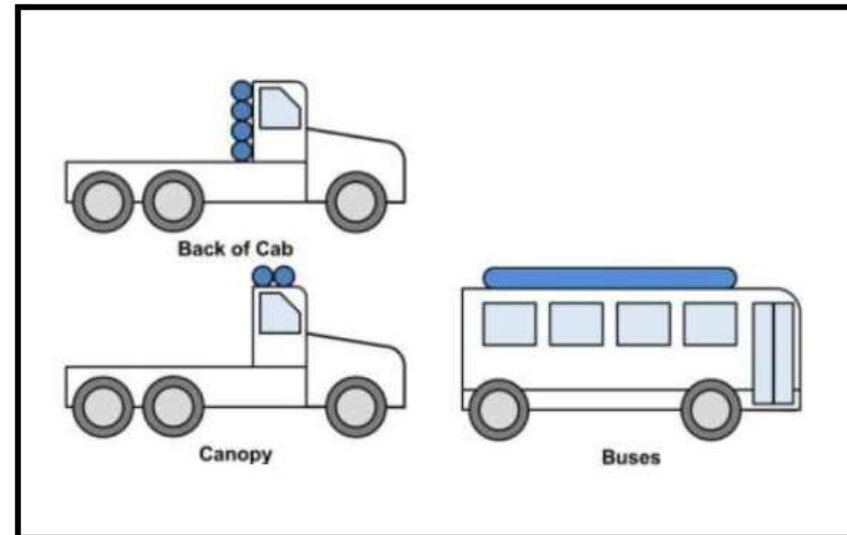
For hydrogen discharge, current language says;

The hydrogen gas discharge from TPRD(s) of the storage system shall **not be directed forward from the vehicle, or horizontally (parallel to road) from the back or sides of the vehicle.**

However,,,



Current language will be applicable.  
(Downward is preferable.)



Current language is **NOT** appropriate.  
Should not be directed downward or  
sides of vehicle.  
Upward would be adequate.

## GTR13 Requirement

- 5.2.1.3.1. Pressure relief systems (para. 6.1.6. test procedure)
- (a) Storage system TPRDs. The outlet of the vent line, if present, for hydrogen gas discharge from TPRD(s) of the storage system shall be protected by a cap;
  - (b) Storage system TPRDs. The hydrogen gas discharge from TPRD(s) of the storage system shall not be directed:
    - (i) Into enclosed or semi-enclosed spaces;
    - (ii) Into or towards any vehicle wheel housing;
    - (iii) Towards hydrogen gas containers;
    - (iv) Forward from the vehicle, or horizontally (parallel to road) from the back or sides of the vehicle.

## 04 Permeation & Garage size

### Agenda(Permeation & Garage size)

- leak-free parking at full fill (J. Schneider, NIKOLA Motor)
- The following comments were suggested about leak-free parking at full fill.
  - Regarding permeation and garages, etc.
  - ✓ The hydrogen storage volume of Heavy Duty vehicles is significantly larger than light duty vehicles. So there should be an assumption made regarding an appropriate volume of storage, above the 330L assumed as a upper volume for the first GTR. As a suggested upper limit of hydrogen onboard, 80kg total storage onboard would be a good reference. The size assumption of the garage (to fit a HD Vehicle) would be larger than  $50\text{m}^3$

### GTR13 Requirement

- (iv) For ease of compliance testing, however, the discharge requirement has been specified in terms of storage system permeation instead of vehicle-level (iii) permeation as a means of compliance is consistent with the proposals developed by the EU NoE HySafe. In this case, the permeation limit measured at 55 °C and 115 per cent NWP is 46 mL/h/L-water-capacity of the storage system. If the total water capacity of the vehicle storage system is less greater than 330 L and the garage size is no smaller than 50 m<sup>3</sup>, then the 46 mL/h/L-water-capacity requirement results in a steady-state hydrogen concentration of no more than 1 per cent. (An upper limit per storage system of 46 mL/h/L (per container volume capacity) x 330L (system volume capacity) / 60min/hr = 253 mL/min per storage system, which comparable to that derived from the alternative approach 150 mL/min x 50/30.4 = 247 mL/min (scaling factor R=1.645), which results in a 1 per cent concentration). This permeation specification has been adopted under the assumption that storage capacity ~330L is not expected for the vehicles within the scope of this gtr, so garages less than 50m<sup>3</sup> can be accommodated;

# Thank You

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