

Technical Session #2
Standardization for
Charging Safety of EV

Status of Korean EVS Regulation

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Korean EVS Research Activities

1. Research on the development of safety-Assessment Procedures for HEV

Objective	Revision of the Safety standard for HEV
Period	Oct. 2006 ~ Sep. 2008
Participant	KATRI, SK Innovation, KESCO, MANDO
Task	<ul style="list-style-type: none">• Safety standards were developed according to performance test procedures for HEV to identify problems and solutions• Revision of the safety standards for HEV<ul style="list-style-type: none">- Power performance, Braking ability, Accelerator control systemDefrost and demist, EMC, Crashworthiness, High voltage system and Traction battery
Result	<ul style="list-style-type: none">• Revision of KMVSS (8 Articles) : Jan.23,2009<ul style="list-style-type: none">- Revision : Article 2(Definitions), 11(Motor and Transmission System), 15(Brake System), 91(Fuel System), 111(Motor Power) , 111-2(EMC)- Newly inserted : Article 18-2(High voltage electric device), 18-3(Traction Battery)• Revision of KMVSS Test Procedure (7 Items) : Feb.19,2009

Korean EVS Research Activities

2. Research on the development of safety-Assessment Procedures for HFCV

Objective	To amend safety standards for HFCV and consequently reflect research results to vehicle management policy
Period	Dec. 2007 ~ Jun. 2012
Participant	KATRI, HMC, SNU, SKKU, KESCO, YURA CO. etc.
Task	<ul style="list-style-type: none">• Development of a technique for safety assessment of HFCV<ul style="list-style-type: none">- Regulation system and policy- Research for safety of hydrogen storage and supply system- Assessment of compliance with safety standards of HFCV- Research for electric safety of high-voltage and fuel cell system• International harmonization of safety standards for HFCV• Development of safety standards for hydrogen storage, supply system and fail safety
Result	<ul style="list-style-type: none">• Revision of KMVSS (10 Articles) : in 2012<ul style="list-style-type: none">- Article 17(Fuel System), 18-2(High voltage electric device),37(Muffler), 87(Accelerator Control System), 90(Brake System), 91(Fuel System), 102(Occupant Protection), 109(Defrost and demist), 111(Motor Power) , 111-2(EMC)• Revision of KMVSS Test Procedures (15 Items) : in 2012

Korean EVS Research Activities

3. Monitoring Program of Electric Vehicles

Objective	Identify problems regarding safety and develop the plan of improvement during real world monitoring
Period	Apr. 2010 ~ Dec. 2012
Participant	KATRI
Task	<ul style="list-style-type: none">▪ Monitoring of EV during real world driving<ul style="list-style-type: none">- Monitoring Vehicle : NEV(10), EV(7), EV Bus(1)- Monitoring region(8)<ul style="list-style-type: none">· Traffic environment : big city, towns, rural, sea-side village, mountain village· Climate condition (term) : consider annual temperature variations, etc.▪ Activation and Ensure the safety of EV<ul style="list-style-type: none">- Identify field problems and solutions▪ Revision of Motor vehicle safety standards for EV<ul style="list-style-type: none">- In-use(Charging) : EMC and Safety of High voltage electric device- Fuel Economy test procedure for Heavy Duty Vehicle(including EV)- Test Procedure of Traction Battery Safety
Result	<ul style="list-style-type: none">· Revision of KMVSS Test Procedure(3 Items) : 2012~2013

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KMVSS (Regulation on Korea Motor Vehicle Safety Standard)

- **Promulgation : Jan.23, 2009**  **Result of Research on HEV Safety**

Article	Description
Article 2 Definition	<p>52. "High voltage electric device" refers to an electric system whose actuating power exceeds DC 60 V or AC 25 V, as in a drive motor or an electric power converter.</p> <p>53. "Traction Battery" refers to a battery that stores electric energy for driving the vehicle or other electric energy storage medium with a similar function.</p>
Article 18-2 High voltage electric device	<ol style="list-style-type: none">1. Electric wires between high voltage electric devices shall be orange in color.2. Electric wiring shall have protective equipment.3. Electric wiring shall be free from any exposed live part conductors or joints in between.4. The polarity of connector is not true for a structure where the polarity cannot easily be changed.5. High voltage electric devices shall have warning marks against electric shock which conform to each of the following requirements.

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Article	Description
Article 18-3 Traction Battery (RESS)	<p>Traction batteries in a vehicle shall meet each of the following requirements.</p> <ol style="list-style-type: none">1. Traction batteries shall be isolated from the wall or guard plate.2. They shall be equipped with functions to prevent an overcharge or over-current exceeding the range specified in the design.3. Traction batteries shall be free of the possibility for fire or explosion that can take place in physical, chemical, electrical, and thermal shock conditions as notified by the Minister of Land, Transport and Maritime Affairs.
Article 91 Fuel System	<p>(4) Hybrid vehicles (including only passenger cars and vans whose gross weights are 4.5t or below) and Electric vehicles (including only passenger cars and vans whose gross weights are 4.5t or below) shall satisfy the standards on a high voltage electric device collision test in Table 11-3.</p>

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	Condition	Acceptance criteria
Article 91 Fuel System Table 11-3 Safety Standard on a high voltage electric device collision test	1. Frontal barrier crash: 48.3km/h	1. Not fire and explosion 2. Electrolyte spillage from Traction Batteries : not more than 5 liters, until 30 min. 3. No visible trace of electrolyte shall spill into the passenger compartment. 4. No part of any battery system component that is located outside the passenger compartment shall enter the passenger compartment 5. Isolation resistance between Live part and electrical Chassis : Not less than 100Ω/V[DC], 500Ω/V[AC]
	2. Rear moving barrier impact : 48.3km/h	
	3. Side moving deformable barrier impact : 32.3km/h	
	4. Post-impact test static rollover : 90 degrees, 4 times, each 5 min.	

▪ **Revised in 2012** → Result of Research on HFCV Safety

- **Base on SGS GTR**

- **Article 18-2 High voltage electric device**
- **Article 91 Fuel System**

Status of Korean EVS Regulations

KMVSS Test Procedure

- **Promulgation : Feb.19, 2009** ➡ Result of Research on HEV Safety

Article	Description	Remark
Annex 1 -Part 47 Test Procedures of High voltage electric device	<ul style="list-style-type: none"> • Application : Liquid Fuel HEV, CNG HEV, LPG HEV, EV • Test Procedure <ul style="list-style-type: none"> - Frontal barrier crash - Rear moving barrier impact - Side moving deformable barrier impact - Post-impact test static rollover - Calculate the electrical isolation 	Similar to FMVSS 571-305

- **Revise in 2014** ➡ Result of Research on HFCV Safety
 - Base on SGS GTR
 - Test Procedures of High voltage electric device for HFCV

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KMVSS Test Procedure

- **Promulgation : Feb.19, 2009** ➡ Result of Research on HEV Safety

Article	Test Item	Condition	Acceptance criteria
Annex 1 - Part 48 Test Procedures of Traction Battery Safety	Drop	Drop from 4.9 m high	Fire/ Explosion
	Immersion	Immerse completely in the sea water	Fire/ Explosion
	Over-charge	Charge up to 150% SOC	Fire/ Explosion
	Over-discharge	Discharge with 1C rate	Fire/ Explosion
	External Short Circuit	Closed circuit with total resistance of 50 mΩ or less for 1 hour	Fire/ Explosion
	Heat Exposure	Exposed to 80 °C heat for 4 hour	Fire/ Explosion
	Fire Resistance	Exposed to flame of 890 to 900 °C for 2 min	Explosion

- **Revise in 2014** ➡ Result of EV Monitoring Program
 - Same Test Item
 - Test conditions and Procedures

Recent Korean Activities in UN/ECE/WP.29

Leading Country of EVS TFG 7(Fire Resistance Test)

- **Held the 2nd EVS Informal Working Group Meeting in Korea**
 - **Location & Date : Seoul, 17th Nov. 2014**
 - **Attendees : Korea, Japan, China, USA, EU, Germany, Canada, Sweden, UTAC, OICA, etc.**
 - **Discussion issues**
 - **Specification of optimized test equipment to test conditions of fire resistance test (A)**
 - **Study on justification for the temperature and thermal energy of the fire resistance test(A) compared to those of GTR draft(B)**
 - **Propose the equivalent test conditions between test A and B**
 - **Discuss basic issues of the fire resistance test such as a purpose, scope, etc.**
 - **Discuss a long term fire resistance test.(Supported by NHTSA)**

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Thank you for your attention.

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