

Electric Vehicles Safety Global Technical Regulation

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On behalf of the EVS-GTR IWG



Background

- In 2012, under the United Nations World Forum for Harmonization of Vehicle Regulations (WP.29) and the 1998 Agreement, China, Japan European Union and the United States are co-sponsoring to establish 2 working groups to address environmental and safety issues associated with electric vehicles (EVs)
- EV and Environment (EVE): focusing on the information exchange and joint research concerning the related impacts of the development of EVs to the environment such as CO₂ emissions, energy consumption and efficiency, energy storage (batteries, capacitors, etc.) and infrastructure.
- EV Safety (EVS): establishing a Global Technical Regulation (GTR) for EVs ensuring high voltage electrical safety, safety of electrical components, and rechargeable electric energy storage systems (REESS)

EVS-IWG

- **EVS-informal working group (IWG):** comprised of over 50 members from government regulators, industry standard organizations and vehicle and battery manufacturers.
- IWG has conducted 13 meetings. The meetings and development process are transparent. Documents and reports are posted on the UN website:
<https://www2.unece.org/wiki/pages/viewpage.action?pageId=3178628>
- Goal: WP.29 vote to establish the GTR is November 2017

EVS-GTR

- **Terms of Reference:**

- To the extent possible, GTR will be science-based, data driven and performance based - avoiding design-specific requirements
- IWG will investigate, conduct research and establish provisions at vehicle and system levels to address vehicle safety issues for EVs:

In-use:

- Occupant protection: protection against electric shock
- Performance and safety requirements for Li-Ion based rechargeable energy storage system (REESS) including battery management system for conditions of low and high temperature, over-charge, over current, over discharge, external short circuit, and environment conditions such as extreme temperature, vibration, mechanical shock and fire resistance

Post crash:

- Electrical isolation; protection against electric shock
- Battery integrity: battery management system, robustness and survivability
- Battery discharge procedure

End-of-life:

- Disposal of battery



2-Phase Approach

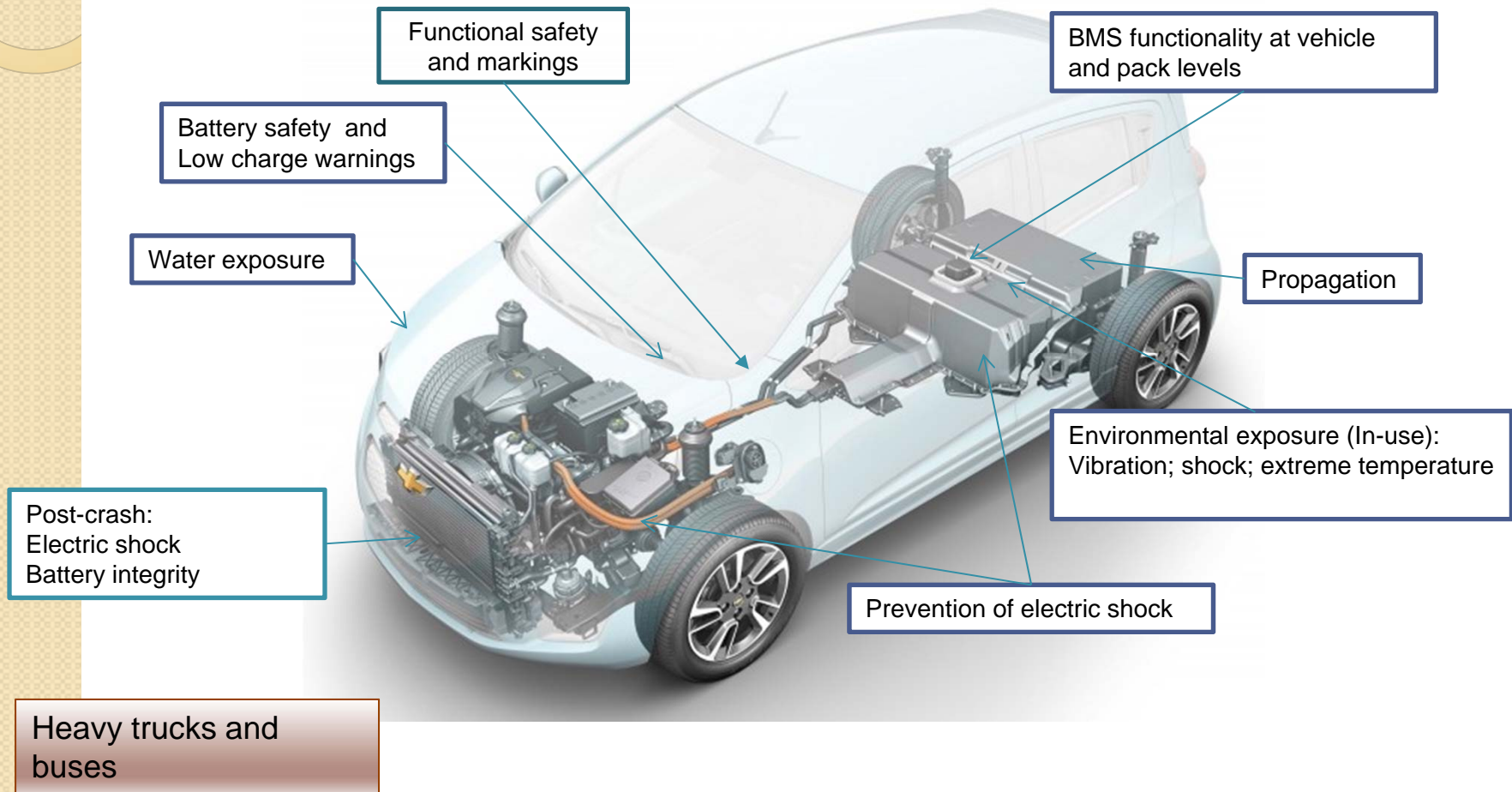
- **Phase 1:** near-term critical safety requirements
 - Based on a proposal from OICA which is comprised of mostly requirements from R94, R95 and R100
- **Phase 2:** safety requirements that require long-term research as well as further improvement of the GTR



Task Force Teams

- TF-1: Protection Against Water – China
- TF-2: Low Electrical Energy/Physical Barriers – OICA
- TF-3: Electrolyte Leakage – OICA
- TF-4: REESS Protocol BMS, environment exposure – OICA
- TF-5: Thermal Propagation – China
- TF-6: State of Charge (SOC) – Japan
- TF-7: Fire Resistance – Korea
- TF-8: Heavy Vehicles and Buses- China
- TF-9: Warning systems – U.S.

Draft GTR – Phase 1





Performance Requirements

5. Performance requirements (light duty/passenger vehicles)

5.1. Requirements of a vehicle with regard to its electrical safety - in-use

5.1.1. Protection against electric shock

5.1.2. Functional safety

5.2. Requirements of a vehicle with regard to its electrical safety - post-crash

5.2.1. General principle

5.2.2. Protection against electric shock

5.3. Requirements with regard to installation and functionality of REESS in a vehicle

5.3.1. Installation of rechargeable energy storage system (REESS) on a vehicle

5.3.2. Warning in the event of operational failure of vehicle controls that manage REESS safe operation (e.g. BMS)

5.3.3. Warning in the case of a thermal event within the REESS

5.3.4. Warning in the event of low energy content of REESS



Performance requirements (cont.)

5.4. Requirements with regard to the safety of REESS - in-use

5.4.1 General principle.

5.4.2. Vibration

5.4.3. Thermal shock and cycling

5.4.4. Fire resistance

5.4.5. External short circuit protection

5.4.6. Overcharge protection

5.4.7. Over-discharge protection

5.4.8. Over-temperature protection

5.4.9. Overcurrent protection

5.4.10. Low-temperature protection

5.4.11. Management of gases emitted from REESS

5.4.12. Thermal propagation

5.5. Requirements with regard to the safety of REESS - post-crash

5.5.1. Vehicle based test

5.5.2. REESS-component based test



Performance Requirements (cont.)

- Based on the requirements of the light duty vehicles

7. Heavy duty vehicles and buses

7.1. Requirements of a vehicle with regard to its electrical safety - in-use

- 7.1.1. Protection against electric shock
- 7.1.2. Functional safety

7.2. Requirements with regard to installation and functionality of REESS in a vehicle

- 7.2.1. Installation of rechargeable energy storage system (REESS) on a vehicle
- 7.2.2. Warning in the event of operational failure of vehicle controls that manage REESS safe operation
- 7.2.3. Warning in the case of a thermal event within the REESS
- 7.2.4. Warning in the event of low energy content of REESS



Performance requirements (cont.)

7.3. Requirements with regard to the safety of REESS - in-use

- 7.3.1 General principle
- 7.3.2. Vibration
- 7.3.3. Thermal shock and cycling
- 7.3.4. Fire resistance
- 7.3.5. External short circuit protection
- 7.3.6. Overcharge protection
- 7.3.7. Over-discharge protection
- 7.3.8. Over-temperature protection
- [7.3.9. Overcurrent protection
- 7.3.10. Low-temperature protection
- 7.3.11. Management of gases emitted from REESS
- 7.3.12. Thermal propagation]



Timeline for Phase 1

- December 2016: Submit draft GTR to GRSP
 - January-February 2017: Possible EVS meeting and editorial meeting
- May 2017: Submit formal GTR to GRSP
- June 2017: Submit GTR to WP.29
- November 2017: Possible vote to establish GTR



Phase 2

- ⦿ The exact scope and timeline for Phase 2 of the GTR will be clarified after the completion of the Phase I. Some possible items:
 - ⦿ In-use:
 - ⦿ Protection during charging: AC and DC
 - ⦿ Propagation/enclosure thermal containment
 - ⦿ Water immersion
 - ⦿ Post-crash:
 - ⦿ REESS safety assessment
 - ⦿ Battery discharge
 - ⦿ Toxicity
 - ⦿ Update phase 1 requirements

Thank you