[DRAFT Meeting Notes]

3rd Meeting of the Informal Working Group on Hydrogen and Fuel Cell Vehicles

Global Technical Regulation No. 13 (Phase 2)

26-28 June, 2018 – Seoul, South Korea

	Agenda Items	Presenters	Documents
0	**Welcome and practical arrangements** Welcome remarks from Director of Advanced Motor Vehicles Division of Ministry of Land, Infrastructure and Land Transport	**Jae-Pyeong Lee**	--
1	**Organization** • Co-chairmanship: N. Nguyen (US/NHTSA); M. Takahashi (JPN/METI) • Co-vice chairmanship: H. Seo (Korea); Y. He (China) • Secretary: Y. Fujimoto (JPN/OICA) • Attendees: See list of attendees in appendix	**N. Nguyen**	--
2	**Approval of the agenda**	**Members**	GTR13-3-01
3	**Approval of the meeting minutes of the 2nd meeting** • No comments from IWG members; Agenda approved	**N. Nguyen**	GTR13-2-27
4	**Review of Terms of Reference** • Address main technical items for Phase 1 • Goal: Conclude IWG activity by Sep 2020, submit for GRSP in Dec 2020	**N. Nguyen**	GTR13-2-15
5	**Update on ongoing and planned research and rulemaking activities** a. China (He) – New and ongoing work on standards (GB/T) for vehicle safety, max speed, range, interface and protocol. For GTR, China to adopt whole vehicle approval and not component-level. Ban on Type 4 cylinder remains with no defined schedule. b. EC (Broertjes) – Commission adopted Mobility Package in May 2018 including GSR (General Safety Regulation): EC79 will be repealed, replaced by UNR134. Material compatibility will be taken from UN level. Moving to component based type approval process. c. Korea (Seo) – Presentation of current market environment and govt efforts to promote hydrogen society. Regulations exist in KMVSS for FCEV safety (cylinder, crash test, fire tests, etc.). d. USA (Kuppa/Keller) – NHTSA performed GTR13 tests and found issues with test procedures. Want to address these in Phase 2 and before incorporating in FMVSS. DOE provided status update on FC-related activity (vehicles, stationary, refueling stations)	**Contracting Parties**	GTR13-3-20 GTR13-3-19
6	**ISO TC197 Update**	**A. Tchouvelev**	GTR13-3-12
	a. Provided work program update		
7	**SAE Update**	**G. Scheffler (SAE)**	GTR13-3-07
	a. SAE J2579 revision 3 (2018) published. Material compatibility test methods now included. Discussions remain on a few outstanding items (see "Material Compatibility" section)		
8	**CSA CHMC2 Update**	**A. Ryan for CSA**	GTR13-3-14
	a. Preliminary draft being circulated among technical committee now. Public comment available at end of August.		
10	**Taskforce #1 (Heavy Duty Vehicle) Update**	**M. Kwon (KATRI)**	GTR13-3-17 GTR13-3-16

	a. Scope: Categorization of vehicle classes based on mass (GVWR >4,536 kg or GVWR>3,500 kg); post-crash fuel system integrity (required for LDV but HDV different depending on location of CHSS); static rollover test (if necessary, same as UNR66); side impact test; changes to test procedures due to increase in storage capacity. b. IWG comment: CP agree to identify scope of TF work, starting with vehicle categories, narrowing down to list of priority items c. Next steps: • Collect opinions of the TF1 participants - By August • 1st web meeting - Early September • 2nd web meeting - October 10		
11	**Taskforce #2 (Receptacle) Update**	**L. Gambone (CSA)**	GTR13-3-10
	a. Presented proposed language to GTR Rationale section and the Performance Requirements sections b. Propose to refer to ISO 17268 or SAE J2600 for receptacle profile and performance, citing safety reasons c. EC agree to TF2 proposal on profile but US self-cert style requesting review of safety-critical requirements d. IWG comment: TF2 to identify critical safety requirements and refine proposal e. Next meeting: In-person session on Monday 15 October in Brussels		
12	**Long-term Stress Rupture**	**A. Tchouvelev / G. Scheffler (SAE)**	GTR13-3-13
	a. Presented modification of durability (hydraulic) test protocol that allows for confirmation of minimum acceptable stress rupture withstand b. Allows for verification of both Type 3 and 4 cylinders regardless of fiber (carbon vs glass) with reduced test time c. SAE has not verified proposal with testing; seeking funds, may know in Aug/Sept. TF5 to work with SAE		
13	**Maximator Company Presentation**	**P. Schulte**	GTR13-3-15
	a. German-based company that manufacturers hydrogen refueling station components, test stands, testing services		
14	**Linamar Company Presentation**	**V. Kovalevsky**	GTR13-3-06
	a. Volute (manufacturer of conformable tanks) transferred technology to Linamar in May 2018. Focus on manufacturing and vehicle integration. Involved in codes/standards work via NGV2, J2601, GTR13		
15	**Proposed Test Method to Establish Hydrogen Compatibility of Materials for FCV**	**G. Scheffler (SAE)**	GTR13-3-07 GTR13-3-05
	a. Material experts developed tests to qualify material for basic strength requirement for design. Now incorporated in SAE J2579:2018. b. Experts awaiting CP feedback on issues including fatigue life test specimen (smooth vs notched) and allowance of welds. Requesting 20 Aug as deadline to send comments to Chris San Marchi (cwsanma@sandia.gov). c. CP discussion on how to include material compatibility, which is more applicable for type approval countries. d. KHK prefers smooth specimen on FLT due to ability to compare results in previous testing. e. KHK believes welds involve issues that require more data collection and further discussion (e.g., types, methods, quality assurance) to show that welds can be acceptable. For now, JPN, EC: "No" on welds; China and Korea requested for more time and discussion on welding f. China believes 1.25 NWP → 1.5 NWP in SSRT is not necessary. However, JARI believes there is not a big difference and 1.5 NWP is consistent with the pressure of a hydrogen station accident.		
16	**Humid Gas- Stress Corrosion Cracking (HG-SCC) for Aluminum Alloys**	**A. Ishizuka (OICA/Honda)**	GTR13-3-02
	a. Aluminum alloys used for CHSS are susceptible to hydrogen embrittlement-type SCC. b. ISO 7866 Annex B provides testing for SLC (sustained load cracking) but not in a humid environment. c. 5 ppm water condition can exist during refueling, creating a humid environment in which SCC is greatly accelerated. d. HPIS E 103:2018 (Japan's standard) proposed to include in Phase 2. But more testing to be done to determine if 5 ppm is equivalent to 85% relative humidity and to evaluate SCC under hydrogen environment. e. IWG comment: How will the materials be referenced in GTR? Perhaps add the J2579 table in annex and update as new materials are added (along with the published journal reference). Above validation tests should be conducted.		

19	**Material Compatibility Wrap-up**	**N. Nguyen**	GTR13-3-05
	a. At what level does CP need to regulate materials? How to avoid hindering technology innovation or making it too expensive? b. Industry concern about how the manufacturers can prove their materials to witness service for type approval authorities. Avoid unnecessary/duplicate testing. c. IWG comment: Review SAE proposal (see GTR13-3-05) and comment by 20 Aug to Chris San Marchi.		
20	**Initial Burst Pressure Requirement**	**H. Tamura (JARI)**	GTR13-3-03
	a. Following JARI results presented at last IWG, Japan proposed text for reducing minimum burst pressure from 225% NWP to 200% NWP for carbon fiber containers. Glass fibers remain 350% NWP (no change). b. The expectation is that GTR sets minimum requirement, and manufacturers are expected to set higher minimum burst pressure beyond 200% NWP as they see fit for their production processes. c. JPN, US, EC: OK with 200%NWP. d. KOR, CN: Need more time to review		
21	**Importance of Compression Frequency & Fluid Fill-up Procedure in Pressure Cycling Test for Composite Vessel**	**S. Cho (KGS)**	GTR13-3-22
	a. Proposal to include text air removal during fill (hydraulic) and to perform cycles no faster than 2.5 cycles per minute. b. IWG comment: Discuss in TF3.		
22	**Taskforce #3 (Test Procedure Improvements) Update**	**L. Gambone (CSA)**	GTR13-3-21
	a. TF #3 met on Monday, 25 June. TF leader provided update of status of proposals to date. b. Shell suggested raising test temperature from 85°C to 140°C as part of durability test cycle. Rationale is that 140°C can be seen by cylinder during station failure and there are currently no allowances made in GTR for this situation. EIGA proposing to engage industry in further discussion. c. IWG comment: Fueling protocol developed to make sure tank <85°C and GTR already tests to 1.5NWP so ensures tank is robust enough. Rationale for raising testing temperature is unclear. Proposal may be making changes without real cost benefit.		
23	**Taskforce #4 (Fire Test) Update**	**G. Scheffler (SAE)**	GTR13-3-09
	a. TF leader restated that goal of task force is to improve reproducibility of current fire test, which requires that PRD activate and vent contents before the CHSS is weakened and bursts. b. Fire test for HD vehicles will need to be discussed because of higher loads. c. Batteries could also be considered as a fire source. d. Taskforce to meet in-person in September in Troy, MI after SAE FC Safety Taskforce meetings.		
24	**Fire Safety**	**V. Molkov (Ulster)**	Not available
	a. Presentation on modeling hydrogen storage tank rupture in a tunnel fire b. Quantitative risk assessment: requirements for acceptable risk of onboard storage.		
25	**Taskforce #5 (Recommendations from ISO TC197)**	**A. Tchouvelev**	GTR13-3-18
	a. Taskforce leader reviewed proposals received from JAMA and IWG provided feedback.		
26	**China's Hydrogen System Storage**	**Y. He (China)**	Not available
	a. Provided verbal update on "liquid hydrogen" at ambient temperature in which hydrogen is in an organic liquid like gasoline and used on a vehicle/bus. Provides refueling time of 4 minutes. Presentation to be made at next IWG.		
28	**Action Items**	**N. Nguyen**	GTR13-3-24
	• See last page or GTR13-3-24.		
29	**Next IWG meetings**		
	2018 October 16-18: Brussels	2019 March 5-7: USA (location TBD) 2019 June 18-20: China 2019 Oct/Nov: TBD	

30	APPENDIX: Attendees List			
	CATARC	JARI Japan	OICA/Audi	SAE
	CLEPA	KHK/Japan	OICA/BMW	Shell Hydrogen
	CSA Group	Kiwa Nederland	OICA/ Daimler AG	TK-Fujikin
	DOE (US)	Korea Auto Testing & Research Inst.	OICA/GM	Tongji Univ.
	Donhee Industries	Korea Gas Safety Corporation	OICA/ Honda R&D	TUV Nord Korea
	European Commission	Korea Research Inst. Std & Science	OICA/Hyundai Europe	US/NHTSA
	EC-Joint Research Centre	Linamar	OICA/Hyundai R&D Korea	Univ.of Ulster
	Hexagon Lincoln	Maximator	OICA/Toyota	Young Do Valve
	ILJIN Composites Korea	METI/ Japan	Powertech Labs	Zhejiang Univ
	ISO TC197	MLIT Japan	Refine China	