HONDA
American Honda Motor Co., Inc.
1919 Torrance Boulevard
Torrance, CA 90501-2746
Phone (310) 783-2000

June 14, 2024

Sophie Shulman
Deputy Administrator
National Highway Traffic Safety Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE
West Bldg., Ground Floor, Docket Room W12-140
Washington, DC 20590

Re: Docket No. NHTSA-2024-0012
Federal Register: 89 FR 26704 (April 15, 2024)
Request for Comments
FMVSS No. 305a EV Safety NPRM

Dear Ms. Shulman:

Enclosed are the comments of American Honda Motor Co., Inc. regarding the above-referenced docket and Federal Register notice

We thank you for this opportunity to provide our comments. If you have any questions, require additional data or further clarification, please contact David Liu, Manager of Regulatory Safety Affairs at david_liu@na.honda.com at your earliest convenience.

Sincerely,

American Honda Motor Co., Inc.

James Kliesch
Director, Regulatory Affairs
Product Regulatory Office

JK:rq

Enclosure

American Honda Motor, Co., Inc.

Comments on FMVSS No. 305a EV Safety NPRM

[Docket No. NHTSA-2024-0012]

[Federal Register: 89 FR 26704 (April 15, 2024)]

[Submitted June 14, 2024]

Honda appreciates this opportunity to provide comments on NHTSA's Notice of Proposed Rulemaking (NPRM) on electric vehicle (EV) safety. We commend the Agency's continued efforts to harmonize and modernize EV safety requirements to keep pace with innovation. This initiative is crucially important for Honda's commitment to electrification, underscored by our significant investment of $64 billion by the end of the decade, and to ensure that our investments are not stranded, allowing for healthy competition on a global scale.[1]

As a leading voice in the development of Global Technical Regulation (GTR) No. 20, Honda strongly supports harmonization of EV safety standards. This approach not only facilitates global consistency but also ensures that the regulatory framework is aligned with the latest technological advancements.

While we support the overall direction of the NPRM, we believe there are key areas where improvements are necessary to enhance objectivity and test practicability. Specifically, we provide detailed feedback on the following aspects:

Thermal Event Warning Based on Thermal Runaway: We recommend that thermal event warnings be tied to the initiation of thermal runaway, ensuring timely and accurate alerts that correspond to safety risks.

REESS Level Testing as a Compliance Option: We advocate for allowing component-level testing of the REESS, which offers a practical and efficient compliance pathway without compromising safety standards.

Clarification of Post-Crash Voltage Measurements and Requirements: Clarity on the timing of post-crash voltage measurements is essential to eliminate ambiguities and align with established international procedures.

We urge the Agency to revisit these aspects of the proposal to ensure that the requirements are balanced and maintain consumer confidence in the transformation to our electrified future. Honda fully supports the comments submitted by Auto Innovators and is pleased to provide additional insights below to enhance this important proposal.

[1] "Honda doubles EV investment to $64B, fleshes out 7 new models in 0 Series." *Automotive News*, 16 May 2024, https://www.autonews.com/manufacturing/honda-doubles-ev-outlay-64b-eyes-5-margin-7-new-models.

Thermal event warning should be based on thermal runaway

S13.2 Warning in the case of thermal event in REESS

Initiation of Thermal Runaway for Warning Activation: The purpose of the heater in the test is to initiate and simulate a thermal event. The critical safety concern arises from the initiation of thermal runaway, not from the mere activation of the heater. The duration required to initiate thermal runaway varies significantly based on factors such as battery type and heater conditions. Even considering heater conditions alone, factors such as heater placement, assembly pressure, and type can greatly affect the time before the temperature within the REESS is significantly higher than the maximum operating temperature, defining a thermal event. Figure 1 below illustrates how these heating factors alone can result in markedly different times to reach a thermal event. Additionally, NHTSA's testing was predominantly based on laminated cell types, but different cell types and materials are also likely to contribute to varying times to achieve a thermal event. Generally, laminate cells reach thermal runaway more easily through heating compared to metal can cells for two reasons. First, sufficient back pressure on the heater is ensured. The heater can be inserted between cells or between a cell and a side plate, deforming the cell's outer shape. The deformation reaction force presses the heater forcefully against the cell surface. Second, the internal material of the cell is more directly heated. The cell casing (laminated film) melts or burns almost immediately after heater activation. This allows the heater to make direct contact with the cell's internal material, raising its temperature rapidly to the critical point for thermal runaway. In the case of metal can cells, our experience indicates that lithium-ion batteries may take well over 60 seconds to initiate thermal runaway. To ensure that the thermal event warning aligns with the safety need, the warning trigger should be more closely tied to the initiation of thermal runaway rather than the activation of the heater.

[redacted]

CONFIDENTIAL Figure 1: Variation in Time to Thermal Runaway Under Different Test Conditions. *This figure illustrates how the time to achieve a thermal event in cells changes based on various test parameters such as heater position, back pressure, heater power, and heater area. The extent of heat transfer to the cell's internal materials is a critical factor in this process.*

We propose to revise the underline text in S13.2:

"*The vehicle shall provide a warning to the driver of a thermal event in the REESS. The warning shall activate within three minutes of ~~activating a~~ the heater within the REESS achieving 600℃ when tested in accordance with S13.3. If thermal runaway is initiated before the heater achieves 600℃, the warning shall activate within three minutes of the initiation of thermal runaway.*"

S13.3 Test procedure for evaluating warning for thermal event in REESS

Achieving 600 °C within 30 seconds of heater activation – S13.3 (c): We believe the intent is that the heater itself should achieve this peak temperature. However, the current wording may also imply that the REESS itself must achieve 600 °C. We recommend clarifying this to ensure the heater itself is the temperature reference point and the test procedure is sufficiently objective. Additionally, as stated in the NPRM, disassembly and modification of the REESS is necessary to carry out this test. We also recommend that additional clarity be provided regarding the modifications needed to attach the required testing equipment. This would also allow for replacement of one or more cells with heater equipment pre-installed. The absence of this allowance could result in less precise placement of testing equipment which may lead to inaccurate test results or degrade the integrity of the REESS assembly.

We propose to revise the underlined text in S13.3 (c):

"A heater that achieves a peak temperature of 600℃ ~~within 30 seconds~~ is attached to one or more cells in the REESS in a manner to put at least one cell in the REESS into thermal runaway. The temperature shall be measured directly at the heater body surface, such as the backside of the heater, during testing. The REESS casing may be opened to facilitate placement of the heater and associated thermocouples and wiring."

Initiating thermal runaway – S13.3 (g): The purpose of heating is to initiate thermal runaway, not necessarily to achieve a specific temperature within a fixed short period. High-output heaters might not always be feasible due to space constraints and the risk of temperature overshoot. Our experience has shown that excessively high input heating can lead to unintended test complications such as cell wall ruptures and electrolyte leakage, which may result in failure or detachment of the heating equipment. Figure 2 below highlights an example where high-output heating consistent with achieving 600°C rapidly within 30 seconds led to melting of the aluminum cell casing and leakage of electrolyte, before the trigger cell temperature could be elevated to a critical level. This level of heating could not objectively assess the presence of a thermal event. Alternatively, additional flexibility for the heater activation time would allow the test to be conducted in a more stable manner. Figure 3 demonstrates an example where heating to achieve 600°C gradually within 180 seconds did not lead to structural degradation of the cell prior to the trigger cell temperature being elevated to a critical level. In this case, the presence of a thermal event was objectively assessed. We propose to allow 180 seconds to achieve 600℃, which is also consistent with GTR 20.

[redacted]

__CONFIDENTIAL Figure 2__: __High-output heating consistent with achieving 600°C rapidly within 30 seconds__ led to melting of the aluminum cell casing and leakage of electrolyte, before the trigger cell temperature could be elevated to a critical level. The presence of a thermal event was not objectively assessed.

[redacted]

__CONFIDENTIAL Figure 3: Heating to achieve 600℃ gradually within 180 seconds__ did not lead to structural degradation of the cell prior to the trigger cell temperature being elevated to a critical level. The presence of a thermal event was objectively assessed.

We propose to revise the underlined text in S13.3 (g):
"*The heater within the REESS is activated to achieve 600 °C within ~~30~~ 180 seconds. The heater shall remain operational until thermal runaway is initiated in at least one cell.*"

Test termination after four minutes of activating the heater – S13.3 (i): Given that 30 seconds may be insufficient for initiating thermal runaway, the test should prioritize the initiation of thermal runaway over the mere activation of the heater. The warning system should respond to the actual safety risk which occurs when cell internal temperatures become elevated.

We propose to revise the underlined text in S13.3 (i):
"The test is terminated after activation of the warning or after four minutes of ~~activating~~ the heater in the REESS achieving 600℃, whichever comes first. If the test is terminated without initiating thermal runaway, the test can be repeated provided that the requirements in S13.2 and S13.3 are still met."

REESS level testing should be allowed as a compliance option

S11.1 Vehicle controls managing REESS safe operations

We understand the Agency intends to assess compliance with vehicle testing. However, REESS or component level testing is a far more practical and efficient approach for automakers. Component level testing offers several advantages. It allows for streamlined and consolidated testing of charging/discharging, with significantly better control of temperature. For instance, in an overtemperature test, we can rapidly increase the temperature to the upper limit, minimizing the time required to reach the desired conditions and providing a more accurate assessment of the timely activation of protection mechanisms.

Conversely, vehicle level testing introduces several limitations. The testing duration is substantially increased, and there is significantly less control over critical test conditions such as temperature and system cooling. Achieving overtemperature requires indirectly heating the REESS by driving the traction motor, relying on energy conversion losses to increase component temperatures, further limited by the ambient temperature of the large environment needed to accommodate a full vehicle. Additionally, these tests require human operators to work in high-temperature environments, posing safety risks. Vehicle testing also involves masking certain vehicle systems to avoid warnings and protections, such as disabling the cooling system, which necessitates the use of specialized parts like ECUs. These factors may not fully align with NHTSA's intended outcomes.

We request the Agency to allow automakers the option to demonstrate compliance by testing at the vehicle level or component level (REESS). This would not reduce the stringency of the proposed safety performance and would align with the GTR No. 20 requirements. We propose to add the underlined text in S11.1(a):
"*During the test, there shall be no evidence of electrolyte leakage, rupture, venting, fire, or explosion of the REESS as verified by visual inspection without disassembly of the vehicle or REESS."*

S12 Test methods and documentation for evaluating vehicle controls managing REESS safe operations

Breakout harness language is unnecessary – S12.1, 12.2, 12.3: The term "traction side" is overly prescriptive and inconsistent with S12.5 which specifies the same connection instructions but does not include this text. The subsequent regulatory text which states that the manufacturer may specify an appropriate connection method is sufficient.

We propose to remove the underlined text in S12.1, 12.2, 12.3:
"*(a) A breakout harness is connected to ~~the traction side of~~ the REESS. Manufacturer may specify an appropriate location(s) and attachment point(s) to connect the breakout harness."*

Overcharge Test – S12.1: The intention of this test is to ensure overcharge protection for the REESS. However, with the proposed SOC between 90 to 95, overcharge protection will likely have already been activated and this test will not adequately assess the transition from a non-protected to a protected state (which occurs when the SOC approaches 100 percent). We recommend that the prescribed SOC be lowered to allow adequate assessment of when overcharge protection is initiated.

We propose to revise the underlined text in S12.1:
"*The overcharge test is conducted at ambient temperatures between 10 °C and 30 °C, with the vehicle REESS initially set ~~between 90 to 95~~ to over 50 percent SOC."*

Over-discharge Test – S12.2: Similar to the concerns above for overcharge, the proposed SOC between 10 to 15 is excessively low. Over-discharge protection will likely have already been activated at such a low SOC and this test will not adequately assess the transition from a non-protected to a protected state (which occurs when the SOC approaches 0 percent). We recommend that the prescribed SOC be increased to allow adequate assessment of when over-discharge protection is initiated. Additionally, we believe the stringency of the requirements for REESS safe operations can be maintained when tested at the component level.

We propose to revise the underlined text in S12.2:

"*The over-discharge test is conducted at ambient temperatures between 10 °C and 30 °C, with the vehicle REESS initially set ~~between 10 and 15~~ below 50 percent SOC. For a vehicle with on-board energy conversion systems such as an internal combustion engine or a fuel cell, the fuel supply is set to the minimum level where active driving possible mode is permitted. The following steps are conducted to evaluate the vehicle's over-discharge protection controls:"*

"(d) The vehicle switch or device that provides power from the REESS to the electric power train is set to the activated position ~~or the active driving possible mode~~."

Over-temperature Test – S12.4: Similar again to the comments above, the proposed SOC between 90 to 95 is excessively high. Overcharge protection may already be active at an elevated SOC and this test may not adequately assess over-temperature protection performance alone. We recommend that the prescribed SOC be decreased to facilitate the assessment of over-temperature protection and the text prescribing the use of a chassis dynamometer be removed to allow testing at the REESS level. Additionally, prescribing an upper bound of 30 °C for the ambient temperature and one hour for the temperature rise duration is unnecessary as the purpose of the test is to raise the REESS temperature to its upper boundary safety temperature. We have experienced situations where the battery temperature will not rise unless the ambient temperature rises.

We propose to revise the underlined text in S12.4:

"*The overtemperature test is conducted at ambient temperatures ~~between~~ of 10 °C ~~and 30 °C~~ or more ~~on a chassis-dynamometer~~ with the vehicle REESS initially set ~~between 90 to 95~~ above 50 percent SOC. For a vehicle with on-board energy conversion systems such as an internal combustion engine or a fuel cell, the fuel supply is set to allow operation for about one hour of driving. The following steps are conducted to evaluate the vehicle's high temperature protection controls:*"

"(c) ~~The vehicle is installed on a chassis dynamometer and~~ the vehicle switch or device that provides power from the REESS to the electric power train is set to the activated position ~~or the active driving possible mode~~."

"(d) ~~The vehicle is driven on the dynamometer~~ using an appropriate vehicle manufacturer supplied drive profile and charging information for discharge and charge of the REESS, ~~to~~ raise the REESS temperature to its upper boundary safe operating temperature ~~within one hour~~."

"(e) The discharge/charge procedure ~~on the chassis-dynamometer~~ is continued until the following occurs:"

Post-crash voltage measurements and requirements should be clarified

S7. Electrical safety test procedures for normal vehicle operation safety

We acknowledge the Agency's intention to address the ambiguity regarding the timing of post-crash voltage measurements. We agree that basing voltage measurements on the impact time is more objective than using the time when the vehicle comes to rest. We also support consistency with the GTR No. 20 test procedure, which specifies that requirements be satisfied within a certain time from impact. However, the current proposal that measurements be made "between 10 to 60 seconds after impact" also introduces potential ambiguity. The intent appears to be ensuring safe voltage levels within 60 seconds after a crash. However, as worded, it could be misinterpreted to mean that the requirements must be met both at 10 seconds and 60 seconds after the impact.

Regarding high voltage discharging, the REESS is automatically disconnected after an impact, and a forced discharge begins. This discharge process is not instantaneous, and the voltage continues to drop exponentially approximately 10 seconds after impact. Consistent with GTR 20, 60 seconds is deemed sufficient to reach safe voltage levels and mitigate risks to bystanders or first responders from accessing high voltage components during rescue operations post-crash.

However, for electrical isolation, this is not a dynamic state and can be stably measured at any practical time after impact. Isolation resistance measurement requires manual measurement at multiple locations (V1, V2, V1', V2') making it impractical to complete within 60 seconds. Consistent with GTR 20, we propose removing the upper limit of 60 seconds and allowing measurements for electrical isolation after 10 seconds after the collision. This would align with GTR No. 20, which specifies "at least 10 seconds after the collision".

To address the above, we propose to add the underlined text in S7.1:
"*All post-crash voltage measurements for determining electrical isolation of high voltage sources specified in S8.2(a), the voltage levels specified in S8.2(b), and the energy in capacitors specified in S8.2(d) are made ~~between 10 to 60 seconds~~ after impact. The electrical isolation specified in S8.2(a)*

must be satisfied after 10 seconds after impact. The voltage levels specified in S8.2(b) and the energy in capacitors specified in S8.2(d) must be satisfied within 60 seconds after impact."

Clarification on electrical safety requirements

S8.2 Electrical safety

We believe that there is an error that should be corrected in S8.2(a)(2) as follows:
"(2) 100 ohms/volt for an AC high voltage source if it is conductively connected to a DC high voltage source, but only if the AC high voltage source meets the physical barrier protection requirements specified in S8.~~3~~2(c)(1) and S8.~~3~~2(c)(2); or"