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World Forum for Harmonization of Vehicle Regulations

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1998 AGREEMENT

Implementation of the 1998 Agreement programme of work by the Working Parties Subsidiaries to WP.29

Proposal to develop a global technical regulation concerning hydrogen / fuel cell vehicles

Transmitted by the Co-Sponsors: Germany, Japan and the United States of America

The text reproduced below has been prepared by the three Technical Co-Sponsors for the development of the global technical regulation: Germany, Japan and the United States of America of America. It is based on informal document No. WP.29-141-19 (ECE/TRANS/WP.29/1058, para. 95).

I. OBJECTIVE OF THE PROPOSAL

1. The trilateral cosponsors goals are to develop and establish a global technical regulation (gtr) for Hydrogen-/ Fuel Cell Vehicles (HFCV) that: (1) Attains equivalent levels of safety as those for conventional gasoline powered vehicles and (2) Is performance-based and does not restrict future technologies. Given that hydrogen-powered vehicle technology is still emerging, WP.29/AC.3 agreed that input from researchers is a vital component of this effort. Based on a comparison of existing regulations and standards of HFCV with conventional vehicles, it is important to investigate and consider: (1) The main differences in safety and environmental aspects and (2) What items need to be regulated based on justification.

II. SAFETY REQUIREMENTS

2. Most Contracting Parties have adopted vehicle crashworthiness standards that rely on dynamic crash test procedures, simulating real world crashes, to evaluate the ability of a vehicle to protect its occupants from (1) trauma and (2) fuel (gasoline and diesel) fed fires. These tests procedures include one for full frontal, offset frontal, side, rear and, to some extent, rollover crash modes. These standards and test procedures are not harmonized worldwide and/or not required in all jurisdictions. Tables 1 and 2 highlight the different safety and fuel integrity test requirements and their application for conventional gasoline and diesel, compressed natural gas, and hydrogen vehicles within the European Union (EU), Japan, and the United States of America (U.S.). While Japan and the U.S. specify at least some crash tests to evaluate the fuel system integrity of conventional and electric/hybrid vehicles, apparently only the U.S. does so for CNG vehicles, and, currently, only Japan does so for hydrogen-powered vehicles. The EU regulatory approach is more based on testing of components and sub systems and requirements for the installation of fuel systems.

3. As noted above, only Japan has adopted a regulation to evaluate the performance of a hydrogen vehicle. The regulation has component, subsystems, and full system crash performance test requirements. The latter is evaluated using full frontal, side and rear crash tests. Evaluating the Japanese regulation as a potential starting point for the development of a gtr is a reasonable approach. However, the Japanese requirements for fuel system integrity of other vehicles as highlighted in the attached tables are not harmonized with those in the U.S. and EU (nor are the U.S. and EU requirements harmonized). Harmonizing crash performance requirements has proven to be a difficult task in the past. A harmonized solution may be achievable, but may take a long time to complete due to the need for research and evaluation.

4. Therefore, for the first phase of this effort, the trilateral group decided to avoid attempting to harmonize current national crash tests for the gtr and instead include language in the gtr specifying that the Contracting Parties apply their existing crash tests and check for compliance with an agreed set of requirements and limit values. The trilateral group will decide on a plan for phase 2 on how to harmonize crash test requirements for HFCV after the establishment of a comprehensive gtr in the first phase.

III. GTR DEVELOPMENT PROCESS

5. In June 2005, WP.29/AC.3 agreed to a proposal from Germany, Japan and United States of America regarding how best to manage the development process for a gtr on hydrogen-powered vehicles. Under the agreed process, once AC.3 develops and approves an action plan for the development of a gtr, two subgroups will be formed to address the safety and the environment aspects of the gtr. The subgroup safety (HFCV-SGS) will report to GRSP. The chair for the group will be discussed and designated by summer of 2007. The environmental subgroup (HFCV-SGE) is chaired by European Commission and reports to GRPE. In order to ensure communication between the subgroups and continuous engagement with WP.29 and AC.3, the project manager (Germany) will coordinate and manage the various aspects of the work ensuring that the agreed action plan is implemented properly and that milestones and timelines are set and met throughout the development of the gtr. The gtr will cover fuel cell (FC) and internal combustion engine (ICE), compressed gaseous hydrogen (CGH2) and liquid hydrogen (LH2) in the phase 1 gtr. Vehicle categories (applicability, scope) will be determined.

6. In order to develop the gtr in the context of an evolving hydrogen technology, the trilateral group proposes to develop the gtr in two phases:

(a) Phase 1 (gtr for hydrogen-powered vehicles):
Establish a gtr by 2010 for hydrogen-powered vehicles based on a component level, subsystems, and whole vehicle crash test approach. For the crash testing, the gtr would specify that each contracting party will use its existing national crash tests but develop and agree on maximum allowable level of hydrogen leakage. The new Japanese regulation, and any available research and test data will be used as a basis for the development of this first phase of the gtr.

(b) Phase 2 (Assess future technologies and harmonize crash tests):
Amend the gtr to maintain its relevance with new findings based on new research and the state of the technology beyond 2010. Discuss how to harmonize crash test requirements for HFCV regarding whole vehicle crash testing for fuel system integrity.

C.1. PHASE 1:

The gtr will consist of the following key areas:

(a) Component and subsystem level requirements (non-crash test based):
Evaluate the non-crash requirements by reviewing analyses and evaluations conducted to justify the requirements. Add and subtract requirements or amend test procedures as necessary based on existing evaluations or on quick evaluations that could be conducted by Contracting Parties and participants. Avoid design specific requirements to the extent possible and do not include provisions that are not justified. The main areas of focus are as follows:

(i) Performance requirements for fuel containers, pressure relieve devices, fuel cells, fuel lines, etc.

(ii) Electrical isolation; safety and protection against electric shock (in-use).
(iii) Performance and other requirements for sub-systems integration in the vehicle.

(b) Whole vehicle requirements (crash test based):
Examine the risks posed by the different types of fuel systems in different crash modes, using as a starting point the attached tables. Review and evaluate analyses and crash tests conducted to examine the risks and identify countermeasures for hydrogen-powered vehicles. The main areas of focus are as follows:

(i) Existing crash tests (front, side and rear) already applied in all jurisdictions.
(ii) Electrical isolation; safety and protection against electric shock (post crash).
(iii) Maximum allowable hydrogen leakage.

C.2. PHASE 2:

(a) Develop and implement a plan to update the gtr to account for changes in the state of the technology beyond 2010
(b) Discuss how to harmonize crash test requirements for HFCV. Develop an amendment to incorporate improvements into the hydrogen gtr.

C.3. TIMELINE FOR PHASE 1:

(a) WP.29/AC.3 - March 2007:
(i) Submit draft gtr Action Plan to AC.3 for agreement.
(ii) Discuss chairmanship for the safety subgroup (HFCV-SGS).

(b) GRSP - May 2007:
(i) Project manager (Germany) to update GRSP and discuss the formation and next activities of the HFCV-SGS.

(c) WP.29/AC.3 - June 2007:
(i) Provide the first of regular progress reports

(d) Summer 2007 (TBD): Hold first HFCV-SGS meeting to begin work on phase 1 of the gtr.
(e) In parallel the environmental informal group (HFCV-SGE) will investigate the possibility of harmonization of environmentally related requirements.

Vehicle Fuel Integrity (Table 1)										
		Conventional Gasoline and Electrical / Hybrid			**CNG/LPG**			**Hydrogen- / Fuel Cell- Vehicle**		
		Japan	**EU**	**US**	**Japan**	**EU**	**US**	**Japan**	**EU*** **	**US**
Fuel Integrity Crash test	**Full frontal**	50	N	48	N	N	48	50	N	N
	Offset frontal	N	N	N	N	N		N	N	N
	Side	50	N	53	N	N	48	50	N	N
	Rear	50	N	80	N	N	48	50	N	N
	Rollover	N	N	Static rollover	N	N	N	N	N	N
Integrate system safety and system requirements	**Fuel tank and underride protection**		Y	N		Y	Y (Tank)		Y	N
	Fuel lines		Y	N		Y		Y	Y	N
	Detection of leakage	N	N	N	N*****	N	N	Y	N	N
	Purge gas							Y	N	N
	Blow off	N/A	N/A	N/A	N	N	N	N	Y	N
	Container Assembly	N/A	N/A	N/A	N	Y	Y	Y	Y	N
	Fault Strategy / Safety management system	N	N	N	N	N	N	N	Y	N
	Prevention of misfueling	N/A	N/A	N/A		Y			Y	
	Installation and mounting requirements		Y		Y	Y		Y	Y	

Vehicle Fuel Integrity (Table 1)										
		Conventional Gasoline and Electrical / Hybrid			**CNG/LPG**			**Hydrogen- / Fuel Cell- Vehicle**		
Component requirements	**Container**	N/A	N/A	N/A	Y	Y	Y	Y	Y	N
	Container Attachments	N/A	N/A	N/A	Y	Y	N	Y	Y	N
	Other components of the fuel system	N/A	N/A	N/A	Y	Y	N	Y	Y	N
	Fuel Cell	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N
Electrical Isolation and electric safety *	**In-use**	N	Y****	N	N/A	N/A	N/A	Y	N****	N
	During and post crash	N	N	Y	N/A	N/A	N/A	N	N****	Y
	Total electric safety		N****					Y	N****	

Y **Mandatory Requirement**
N **No requirement**
N/A **Not applicable**
***** **For Electric, Hybrid or Fuel Cell Vehicles**
****** **N1 vehicles with side fuel container**
******* **Draft European H2 Regulation (already appliccable in Germany)**
******** **Draft proposal to amend ECE-R 100 is under discussion**
********* **Odorant in CNG fuel**
No's in table : Impact speed [km/h]

	Vehicle Occupant Protection (Table 2)		
	Japan	**EU**	**US**
Full frontal	50 km/h	Y	48 km/h
Offset frontal	N	56 km/h	N
Side deformable barrier	50 km/h	50 km/h	53 km/h
Side pole	N	N	53 km/h
Rear	N	N	N
Rollover	N	N	Y
Roof crush	N	N	Y

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