

Proposal for amendments to ECE/TRANS/WP.29/GRSP/2012/12 - Draft global technical regulation (gtr) on hydrogen fuelled vehicles

I. Proposal

Paragraph 5.3.2.2.3., delete the square brackets and retain the text unchanged.

Paragraph 6.3.5.2.4., delete the square brackets and retain the text unchanged.

II. Justification

The purpose of this proposal is to retain the so-called barriers alternative for post-crash electrical safety.

During the discussion of the gtr, more specifically the post-crash electrical safety requirements, OICA supported, and continues to do so, four alternatives for the requirements of protection against electrical shock (paragraph 5.3.2.2.), i.e. electrical isolation, low voltage, physical barriers and low energy for assuring post-crash electrical safety.

While the low voltage (or absence of high voltage - paragraph 5.3.2.2.1.) and the electrical isolation (or isolation resistance - paragraph 5.3.2.2.2.) alternatives have been recognised and are included in the draft gtr, the issues of low energy and of physical protection could not be agreed upon by the informal group.

Because the low energy option is currently the subject of ongoing NHTSA research, this OICA proposal focuses on the physical barriers alternative (paragraph 5.3.2.2.3.).

OICA stresses that the physical barriers option is accepted by virtually all international regulatory authorities and industry experts. It has already been incorporated into multiple codes and standards (e.g., UN ECE R12, UN ECE R94, UN ECE R95, SAE J1766, ISO 6469/4 (draft), and Japanese Attachment 111). China is also considering the introduction of the physical barriers option in their upcoming vehicle electrification standards.

Physical barriers are the principal means to assure the safety of electric vehicles in normal use and OICA asserts that they also provide equivalent protection to the other options in post-crash situations.

Also FMVSS 305 allows for the physical barriers alternative with respect to the rechargeable energy storage system (RESS). FMVSS 305 requires that if the electrical contactors are located within the RESS, then the low voltage or electrical isolation measurements are taken downstream of the contactors. Therefore, this language permits the barriers alternative for the RESS. As such, we recommend that the allowance for the barriers alternative that already exists in FMVSS 305 for the RESS be expanded to more generally include any high voltage source.

As detailed in prior Alliance (OICA member) comments to NHTSA¹, the physical barriers alternative is essential to the certification of fuel-cell vehicles: in crashes where the crash pulse is insufficient to open the electrical contactors the direct current (DC) bus can impinge on the alternating current (AC) bus through the inverter. In such situations, it is not practical to consistently achieve 500 ohms/volt electrical isolation on the AC bus.

¹ Alliance of Automobile Manufacturers, Supplemental Comments to docket No. NHTSA-2007-28517 (June 15, 2009), pages 7-10.

OICA acknowledges that, based on the draft Battelle analysis, NHTSA has expressed concerns with indirect contact shock protection of the physical barrier alternative. OICA notes that the Battelle report focuses on an unlikely scenario that requires a crash with:

1. A loss of isolation within the enclosure of one high-voltage source,
2. A loss of isolation within a second (different) high-voltage-source enclosure,
3. A requirement that these two separate losses of isolation occur on opposite rails of the high-voltage bus,
4. A requirement that a person have access to these two enclosures in a crashed vehicle, and
5. A situation where the person touches these two enclosures simultaneously.

The likelihood of each one of these events is remote. Further, the likelihood that this combination of independent faults would occur in real-world situations is even more remote and exceedingly small. Thus, OICA suggests that it is unrealistic to attempt to safeguard against this case: a highly improbable scenario involving multiple independent faults.

During the April 11, 2012 call with NHTSA, industry participants noted that it is neither feasible nor necessary to adopt the Battelle suggestion to substantially reduce the isolation resistance of the galvanic bonding below 0.1 ohms². On this call, it was also noted that standard industry practice includes overcurrent protection on these high voltage components and that this practice provides an additional layer of protection.

Subsequent to the April 11, 2012 call, OICA members began review of the technical aspects of the Battelle report. Although our analysis is not yet complete, we have identified a number of technical questions and concerns with the assumptions and methodology of the Battelle analysis.

In conclusion, OICA considers that the physical barrier alternative as currently drafted is acceptable and should be included in the gtr, based on:

1. the extremely remote likelihood that the risk scenario detailed in the Battelle analysis would actually occur in real-world situations,
2. the technical concerns with the assumptions and methodology identified in our preliminary review of that analysis that question Battelle's conclusions,

² The 0.1 ohms resistance level for electrical bonding is well established in international standards both in and out of the automotive industry. For example, MIL_B_5087, NASA Technical Standard NSA-STD-P023 (Electrical Bonding for NASA Launch Vehicles, Spacecraft, Payloads, and Flight Equipment, ISO6469, ECE-R100, and IEC 60335-1 "Household and Similar Electrical Appliances" Part 1: General Requirements.