The Vehicle Suppliers Association

# Comments of
# MEMA, The Vehicle Suppliers Association
# to the
# National Highway Traffic Safety Administration
# on the
# Notice of Proposed Rulemaking; FMVSS No. 305a Electric-Powered Vehicles: Electric Powertrain Integrity Global Technical Regulation No. 20, Incorporation by Reference

June 14, 2024

Docket No. NHTSA-2024-0012

## Introduction

MEMA, The Vehicle Suppliers Association, is the leading trade association in North America for vehicle suppliers, parts manufacturers, and remanufacturers. It has been the voice of the vehicle supplier industry since 1904.

Automotive and commercial vehicle suppliers are the largest employer of manufacturing jobs in the United States employing over 900,000 people throughout the country. Direct, indirect, and induced vehicle supplier employment accounts for over 4.8 million U.S. jobs and contributes 2.5 percent to U.S. GDP.

Suppliers lead the way in new vehicle innovations. Member companies conceive, design, and manufacture the OE systems and technologies that make up two-thirds of the value of every new vehicle and supply the automotive aftermarket with the parts that keep millions of vehicles on the road, fueling international commerce and meeting society's transportation needs. MEMA members are committed to safety and sustainability.

MEMA appreciates the opportunity to submit these comments and encourages harmonization with GTR-20 requirements to the maximum extent possible. MEMA welcomes the opportunity to work with NHTSA to provide any technical assistance or information to the agency.

## Opening Remarks

MEMA agrees with the incorporation by reference of Global Technical Regulation 20 (GTR No. 20) in general, and we make several suggestions to improve the GTR regionally in our comments below. In the comments that follow we propose both changes to NHTSA's suggested deviations from GTR-20 as well as some changes we believe will be improvements to safety and testing feasibility.

In general, we agree with the NHTSA's proposal to require documentation on a variety of performance requirements. We make several suggestions in the following comments to expand on and improve this practice.

## Discussion/Comments

### Applicability

In this NPRM, NHTSA has proposed requirements to ensure post-crash safety using full vehicle crash tests for light vehicles and heavy school buses. Such full vehicle crash tests evaluate post-crash safety at a system level, so NHTSA is not considering component-level tests of the REESS for those vehicles. However, since there are no full vehicle crash tests currently in FMVSSs for heavy vehicles (other than heavy school buses), NHTSA seeks comment on considerations for component-level tests (other than the mechanical integrity and mechanical shock tests in GTR No. 20) that are representative of impact loads in heavy vehicle crashes and that can be applied to different weight classes of heavy vehicles.

MEMA Comment: We agree with the inclusion of light-duty vehicles and school buses to the general requirements and with the agency's decision to include heavy-duty vehicles without full crash tests.

Recommendation: Acceptability criteria should be added for the mechanical integrity and mechanical shock tests. The acceptability criteria should include an isolation requirement from all parts of battery system to the external power output connectors of the battery pack as is currently included in FMVSS 305 S5.3[1], as well as avoiding a single point of failure as a standard and best-practice.

Current FMVSS No. 305 applies to electric vehicles whose speed, attainable over a distance of 1.6 kilometers (km) (1 mile) on a paved level surface, is more than 40 km/h (25 miles per hour (mph)). It does not apply to vehicles that travel under 40 km/h (25 mph), such as low speed vehicles. There are low-speed vehicles that are also electric-powered vehicles. NHTSA requests comments on applying aspects of FMVSS No. 305a to low-speed vehicles to ensure a level of protection against shock and fire, particularly during normal vehicle operation, and to

[1] https://www.ecfr.gov/current/title-49/subtitle-B/chapter-V/part-571/subpart-B/section-571.305

assure the safe operation of the REESS. The agency requests comment on the possible applicability of FMVSS No. 305a to low-speed vehicles and its relevant safety needs, including any supporting research on low-speed vehicles.

MEMA Comment: We agree that this standard should not apply to low-speed vehicles.

Future Battery Chemistries

MEMA notes that the proposed regulatory text for FMVSS-305a does not specifically mention that many of these tests and procedures are specific to lithium battery chemistry. GTR-20 in contrast makes numerous mentions of its applicability to lithium chemistries. While different battery chemistries are being explored, even anticipated, they may require different tests and are likely to be the subject of new global technical regulations. To better align with GTR-20 and avoid misconceptions regarding other future battery chemistries, MEMA proposes NHTSA modify Section S3 by adding the words "lithium battery" as shown below.

*S3. Application. This standard applies to* lithium battery *passenger cars, multipurpose passenger vehicles, trucks, and buses that use electrical propulsion components with working voltages greater than 60 volts direct current (VDC) or 30 volts alternating current (VAC), and whose speed attainable over a distance of 1.6 km on a paved level surface is more than 40 km/h.*

Post-Crash Electrical Safety

Based on the analysis results, NHTSA tentatively concludes that a post-crash electrical safety compliance option for capacitors based on an electrical energy of 0.2 Joules or less provides adequate safety from electrical shock and long term harmful effects on the human body. Providing this post-crash compliance option would allow for practicable powertrain designs for battery electric and fuel cell vehicles without any reduction in safety. Automotive high-voltage systems typically utilize a number of capacitors connected to high voltage buses, and it is not always practical to discharge every capacitor post-crash. NHTSA tentatively believes that by providing this compliance option for a safe energy limit, vehicle manufacturers would have the flexibility to design products that assure safety. NHTSA seeks comments on the parameters (human body resistance, discharge profiles) used in the analysis and the analysis method.

MEMA Comment: Acceptability criteria should be part of the low-energy option for capacitors as well. If the capacitors are discharged to below 0.2 Joules, it remains critical for the battery to be isolated to prevent re-charging. The acceptability criteria should include an isolation requirement from all parts of battery system to the external power output connectors of the

battery pack as is currently included in FMVSS 305 S5.3[2], as well as avoiding a single point of failure as a standard and best-practice.

GTR No. 20 requires that for a period of one hour after a crash test, there shall be no evidence of fire or explosion of the REESS. However, such a requirement is not currently in FMVSS No. 305. In accordance with GTR No. 20, NHTSA proposes to include in FMVSS No. 305a a requirement that there be no evidence of fire or explosion for the duration of one hour after the crash test for heavy school buses, and for the duration of one hour after each crash test and subsequent quasi-static rollover test for light vehicles. The assessment of fire or explosion would be verified by inspection without removal of the REESS or any parts of the vehicle.

MEMA Comment: MEMA agrees with the inclusion of the one-hour post-crash test period.

Exclusion of High Voltage Sources

Section 6.3.2 of the proposed rule states "*Exclusion of high voltage sources from electrical isolation requirements. A high voltage source that is conductively connected to an electric component which is conductively connected to the electrical chassis and has a working voltage less than or equal to 60 VDC, is not required to meet the electrical isolation requirements in S6.3.1 if the voltage between the high voltage source and the electrical chassis is less than or equal to 30 VAC or 60 VDC.*"

MEMA Recommendation: Harmonize with UN ECE R100[3] definition 2.42 to clarify that the 60VDC threshold also applies to pulsating DC voltages less than 60VDC in cases where there is no change in polarity.

Over-Discharge Protection

NHTSA tentatively concludes that GTR No. 20's over-discharge test is practical and feasible based on the agency's own testing. NHTSA proposes to include the over-discharge protection requirement and test procedure in FMVSS No. 305a.

MEMA Comment: Though we do not perceive an immediate need for over-discharge protection from a safety standpoint, we note that these requirements are present in GTR-20. For the sake of harmonization, MEMA agrees with NHTSA's decision to incorporate these

[2] See preceding footnote
[3] https://unece.org/transport/documents/2022/03/standards/regulation-no-100-rev3

requirements and with NHTSA's conclusion regarding practicality of the over-discharge test. To align with NHTSA's proposal that overcharge tests should be "performed on a completed vehicle", the over-discharge test should also be performed on a completed vehicle.

Overcurrent protection

MEMA Comment: Overcurrent protection requirements should be expanded and improved. Overcurrent conditions can commonly occur during a short circuit while charging, in a vehicle collision, or due to an insulation breakdown over time. In each of these scenarios, if the power cannot be shut off, the vehicle body can become "live" creating a shock hazard for occupants and first responders, and lead to increased risk of fire from overheating of contacts. Contactor failure is a frequent safety failure issue, as evidenced by recent vehicle recalls and can result in a permanently connected battery in the "on" state[4].

Recommendations:

1. To offer adequate protection to passengers and first responders, the battery should be isolated in the case of an overcurrent failure mode or a crash.

2. In the case of an overcurrent event or crash, a single point of failure should be avoided, which is standard practice (i.e., vehicle crash and contactor failure)

3. Require manufacturers demonstrate they can fully isolate the positive and negative poles of the battery under all reasonably foreseeable conditions (drive, charge, park on- and off-grid, and post-crash.

Over-Temperature Protection

GTR No. 20 specifies that the vehicle be soaked for at least 6 hours in a thermally controlled chamber at 45 °C. However, NHTSA's testing demonstrated that the presoaking of the vehicle at elevated temperatures does not raise the temperature of the REESS as significantly as by driving the vehicle under high acceleration and deceleration drive modes. Therefore, to reduce the test time and test burden, the agency does not believe it needs to specify presoaking of the vehicle. Do you have any questions or concerns based on the agency's proposal?

MEMA Comment: MEMA agrees with NHTSA's conclusion and agrees with the proposal to remove the 45°C presoaking.

[4] https://fordauthority.com/2023/10/2021-2022-ford-mustang-mach-e-recalled-over-hvbjb-issue/amp/

Mitigating Risk of Thermal Propagation Due to Internal Short Within a Single Cell in the REESS

MEMA Comment: MEMA and its members share NHTSA's commitment to EV battery safety. Safety is a top priority of EV battery manufacturers to protect production workers and EV drivers. EV batteries are designed using quality control processes and safety features to safeguard against short circuit and thermal runaway scenarios. However, if a single-cell thermal runaway (SCTR) occurs, proper battery safety design features allow for failure to occur in predictable, reliable ways, for example batteries can be oriented in EV packs to vent away from vehicle occupants.

Thermal Event-Warning and Tests

NHTSA proposes to initiate a thermal event in the REESS by inserting a heater within the REESS that achieves a peak temperature of 600°C within 30 seconds. In the proposed test procedure, the REESS is removed from the vehicle, if possible, and the REESS casing is opened to attach the heater to a cell or cells in the REESS in a manner to put at least one cell in the REESS into thermal runaway.

MEMA Comment: MEMA disagrees with NHTSA's proposal to exceed GTR-20 thermal propagation tests by requiring the purposeful initiation of a thermal runaway. This test would exceed GTR-20 requirements and could defeat the purpose of the sensing/warning requirements which are in part intended to mitigate thermal events. Purposeful thermal runaway of one or more cells would cause the creation of toxic smoke and other potentially unsafe conditions to test personnel. This test contradicts other proposed requirements to mitigate risk of or stop thermal runaway in the battery pack and cells. This proposed requirement should be withdrawn from this rule and evaluated further before potential future inclusion.

Water-Related Testing

NHTSA proposes to adopt GTR No. 20's physical water test requirement, where a vehicle shall maintain electrical isolation resistance after the vehicle is exposed to water under normal vehicle operation, such as in a car wash or while driving through a pool of standing water. However, the agency is not proposing to adopt GTR No. 20's two other water exposure methods: documentation measures and warning requirements. … NHTSA tentatively concludes that the GTR No. 20's physical test option is a practical and feasible means of evaluating the effects of water exposure under normal vehicle operating conditions. It has advantages of a performance standard in assessing compliance over a documentation

approach. Thus, the agency is not proposing the compliance option in GTR No. 20 of providing documentation on high voltage components meeting IPX5 level of protection.

MEMA Comment: Documentation requirements should be made and should include water ingress and water egress risk and require a leak check test for each battery pack at the end of the assembly line. Leak check must include all sealing surfaces of the battery pack.

After the ''vehicle washing'' test and with the vehicle surface still wet, electrical isolation is determined for high voltage sources in the same manner as that currently in S7.6 of FMVSS No. 305. The high voltage sources are required to meet the electrical isolation requirements as specified in S5.4.3 of current FMVSS No. 305. Comments are requested on the merits of including the test in FMVSS No. 305a. NHTSA seeks comment on the representativeness of the washing test, including but not limited to the proposed test conditions (e.g., 30–35 kPa versus 80–100 kPa water pressure conditions, water salinity levels, and water exposure durations, etc.).

MEMA Comment: We support inclusion of these proposed requirements and encourage their expansion to include submersion and immersion testing as well. Failure to adopt any standards for submersion puts road users and first responders at risk. By requiring advanced test standards, it protects U.S. industry, enables manufacturers to develop their own solutions, while ensuring high safety standards are met. Rigorous test standards would enable the US to maintain a position of technological leadership and prevent lower-quality imports from entering the market.

Recommendation: NHTSA should commit to a technical amendment. During this period NHTSA should meet with stakeholders, collect data, and adopt a testing requirement that would address submersion scenarios.

Current leak check testing practices do not include testing of all sealing surfaces for water ingress and egress, allowing significant vulnerability in the battery. There are at least two different leak check testing methods available for assembled battery packs that check all sealing surfaces.

Recommendation: Documentation requirements should include water ingress and water egress risk and require a leak check test for each battery pack at the end of the assembly line. The leak check must include all sealing surfaces of the battery pack.

The agency seeks comment on test conditions and test procedures that would address observed safety risks associated with submersion of REESS and high voltage components.

MEMA Comment: Documentation requirements should include water ingress and water egress risk and require a leak check test for each battery pack at the end of the assembly line. Leak check must include all sealing surfaces of the battery pack.

A submersion test is needed. GTR 20 and the tests in Chinese Standard GB 38031[5] are insufficient. More data is required for a strong water submersion test, the vehicle to collect data and design a test may be through a technical amendment. Rigorous test standards would enable the US to maintain a position of technological leadership and prevent lower-quality imports from entering the market. GTR 20 requires IPX5 and IPXXD/IPXXB, which is insufficient because they are only representative of normal driving conditions and do not cover vehicles subjected to flooding events.

Recommendation: Increase submersion testing stringency to intrusion protection rating 7 (IPX-7).

Regarding Documentation Requirements

MEMA agrees with NHTSA's proposed documentation provisions, with due regard for the protection of confidential business information that may be contained therein. We trust the agency will process performance/process documentation in a manner that protects supplier's confidentiality.

Proposed Compliance Dates

The proposed compliance dates are as follows.

1. Regarding the proposed requirements other than the emergency response information to assist first and second responders, the compliance date would be two years after the publication of the final rule in the Federal Register. Small-volume manufacturers, final-stage manufacturers, and alterers would be provided an additional year to comply with the final rule beyond the two-year date identified above. We propose to permit optional early compliance with the final rule.
    a. Under § 30111(d) of the Safety Act, a standard may not become effective before the 180th day after the standard is prescribed or later than one year after it is prescribed, unless NHTSA finds, for good cause shown, that a different effective date is in the public interest and publishes the reasons for the finding. NHTSA has tentatively determined that a 2-year compliance period is in the public

[5] https://www.gbstandards.org/GB_standard_english.asp?code=GB%2038031-2020

interest because all vehicle manufacturers need to gain familiarity with the proposed REESS requirements.

2. Regarding requirements to provide emergency response information to assist first and second responders, the proposed compliance date is one year after publication of the final rule. Small volume manufacturers, final-stage manufacturers, and alterers would be provided an additional year to comply with the final rule. Optional early compliance would be permitted.

MEMA Comment: We agree with the proposed compliance dates and requirements above.

## Conclusion

MEMA appreciates this opportunity to provide comments to the NPRM. We encourage maximum harmonization with GTR-20 requirements to the extent possible. We have proposed some changes to NHTSA's proposals as well as some additional proposals based on our members' concerns. MEMA welcomes the opportunity to work with NHTSA to provide any technical assistance or information and will follow up with the agency after submission.

We encourage NHTSA to finalize this requirement as soon as is feasible because the vehicles in scope of this FMVSS are already in use in the United States and harmonized and clear safety requirements will make an important contribution to maintaining and improving the safety of our roads.

Please feel free to contact me with any questions at aboesenberg@mema.org

Sincerely,

Alex Boesenberg

vice president of regulatory affairs, MEMA