DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2011–0107]

RIN 2127–AK80

Federal Motor Vehicle Safety Standards; Electric-Powered Vehicles; Electrolyte Spillage and Electrical Shock Protection

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This document responds to petitions for reconsideration of a final rule issued by this agency on June 14, 2010. This final rule amended the electrical shock protection requirements to facilitate the development and introduction of fuel cell vehicles (a type of electric-powered vehicle) and the next generation of hybrid and battery electric powered vehicles. This document addresses issues raised in the petitions for reconsideration relating to the scope and applicability of the standard, the definitions in the standard, the retention requirements for electric energy storage/conversion systems, the electrical isolation requirements, the test specifications and requirements for electrical isolation monitoring, the state-of-charge of electric energy storage devices prior to the crash tests, a proposed protective barrier compliance option for electrical safety, the use of alternative gas to crash test hydrogen fuel cell vehicles, and a proposed low-energy compliance option for electrical safety.

DATES: The effective date of this final rule is September 1, 2011 with optional early compliance.

Petitions for reconsideration: Petitions for reconsideration of this final rule must be received not later than September 12, 2011.

ADDRESSES: Petitions for reconsideration of this final rule must refer to the docket and notice number set forth above and be submitted to the Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: For technical issues: Ms. Shashi Kuppa, Office of Crashworthiness Standards (telephone: 202–366–3827) (fax: 202–493–2990), NVS–113.

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I. Background—June 14, 2010 Final Rule

On June 14, 2010, NHTSA issued a final rule which amended the electrical shock protection requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 305, ''Electric-powered vehicles; electrolyte spillage and electrical shock protection,'' to facilitate the development and introduction of fuel cell vehicles, a type of electric-powered vehicle, and the next generation of hybrid and battery electric powered vehicles (75 FR 33515, NHTSA Docket No. 2010–0021). The final rule revised the agency's standard regulating electrolyte spillage and electrical shock protection for electric-powered vehicles to align it more closely with the April 2005 version of the Society of Automotive Engineers (SAE) J1766—''Recommended Practice for Electric and Hybrid Electric Vehicle Battery Systems Crash Integrity Testing.''

This rule also provided greater flexibility by allowing manufacturers to meet the requirements of FMVSS No. 305 by designing their electrically powered vehicles so that, in the event of a crash, the electric energy storage, conversion, and propulsion systems are either electrically isolated from the vehicle's chassis or their voltage is below specified levels considered safe from electric shock hazards. Since the physiological impacts of direct current (DC) are less than those of alternating current (AC), the final rule specified lower electrical isolation requirements for certain DC components (100 ohms/volt) than for AC components (500 ohms/volt).

In addition, the final rule included new definitions, made changes to existing definitions of terms used in the standard, changed the energy storage/conversion device retention requirements, specified a low voltage option for achieving electrical safety, and required monitoring of the isolation resistance of DC high voltage sources that comply with the 100 ohms/volt electrical isolation requirement. The agency also established an effective date on September 1 in the year after the final rule was published (or September 1, 2011) with optional early compliance.

II. Petitions for Reconsideration

Subsequently, NHTSA received petitions for reconsideration of the June 14, 2010 final rule from the Alliance of Automobile Manufacturers (Alliance),[1] Technical Affairs Committee of the Association of International Automobile Manufacturers, Inc. (AIAM)[2] and Honda Motor Co., Ltd. (Honda). Ford Motor Company (Ford) also presented an analysis to the agency in support of the Alliance's petition for reconsideration regarding the issue of electric energy storage system state-of-charge prior to the crash tests specified in the standard.[3] In addition, on December 21, 2010, the Alliance, AIAM, and Honda submitted a joint letter as supplementary information to their petitions for reconsideration stating their support for the definitions used in the draft documents on electrical safety for a forthcoming global technical regulation (GTR) on hydrogen fuel cell vehicle safety.

The petitioners generally sought increased clarity by raising issues

[1] The Alliance is a trade association whose members are: BMW Group, Chrysler Group LLC, Ford Motor Company, General Motors LLC, Jaguar Land Rover, Mazda, Mercedes-Benz USA, Mitsubishi Motors, Porsche, Toyota, and Volkswagen.

[2] The AIAM petition stated it is a trade association whose Technical Affairs Committee members include: American Honda Motor Co., American Suzuki Motor Corp., Aston Martin Lagonda of North America, Inc., Ferrari North America, Inc., Hyundai Motor America, Isuzu Motors America LLC, Kia Motors America, Inc., Mahindra & Mahindra Ltd., Maserati North America, Inc., McLaren Automotive Ltd., Nissan North America, Inc., Peugeot Motors of America, Subaru of America, ADVICS North America, Inc., Delphi Corporation, Denso International America, Inc., and Robert Bosch Corporation. In January 2011, AIAM was renamed as the Association of Global Automakers (Global Automakers). Nonetheless, our response to petitions of the final rule will still refer to AIAM.

[3] Ford presented an analysis of the state-of-charge of the energy storage system prior to the crash tests in a meeting with NHTSA personnel on May 26, 2010. This presentation was posted to the Docket No. NHTSA–2010–0021 on September 1, 2010.

regarding the definitions, test specifications, and performance requirements in this rule. Specifically, the petitioners raised questions regarding the applicability and scope of the standard, the definitions of terms used, the electric energy storage/conversion system retention requirements, the electrical isolation requirements, the requirements and test specifications for electrical isolation monitoring systems, the electric energy storage device state-of-charge, the protective barrier as a compliance option for electrical safety, and the use of alternative gas for testing hydrogen fuel cell vehicles.

III. Summary of Revisions to the June 14, 2010 Final Rule

This document responds to all the petitions for reconsideration of the June 14, 2010 final rule. Specifically, this final rule makes the following changes to the June 14, 2010 final rule:

- Revises the ''Application'' section to indicate that the standard applies only to vehicles that use high voltage electrical components for propulsion power rather than to any vehicle that has high voltage electrical components.
- Clarifies the definitions used in the June 14, 2010 final rule for electrical isolation, electric energy storage/conversion system, electric energy storage device, propulsion system, and high voltage source.
- Adds further clarity by including new definitions for automatic disconnect, electric energy storage/conversion device, electrical chassis, and electric power train.
- Revises the application of retention requirements from energy storage/conversion ''systems'' to energy storage/conversion ''devices.''
- Clarifies the electric energy storage/conversion device retention requirements to indicate that during and after the test, the device(s) shall remain attached to the vehicle by at least one component anchorage, bracket, or any structure that transfers loads from the device to the vehicle structure and those located outside the occupant compartment shall not enter the occupant compartment.
- Clarifies the electrical safety requirements to specify that AC high voltage sources with electrical isolation monitoring require 500 ohms/volt electrical isolation.
- Specifies the voltage measurement locations for high voltage sources with and without automatic disconnects in the test procedures for determining electrical safety.
- Revises the electrical isolation monitoring requirement by deleting the term ''continuous'' in ''continuous monitoring'' and including a range in resistance of the external resistor selected in the test procedure to evaluate the performance of the monitoring system.
- Clarifies the specification for the state-of-charge of electric energy storage devices before the crash tests to be at the maximum state-of-charge in accordance with the vehicle manufacturer's recommended charging procedures, as stated in the vehicle owner's manual or on a label permanently affixed to the vehicle, or at 95 percent of the maximum capacity of the electric energy storage device if no such recommendation is made.
- Revises the regulatory text and Figures 1–5 to utilize the new terms added to the definitions section.

IV. Agency Response and Rationale

After reviewing the petitions for reconsideration, NHTSA is responding to each issue raised by the petitioners as follows.

a. Application

The June 14, 2010 final rule defined the scope of FMVSS No. 305 by stating the following in paragraph S3 Application:

> S3. Application. This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks, and buses that have a GVWR of 4,536 kg or less, that use electrical components with working voltages more 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.

Both the Alliance and the AIAM noted that in section ''S3 Application'' of the final rule, the agency omitted the word ''propulsion'' and that this was not consistent with the language in the NPRM.[4] Both organizations argued that the omission of the word ''propulsion'' could be interpreted to encompass all electrical systems that are not within the scope of FMVSS No. 305 (*e.g.* high intensity discharge (HID) headlamps, engine ignition systems, fuel injectors, *etc*).

The Alliance proposed that the scope be remedied by adding the word ''propulsion'' in the application section, S3. The AIAM indicated in its petition that it supported the language proposed by the Alliance. The language proposed by the Alliance is as follows:

> S3 Application. This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks and buses with a GVWR of 4536 kg or less, that use electrical *propulsion* components with working voltages more 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. (emphasis in the original)

NHTSA's Response: We agree with the Alliance that by omitting the word ''propulsion'' in S3 of the final rule, the standard encompasses vehicles and electrical systems that were not intended for application of FMVSS No. 305. Since the agency is not aware of any cases of injuries/fatalities from shock in non-electrically powered vehicles with other high voltage components such as HID headlamps, ignition systems, or fuel injectors, this final rule adopts the language for S3 Application as proposed by the Alliance. This new version of the regulatory text ensures that FMVSS No. 305 will not extend to the aforementioned vehicles and vehicle components for which the standard was not intended to apply.

b. Definitions

The June 14, 2010 final rule adopted new definitions into FMVSS No. 305. In a joint letter submitted by the Alliance, AIAM, and Honda, the organizations acknowledged that while the current FMVSS No. 305 definitions were based on SAE J1766, the subsequent promulgation of FMVSS No. 305 and the development of an international GTR on hydrogen fuel cell vehicle safety have largely rendered aspects of the SAE standard obsolete. The organizations requested that the agency incorporate, into FMVSS No. 305, the definitions contained in the draft electrical safety requirements developed by the Electric Safety (ELSA) working group in September 2010 as part of the draft GTR. Given this request from the aforementioned organizations, the rapid development of technology in electrical and fuel cell vehicles resulting in numerous changes in terminology and their associated definitions, and significant uncertainty among the relevant stakeholders as to the proper interpretation of many of the definitions adopted by the June 14, 2010 final rule, today's final rule seeks to clarify and update many of the definitions through additional language and/or adopting similar language from the draft ELSA electrical safety document (henceforth referred to as the ELSA document) where appropriate.[5] In the following

[4] 72 FR 57266; Notice of Proposed Rulemaking; October 9, 2007.

[5] Electrical Safety Provisions for Vehicles Post Crash ELSA–8–05 Rev. 01 (Draft agreed during 8th ELSA Meeting, Aug 31–Sept 2, 2010) *http://www.unece.org/trans/doc/2010/wp29grsp/ELSA-8-05r1e.pdf.*

sections, we will address each of the definitions added or amended by today's final rule in turn.

1. Automatic Disconnect

One appropriate area for adopting similar language from the ELSA document is the definition for ''automatic disconnect.'' Since the June 14, 2010 final rule did not define ''automatic disconnect,'' the agency is concerned that it may result in ambiguity regarding the location of voltage measurements taken pursuant to paragraph S7.6.1 (as further discussed later in this document). Therefore, today's final rule includes a definition for automatic disconnect, derived from the ELSA document, which states that ''automatic disconnect'' means a device that when triggered, conductively separates a high voltage source from the electric power train or the rest of the electric power train.

2. Electrical Isolation

In the final rule, we defined ''Electrical isolation'' as ''the electrical resistance between the vehicle high voltage source and any vehicle conductive structure.'' The Alliance stated that the definition for ''electrical isolation'' as defined in the final rule could present difficulties because ''any vehicle conductive structure'' could be interpreted to include the high voltage source itself, and a high voltage source cannot be isolated from itself. The Alliance, therefore, petitioned to revise the definition so that the electrical isolation is between the vehicle high voltage source and the ''vehicle chassis electricity-conducting structure.''

NHTSA's Response: The agency agrees that that the language ''any conductive structure'' should be clarified to indicate which vehicle components are required to be isolated from the high voltage source. However, we decline to adopt the Alliance's proposed term, ''vehicle chassis electricity-conducting structure,'' since it also lacks sufficient clarification on which vehicle components will be included by this term. For example, it is unclear whether the term includes other conducting structures in the vehicle such as the enclosures of high voltage sources. To address this issue, this final rule clarifies what the high voltage source is electrically isolated from by including a definition for a new term that has been proposed in the draft ELSA document. Based on the language of the ELSA document, a definition for ''electrical chassis'' is included in today's final rule as follows:

Electrical chassis means conductive parts of the vehicle whose electrical potential is taken as reference and which are: (1) conductively linked together, and (2) not high voltage sources during normal vehicle operation.

Since this definition of electrical chassis includes vehicle designs with multiple electrical chassis, this final rule clarifies the definition of electrical isolation to mean the electrical resistance between a given high voltage source and any electrical chassis of the vehicle. Further, in order to be consistent with the manner in which electrical isolation is determined in S7.6.6 and S7.6.7 of the electrical isolation test procedure and with the units of electrical isolation specified in S5.3(a), today's final rule also clarifies the definition of electrical isolation of a high voltage source to mean the electrical isolation resistance of the high voltage source divided by the working voltage of the high voltage source. Applying these corrections, along with the new definition of electrical chassis, today's final rule amends the definition for electrical isolation to read as follows:

Electrical isolation of a high voltage source in the vehicle means the electrical resistance between the high voltage source and any of the vehicle's electrical chassis divided by the working voltage of the high voltage source.

The agency believes the changes made in today's final rule address the Alliance's concern about the broad term ''any vehicle conductive structure.'' Specifically, this definition ensures that the term ''vehicle conductive structure'' is not construed to include the high voltage source itself as the new definition for ''electrical chassis'' explicitly excludes high voltage sources. In addition, the use of these definitions more closely aligns FMVSS No. 305 with the definitions proposed by the ELSA working group and clarifies what types of components would be considered part of the chassis. For example, under these definitions, the electrical chassis includes the enclosures of the high voltage sources which are conductively linked to other conductive parts of the vehicle whose electrical potential is taken as a reference.

3. Electric Energy Storage/Conversion/Power Generating System & Electric Energy Storage Device

Before the NPRM in this current rulemaking, FMVSS No. 305 contained a definition for the term ''Battery system component.'' In the NPRM, the agency proposed replacing the definition of ''Battery system component'' with ''Energy storage system.'' The agency changed the definition in the final rule after considering the joint Alliance/AIAM comment to the NPRM to include ''energy conversion system'' as part of the definition for ''Energy storage system.'' In their comment, the Alliance/AIAM stated that fuel cell systems were conversion systems and should also comply with the retention requirements. NHTSA agreed and redefined ''Energy storage system'' as ''Electric energy storage/conversion/power generating system.'' The term ''power generating system'' was also included to align FMVSS No. 305 more closely with the terminology used in SAE J1766. Thus, the June 14, 2010 final rule defined ''Electric Energy Storage/Conversion/Power Generating System'' as follows:

Electric energy storage/conversion/power generating system means the components comprising, but not limited to, the vehicle's high voltage battery system, capacitor system, or fuel cell system, and rechargeable energy storage systems. These include, but are not limited to, the battery or capacitor modules, interconnects, venting systems, battery or capacitor restraint devices, and electric energy storage boxes or containers that hold the individual battery or capacitor modules. Hydrogen system components of fuel cell vehicles, such as the hydrogen tanks and hydrogen tubes, are not included in the electric energy storage/conversion system.

We received multiple petitions requesting that the agency reconsider the ''Electric energy storage/conversion/power generating system'' definition. The Alliance stated that this definition is overly broad and includes energy storage systems beyond those used for propulsion power. The Alliance recommended that the definition be modified to utilize the following text: Electric energy storage/conversion/power generating system ''*means the electric energy sources for the propulsion* system comprising, but not limited to, the vehicle's high voltage battery system * * *'' (emphasis in original).

The AIAM and Honda had further concerns about the definition. The AIAM stated that the definition is not used consistently throughout the standard or even within the definition itself. For example, the AIAM noted that the last sentence of the definition for electrical energy storage/conversion/power generating system (which refers to hydrogen system components of fuel cell vehicles) is only applicable to the electric energy storage or conversion system parts of the definition and not to the power generating system portion. Honda stated that the combined definition may cause confusion to the reader.

Further, both the AIAM and Honda stated that various requirements in

FMVSS No. 305 apply only to portions of the electric energy storage/conversion/power generating system definition, creating confusion regarding the applicability of various requirements in the standard. The AIAM and Honda refer to fuel cell modules as an example of this potential confusion. They noted that the retention requirements in S5.2, as written, are applicable only to the electric energy storage system and electric energy conversion system but are not applicable to the electric power generating system. According to SAE J1766 (April, 2005), the term ''power generating system components'' is defined as ''the components comprising the high voltage power generating system in an Electric, Fuel Cell or Hybrid vehicle. These include, but are not limited to, generators, fuel cell modules, DC/DC converters and interconnects.'' The AIAM and Honda stated that if the SAE definition is used to determine the meaning of ''power generating system'' for purposes of S5.2 retention requirements, it could be concluded that fuel cell modules are exempt because S5.2 does not list ''power generating system'' as requiring compliance with the retention requirements. The AIAM and Honda do not believe that the agency intended to exclude fuel cell modules from the retention requirements, considering the potential occupant injury risk in a crash if fuel cell modules became unattached. For clarity, both the AIAM and Honda petitioned that the terms ''Electric energy storage system,'' ''Electric energy conversion system'' and ''Electric power generating system'' be defined separately.

NHTSA's Response: We agree with petitioners that the ''Electric energy storage/conversion/power generating system'' definition should be clarified in order to avoid confusion as to the applicability of various requirements in FMVSS No. 305. In order to accomplish this task, today's final rule utilizes three separate definitions. First, it renames and makes adjustments to the language in the ''Electric energy storage/conversion/power generating system'' definition in order to reference the components that comprise the entire ''Electric energy storage/conversion system.'' Second, today's final rule also adds a new definition for ''Electric energy storage/conversion device'' in order to help distinguish the instances in which the various requirements of FMVSS No. 305 are to apply to an entire system as opposed to only component devices. Finally, this rule also retains the ''Electric energy storage device'' definition with minor revisions in order to clarify the instances in which the test specifications of this rule apply to the electric energy storage devices alone.

The agency also agrees with the Alliance petition that the definition for ''electric energy storage/conversion/power generating system'' should be specific to systems used for vehicle propulsion in order to distinguish them from other electric energy storage systems such as the auxiliary battery that is present on many hybrid/electric vehicles and is currently not subject to the retention requirements since it is typically of low mass and does not pose a safety hazard in the existing fleet. Thus, we have made the appropriate modifications to the three aforementioned definitions to indicate that the devices or components covered by each definition are used for vehicle propulsion.

In order to further add clarity to this definition, this final rule removes the reference to the term, ''power generating systems,'' from the June 14, 2010 final rule definition of ''Electric energy storage/conversion/power generating system.'' As ''power generating systems'' was included in the June 14, 2010 final rule definition in order to more closely align FMVSS No. 305 with the (now obsolete) SAE Standard J1766, the agency believes that there is no longer a purpose for including ''power generating systems'' in the ''Electric energy storage/conversion/power generating system'' definition. Thus, today's final rule simply defines ''Electric energy storage/conversion system.''

In addition, we agree with the AIAM that the last sentence of the ''Electric energy storage/conversion/power generating system'' definition in the June 14, 2010 final rule can cause confusion. We believe that the last sentence of that definition, which states that ''[h]ydrogen system components of fuel cell vehicles, such as the hydrogen tanks and hydrogen tubes, are not included in the electric energy storage/conversion system,'' is superfluous. Thus, in further advancing the goal of clarity in the ''Electric energy storage/conversion system'' definition, we have deleted the aforementioned sentence. Under the definition in today's final rule, fuel cells are a type of energy conversion system and the agency will continue to refer to high voltage batteries, capacitors, and fuel cell systems as ''energy storage/conversion systems.''

Thus, the final rule defines ''Electric energy storage/conversion system'' as follows:

> *Electric energy storage/conversion system* means an assembly of electrical components that stores or converts electrical energy for vehicle propulsion. This includes, but is not limited to, high voltage batteries or battery packs, fuel cell stacks, rechargeable energy storage systems, capacitor modules, inverters, interconnects, and venting systems.

Additionally, today's final rule adds a new definition for ''Electric energy storage/conversion device.'' We take note that the retention requirements of S5.2 of the June 14, 2010 final rule apply to all components that fall under the broader ''Electric energy storage/conversion system'' definition and that petitioners asked for clarification to the ''Electric energy storage/conversion system'' definition, in part, to clarify the specific components that will be subject to the retention requirements of paragraph S5.2. As further discussed later in this document, petitioners are concerned that ''energy storage/conversion systems'' can include interconnects and venting systems that are typically of low mass and need not be included in the retention requirements because they are not a safety risk. Thus, to make this distinction, today's final rule modifies paragraph S5.2 to utilize the definition for ''electric energy storage/conversion device'' and defines this term as follows:

> *Electric energy storage/conversion device* means a high voltage source that stores or converts energy for vehicle propulsion. This includes, but is not limited to, a high voltage battery or battery pack, fuel cell stack, rechargeable energy storage device, and capacitor module.

Today's final rule also retains and amends the definition of ''Electric energy storage device'' from the June 14, 2010 final rule. The June 14, 2010 final rule defined ''Electric energy storage device'' as follows:

> *Electric energy storage device* means a high voltage source that can store energy, such as a battery or capacitor modules.

The term, ''Electric energy storage device,'' is used in the regulatory text to specify the state of charge of electric energy storage devices before the vehicle crash test. While closely related to the term ''Electric energy storage/conversion device,'' it does not encompass conversion devices such as fuel cell stacks. Today's final rule makes minor revisions to this definition in order to add clarity and consistency with the two other definitions discussed in this section by specifying that the electric energy storage devices under consideration are used for vehicle propulsion. Thus, the definition of electric energy storage device in today's final rule is amended as follows:

Electric energy storage device means a high voltage source that stores energy for vehicle propulsion. This includes, but is not limited to, a high voltage battery or battery pack, rechargeable energy storage device, and capacitor module.

Paragraphs S1 and S2 of today's final rule have also been amended to reflect these new definitions.

4. High Voltage Source

The June 14, 2010 final rule included a definition of ''high voltage source'' which is reproduced below:

High voltage source means any electric component that has a working voltage greater than 30 VAC or 60 VDC.

The Alliance stated that in common usage, a ''voltage source'' is a component capable of generating or storing electrical potential energy. It argued that under the current definition, connectors and wiring could be construed as voltage sources even though they are not capable of generating or storing electrical energy. The Alliance petitioned that the definition of ''high voltage source'' be revised to include ''any electric component that is capable of generating or storing a voltage greater than 30 VAC or 60 VDC.''

NHTSA's Response: We agree with the Alliance that the current definition of ''high voltage source'' should be clarified. However, we cannot agree with the petitioner's proposal to limit the definition of high voltage sources to only those components that are capable of generating or storing electrical energy. Through the definition included in the June 14, 2010 final rule, the agency did intend to apply the electrical safety requirements to high voltage components, including wiring and connectors that are part of the vehicle's electric power train to ensure comprehensive electric shock protection.

However, we acknowledge that the definition in the June 14, 2010 final rule may not sufficiently distinguish the components included by the ''high voltage source'' definition from those that are not included. To clarify our intent today's final rule defines a high voltage source as ''any electric component *contained in the electric power train or conductively connected to the electric power train* that has a working voltage greater than 30 VAC or 60 VDC (emphasis added).''

To further clarify this new definition, today's final rule adds a definition for ''electric power train'' stating that it refers to ''an assembly of electrically connected components which includes, but is not limited to, electric energy storage/conversion systems and propulsion systems.'' The definition of ''electrical energy storage/conversion system'' is updated as described above. Further, today's final rule makes minor revisions to the definition of ''propulsion system'' to mean ''an assembly of electric or electro-mechanical components or circuits that propel the vehicle using the energy that is supplied by a high voltage source. This includes, but is not limited to, electric motors, inverters/converters, electronic controllers, and associated wire harnesses and connectors, and coupling systems for charging rechargeable energy storage systems.''

These definitions adopt similar language from the Definitions and the General sections of the ELSA document in order to both address the Alliance, AIAM and Honda's suggestion that the agency adopt the ELSA definitions where appropriate and to more clearly define the components that are included under the definition of ''high voltage source.''

c. Electric Energy Storage/Conversion System Retention

In the NPRM, NHTSA proposed adjusting the ''Battery retention'' requirements of paragraph S5.2 to properly reflect the additional energy storage devices that the updated standard intended to cover. The adjustment to paragraph S5.2 accomplished this goal by proposing to replace the word ''battery'' with the words ''energy storage device'' in S5.2 and adjust other portions of the regulatory text accordingly.

In the final rule, we amended the regulatory text based on the considerations in the NPRM and in response to additional information from a March 9, 2009 interpretation request from Hyundai. Hyundai stated that the requirements of S5.2 allowed a battery module located outside the passenger compartment to become dislodged as long as it does not enter the occupant compartment, while a module that is located within the occupant compartment must simply remain in the location in which it is installed. Hyundai stated that this may not properly address the intent of the standard in some circumstances.[6] It argued that in vehicles such as sport utility vehicles (SUV) or station wagons, a battery module located inside the occupant compartment that moves during impact due to the deformation of the floor but remains firmly attached to its mounting, would technically fail the retention requirement even though it would not pose a projectile hazard.

The agency elected to respond to Hyundai's interpretation request in the June 14, 2010 final rule because the NPRM in this rulemaking had already proposed to amend the language of S5.2. Thus, in the final rule, the agency responded to that interpretation request stating

''The agency agrees that battery modules located inside the occupant compartment technically may move a small amount from the location from which they are installed during the impact tests. The agency also agrees that battery modules located outside the occupant compartment that partially move into the occupant compartment because of structural deformation of the vehicle structure do not impose a projectile hazard provided that they remain attached to the mounting structure.[7] Therefore, the agency concurs that battery modules located outside the occupant compartment should be treated in the same manner as those located inside the occupant compartment, provided that they remain attached to their anchorages.''

Accordingly, the June 14, 2010 final rule revised the regulatory text to read as follows:

S5.2 *Electric energy storage/conversion system retention.* All components of the electric energy storage/conversion system must be anchored to the vehicle. All component anchorages, including any brackets or structures that transfer loads from the component to the vehicle structure, shall remain attached to the vehicle structure at all attachment locations during and after testing performed pursuant to the procedures of S6 of this standard.

In its petition for reconsideration of the June 14, 2010 final rule, the Alliance stated that the final rule's specification that all component anchorages, shall remain attached to the vehicle structure at all attachment locations is an overly broad requirement that goes beyond the intent of assuring that battery system components do not become separated from the vehicle. The Alliance stated that this language could be interpreted as prohibiting a plastic tie-wrap used to position a wiring harness to the vehicle from severing in a crash, a requirement that is neither practicable nor necessary.

The Alliance and the AIAM further stated that some electric energy storage/conversion systems, especially those which are located in the engine compartment are protected from serious damage resulting from the collision by absorbing the energy into deforming or even breaking component mountings. The Alliance stated that this was analogous to other energy management strategies, such as allowing steering

[6] 65 FR 57985, FMVSS No. 305 Final Rule, September 27, 2000.

[7] 75 FR 33523.

columns mountings to deform and break to keep the steering column away from the driver of a vehicle during a severe crash. The Alliance stated that a battery pack could be mounted to the vehicle at a dozen attachment points, and the fact that one of these attachments severs during a crash test would be inconsequential to the secure attachment of the battery pack to the vehicle, yet violate the language of the final rule. The AIAM stated that these system retention provisions may, in some respects, be unnecessarily design restrictive and potentially contrary to the interests of safety because rather than broadly mandating that the battery remain attached to the vehicle, the regulatory text places undue emphasis on the condition of individual anchorages, brackets and structures.

Both the AIAM and Honda further argued that the intent of S5.2 was to ensure that the battery modules would not become unattached and become flying projectiles in a crash or subsequent rollover. Each referenced the September 27, 2000 final rule establishing FMVSS No. 305 [8] where the agency stated, ''We note that the intent of the proposed requirements in S5.2 was to ensure that the battery modules would not become unattached and become flying projectiles in a crash or subsequent rollover.'' The AIAM stated that this regulatory goal is best served by a requirement that broadly focuses on the overall condition of the battery module (whether it remains attached to the vehicle and has not intruded into the passenger compartment) rather than the condition of the individual anchorages.

Finally, the AIAM and Honda also stated that there are many smaller components that paragraph S5.2 in the June 14, 2010 final rule applies to, such as ducts or vents, which may become unattached. They argued that the occupant injury risk from such components of the energy storage/conversion system is very low, given their small mass and that there are no comparable requirements for internal combustion engine (ICE) vehicles. The AIAM and Honda stated that in order to exclude low mass components of the energy storage/conversion system, such as ducts and vents, the retention requirements should apply only to energy storage/conversion devices rather than to energy storage/conversion systems.

Each of the petitioners had different strategies for amending the requirements for electric energy storage/conversion system retention. The Alliance petitioned that in order to avoid unnecessary design limitations while achieving protection from both physical damage and electrical shock, the following language be adopted for S5.2 of FMVSS No. 305:

> ''The following requirements shall be met during and after testing performed pursuant to the procedures of S6 of this standard:
>
> 1. Energy storage/conversion system components shall remain secured to the vehicle, and
>
> 2. For energy storage/conversion system components located outside the passenger compartment, such components shall not enter the passenger compartment airspace.''

The Alliance also requested that if the agency does not agree with the proposed language, the agency revert to the previous language of S5.2.

The AIAM petitioned the agency to amend S5.2 to read as follows:

> ''S5.2 Electric energy storage/conversion device(s) retention. Electric energy storage/conversion devices must remain attached to the vehicle during and after testing performed pursuant to the procedures of S6 of this standard.''

Honda petitioned to amend S5.2 as follows:

> ''S5.2 Electric energy storage/conversion devices(s) retention. The electric energy storage/conversion device(s) must remain attached to the vehicle by anchorages, brackets, or structures that transfer loads from the device(s) to the vehicle structure during and after testing performed pursuant to the procedures of S6 of this standard.''

NHTSA's Response: We agree with the comments from the Alliance, AIAM, and Honda suggesting that the changes to the retention requirement in the June 14, 2010 final rule may be overly broad. We acknowledge that increased crash protection for energy storage/conversion systems can be achieved through the deformation or breaking of certain component mounting/anchorages to absorb the crash energy. We further acknowledge that the language in the June 14, 2010 final rule can be construed to include plastic tie-wraps used to position a wiring harness which are not consequential towards the overall condition of the energy storage/conversion systems.

However, we decline to adopt the regulatory text proposed by petitioners because we are concerned with ensuring that the final standard is clear and objective. Thus, the agency does not believe that the proposed language changes from the AIAM and the Alliance are appropriate as they require that the electric energy storage/conversion devices remain attached without offering any specifics on how the agency would distinguish between a device that has ''remained attached'' and one that has not. The regulatory text proposed by Honda offers more information on what constitutes ''remaining attached'' by indicating that the electric energy storage/conversion device must remain attached via ''anchorages, brackets, or structures that transfer loads from the device(s) to the vehicle.'' However, this approach remains unclear as it does not specify how many anchorages, brackets, or structures that transfer load must remain attached.

Thus, today's final rule addresses the considerations of ensuring adequate crash protection, creating an objective standard, and enabling industry designs that utilize anchorages to redirect crash forces by establishing regulatory text which requires that the electric energy storage/conversion devices remain attached to the vehicle by at least one component anchorage, bracket, or any structure that transfer loads from the component to the vehicle structure. Using this regulatory text, the agency can afford the manufacturers the maximum amount of flexibility to utilize the anchorages as a method for redirecting crash forces in their vehicle designs while still ensuring that electric energy storage/conversion devices do not become projectiles which can potentially injure vehicle occupants. Further, the additional regulatory text adds clarity and objectivity to the standard by specifying how the agency will distinguish between devices that have remained attached versus those that have not. Namely, the additional text clarifies that this standard only requires that the electric energy storage/conversion devices maintain a connection to the vehicle structure at one or more load transferring point after it is tested in accordance with the test procedures in S6.

However, since we are not requiring all component anchorages to remain attached to the vehicle at all attachment locations, we believe that the June 14, 2010 final rule's conclusion that there is no need to treat devices inside the occupant compartment differently from those outside the occupant compartment is no longer accurate. While we agree with petitioners that the intent of the retention requirement, as specified in the 2000 final rule, was to ensure that battery modules would not become unattached and become flying projectiles in a crash or subsequent rollover, this is not the only purpose of the retention requirement. One of the purposes of FMVSS No. 305 is to reduce deaths and injuries during and after a crash that occur from the intrusion of electric energy storage/conversion devices into the occupant compartment.

[8] 65 FR 57985.

In the June 14, 2010 final rule, the S5.2 requirement that all component anchorages remain attached to the vehicle structure at all attachment locations ensured that the energy storage/conversion system would not significantly intrude into the occupant compartment.

We recognize that, with the new regulatory text for S5.2 in today's final rule, there may be an increased potential for electric energy storage/conversion devices to partially detach from the vehicle structure and intrude into the occupant compartment. To address this, we are reintroducing the requirement that any electric energy storage/conversion device located outside the occupant compartment not intrude into the occupant compartment. However, we decline to use the term ''passenger compartment airspace'' as suggested by the Alliance. A similar term ''occupant compartment air space'' was defined by the agency in an interpretation letter [9] of FMVSS No. 302, ''Flammability of interior materials.'' Since FMVSS No. 305 addresses safety from electrolyte spillage, electric shock, and intrusion of the energy storage system, and does not address fire safety, the presence of airspace is not relevant and we believe that ''occupant compartment'' is the more appropriate term for paragraph S5.2.

We also agree with Honda and the AIAM that the language of the June 14, 2010 final rule could be interpreted as unintentionally requiring low mass components, such as ducts and vents, to remain attached to the electric energy storage/conversion systems. As previously discussed, today's final rule adds a new definition for ''electric energy storage/conversion device,'' which includes a high voltage battery or battery pack, capacitor modules, fuel cell stacks, and rechargeable energy storage devices used for vehicle propulsion, but does not include low mass components, such as ducts, vents, and wiring harnesses. As the retention requirements of the final rule are amended in today's final rule to apply to the electric energy storage/conversion device rather than to the system, these changes address the concerns raised by the AIAM and Honda by ensuring that the retention requirements do not apply to low mass components.

In conclusion, the regulatory text in paragraph S5.2 has been amended to read as follows:

S5.2 *Electric energy storage/conversion device retention.* During and after each test specified in S6 of this standard:

(a) electric energy storage/conversion devices shall remain attached to the vehicle by at least one component anchorage, bracket, or any structure that transfers loads from the device to the vehicle structure, and

(b) electric energy storage/conversion devices located outside the occupant compartment shall not enter the occupant compartment.

d. Electrical Safety

1. Clarifying the Requirements in Paragraph S5.3

Paragraph S5.3 of the June 14, 2010 final rule requires that each high voltage source in a vehicle must meet the electrical isolation requirements of subparagraph (a) or the voltage level requirements of subparagraph (b) after each test. The subsections state:

(a) The electric isolation between each high voltage source and the vehicle chassis electricity-conducting structure must meet one of the following:

(1) Electrical isolation must be greater than or equal to 500 ohms/volt for all DC high voltage sources without continuous monitoring of electrical isolation during vehicle operation and for all AC high voltage sources; or

(2) Electrical isolation must be greater than or equal to 100 ohms/volt for all DC high voltage sources with continuous monitoring of electrical isolation, in accordance with the requirements of S5.4, during vehicle operation.

(b) The voltage of the voltage source must be less than or equal to 30 VAC for AC components or 60 VDC for DC components.

The Alliance stated that it believes that the agency has inadvertently written the electrical safety requirements in the final rule in a way that would permit compliance with S5.3(a)(2) as the sole basis for complying with S5.3 in total. It noted that S5.3 states that the vehicle must meet the electrical isolation requirements of subparagraph (a) or the voltage requirements of subparagraph (b). It further noted that if subparagraph (a) is chosen, the language permits compliance to either subparagraph (1) or subparagraph (2), and if subparagraph (2) is chosen, there are no isolation requirements specified for AC high voltage sources. The Alliance requested clarification on whether the agency intended to require 500 ohms/volt isolation for AC sources in subparagraph (a) in both the subsidiary options of subparagraph (a).

NHTSA's Response: NHTSA agrees with the Alliance that the regulatory text in S5.3(a) could be interpreted to imply that for a vehicle with continuous monitoring of electrical isolation, only the DC high voltage components need to meet the 100 ohms/volt electrical isolation and that there are no requirements for AC high voltage components. This was clearly not the intent. We are amending the regulatory text of S5.3(a) to indicate that the electrical isolation between a given high voltage source and any electrical chassis of the vehicle must be greater or equal to one of the following: (1) 500 ohms/volt for an AC high voltage source, or (2) 500 ohms/volt for a DC high voltage source without electrical isolation monitoring, or (3) 100 ohms/volt for a DC high voltage source with electrical isolation monitoring during vehicle operation. In order to further clarify paragraph S5.3, we have included references to specific portions of the test procedures that apply to the electrical safety requirements. In addition, the term ''vehicle chassis electricity conducting structure'' in S5.3 has been replaced by the term ''electrical chassis'' to maintain consistency with the changes discussed earlier in this document. In conclusion, today's final rule amends paragraph S5.3 as follows:

S5.3 *Electrical safety.* After each test specified in S6 of this standard, each high voltage source in a vehicle must meet the electrical isolation requirements of subparagraph (a) or the voltage level requirements of subparagraph (b).

(a) The electrical isolation of the high voltage source, determined in accordance with the procedure specified in S7.6, must be greater or equal to one of the following:

(1) 500 ohms/volt for an AC high voltage source; or

(2) 500 ohms/volt for a DC high voltage source without electrical isolation monitoring during vehicle operation; or

(3) 100 ohms/volt for a DC high voltage source with electrical isolation monitoring, in accordance with the requirements of S5.4, during vehicle operation.

(b) The voltages V1, V2, and Vb of the high voltage source, measured according to the procedure specified in S7.7, must be less than or equal to 30 VAC for AC components or 60 VDC for DC components.

2. Testing Procedures for S5.3(b) Low Voltage Option

The Alliance also stated in its petition that S5.3(b) of the final rule adopted a low-voltage option for providing electrical isolation, while S7.7 specifies the procedure for measuring the voltage. The Alliance petitioned that, for purposes of clarity, the language currently specified in S7.6.1 regarding voltage measurement locations for the electrical isolation option be added to S7.7 for the low-voltage option.

NHTSA's Response: The agency agrees with the Alliance that the procedure to measure the voltage in S7.6.1 should be added to S7.7 for the

[9] Interpretation to Mazda (North America) Inc.—H. Nayaka: February 15, 1983. An ''occupant compartment air space'' is defined as ''the space within the occupant compartment that normally contains refreshable air.''

purposes of improving clarity. However, we believe S7.6.1 needs to be modified to utilize the new definitions adopted above and to clarify the measurement procedure before its contents are added to S7.7. The test procedures in paragraph S7.6.1 of the June 14, 2010 final rule states:

For a vehicle that utilizes an automatic disconnect between the high voltage source and the traction system that is physically contained within the high voltage electric energy storage/conversion/power generating system, the electrical isolation measurement after the test is made from the traction-system side of the automatic disconnect to the vehicle chassis electricity-conducting structure. For a vehicle that utilizes an automatic disconnect that is not physically contained within the high voltage electric energy storage/conversion/power generating system, the electrical isolation measurement after the test is made from both the high voltage source side and from the traction-system side of the automatic disconnect to the vehicle chassis electricity-conducting structure.

As previously discussed, today's final rule has adopted new definitions for ''electric power train'' and ''electrical chassis.'' Therefore, all instances of the term ''traction-system'' in S7.6.1 are replaced by the term ''electric power train'' and all instances of the term ''vehicle chassis electricity-conducting structure,'' are replaced by the term ''electrical chassis.'' This final rule also amends the definition for ''high voltage source'' to include electric components contained in the electric power train and those connected to it. For high voltage sources contained within the electric power train, the regulatory text of S7.6.1 and S7.7 have been amended to indicate that the electrical isolation measurement is made from the side of the automatic disconnect that is connected to ''the rest of the electric powertrain.'' In addition, the regulatory text of the June 14, 2010 final rule S7.6.1 indicates that the ''automatic disconnect'' only applies to high voltage sources within the vehicle's energy storage/conversion/power generating system. We believe that this regulatory text may be misconstrued, since the intent of the agency was that the specifications for the electrical isolation measurement locations with respect to the automatic disconnects in S7.6.1 apply to each high voltage source with automatic disconnects. Therefore, the regulatory text of S7.6.1 in today's final rule is modified as follows and incorporated into S7.7 as requested by the Alliance:

For a high voltage source that has an automatic disconnect that is physically contained within itself, the electrical isolation measurement after the test is made from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train. For a high voltage source that has an automatic disconnect that is not physically contained within itself, the electrical isolation measurement after the test is made from both the high voltage source side of the automatic disconnect and from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train.

However, to ensure consistency and clarity of terminology, today's final rule also revises the first sentence in S7.6.1 to indicate that the electric energy storage/conversion system (rather than the high voltage source) is connected to the vehicle's propulsion system to enable the propulsion system to be energized when the vehicle ignition is in the ''on'' position. A similar clarification is made in S7.2 by replacing ''high voltage system'' (which is not defined in the regulatory text) with ''electric energy storage/conversion system'' and ''propulsion motors'' with ''propulsion system.''

e. Electrical Isolation Monitoring

While the NPRM did not propose a requirement for electrical isolation monitoring, we acknowledged in the NPRM that the petitioner for rulemaking requested that FMVSS No. 305 allow for DC high voltage sources to meet a 100 ohms/volt electrical isolation requirement when coupled with electrical isolation monitoring. In the final rule, based on our analysis of comments on the NPRM, we required that each DC high voltage source meet 500 ohms/volt electrical isolation for vehicles without continuous electrical isolation monitoring but allowed DC high voltage sources to meet 100 ohms/volt electrical isolation if the vehicle had continuous monitoring of electrical isolation during vehicle operation. We required that the system must monitor its own readiness and provide a warning display that must be clearly visible from the driver's designated seating position for loss of isolation when tested according to the test procedure in S8.

The agency stated its belief that electrical isolation monitoring is especially needed for electrical components whose electrical isolation may degrade over time such as fuel cell stacks in fuel cell vehicles where the coolant may increase in conductivity during vehicle service and thereby result in a reduction of electrical isolation. Since it is anticipated that the 100 ohms/volt electrical isolation requirement for DC high voltage components would likely be exercised for the fuel cell stacks and other such electrical components whose isolation may degrade over time, we included the need for isolation monitoring of these components in the final rule.

In its petitions for reconsideration, Honda stated that the level of protection against electric shock should be judged by the absolute value of electrical isolation resistance. Honda argued that whether or not the vehicle is equipped with an isolation monitor has no relation to the possibility of electric shock resulting from touching the high voltage bus after a crash. Honda proposed removing entire sections of S5.4 and S8 related to isolation monitoring systems. Honda noted that the 2009 SAE J2578 [10] and the 2009 ISO 6469–3 [11] draft standards do not require electrical isolation monitoring for electrical components with 100 ohms/volt electrical isolation and requested that the electrical isolation monitoring requirements be removed to resolve the differences between the FMVSS No. 305 and the SAE/ISO standards.

Honda requested that if NHTSA decides not to remove the electrical isolation monitoring requirement, it instead permit periodic electrical isolation monitoring systems such as those that do not monitor the electrical isolation during start-up of vehicle/system (until main contactor is connected). Honda stated that the 2010 draft of ISO 6469–3 and the 2006 draft of ISO 23273–3 permit both continuous and periodic electrical isolation measurements during vehicle operation and that ''periodic'' systems would also detect a failure in isolation and appropriately warn the driver. Therefore, Honda proposed FMVSS No. 305 include the words ''or periodic'' after the word, ''continuous'' in S5.3, S5.4 and S8.

Further, Honda stated that the electrical isolation monitoring system only monitors the entire system during normal vehicle operation and is not capable of independently monitoring each high voltage source. Therefore, Honda requested that the agency clarify that the electrical isolation monitoring system will not be required to independently monitor each high voltage source by deleting the words ''For each continuously monitored DC

[10] SAE J2578—Recommended practice for general fuel cell vehicle safety, SAE J2578–2009–01, Society of Automotive Engineers, *http://standards.sae.org/j2578_200901/.*

[11] ISO 6469–3—Electrically propelled road vehicles—Safety specification—Part 3: Protection of persons against electric shock, 2009, *http://www.iso.org/iso/catalogue_detail?csnumber=45479.*

high voltage source,'' from the regulatory text in S5.4.

Finally, Honda stated that the test procedure to determine the operation of isolation monitoring systems does not allow flexibility in selecting the resistor that is inserted between the positive terminal of the high voltage source and the vehicle chassis electric conducting structure. Honda noted that, as prescribed, S8(4) requires inserting a resistor with resistance equal to the calculated result 1/(1/(95 times the working voltage of the high voltage source)—1/Ri) and does not allow any flexibility. Honda petitioned to allow any higher resistor to be used in the test procedure to determine if the isolation monitoring system is operating correctly arguing that the stringency of the test would not be compromised since higher resistance would provide a worse case condition.

NHTSA's Response—While we agree with Honda that isolation monitoring is intended to identify the possibility of deteriorated isolation that occurs over time during the normal service life of the vehicle and that an isolation monitor is not intended to guard against the possibility of electric shock resulting from touching a high voltage source after a crash, we do not agree that the requirement for electrical isolation monitoring should be deleted from the standard. The requirement that DC high voltage sources be monitored during vehicle operation with an isolation monitoring system that displays a warning for loss of electrical isolation is similar to the air bag readiness indicator required by FMVSS No. 208, ''Occupant crash protection.'' Neither the electrical isolation warning display nor the air bag readiness indicator provides protection during or after a crash. However, these indicators serve to provide the driver information that the related system may not be in proper working condition. Electrical isolation monitoring addresses a relevant safety concern because electric vehicles that use the 100 ohms/volt electrical isolation option to comply with the electrical safety requirements may likely be powered by fuel cells which have coolant that can deteriorate the electrical isolation over time. The agency made the decision to require electrical isolation monitoring based on careful analysis of the electrical safety concerns associated with providing adequate electrical shock protection both during vehicle operation and following a crash.

We also note that the electrical isolation and the electrical isolation monitoring requirements in the June 14, 2010 final rule were consistent with the joint Alliance/AIAM comments to the NPRM and SAE J1766. The standards referred to by Honda in its petition (SAE J2578 and ISO 6469–3) are draft documents that may be subject to change. For example, the 2009 draft of ISO 6469–3 does not require electrical isolation monitoring while the 2010 version makes provisions for continuous and periodic electrical isolation monitoring. As the aforementioned voluntary standards are still in flux regarding requiring electrical isolation monitoring, and as the agency believes that electrical isolation monitoring addresses an important safety concern by warning the driver of a possible degradation in electrical isolation, we are denying Honda's petition to remove the electrical isolation monitoring requirements from S5.4 and S8.

However, we agree with Honda's petition that the term ''continuous'' in the electrical isolation monitoring system requirement should be clarified. Since the standard provides a test procedure and performance criteria for assessing the operation of the electrical isolation monitoring system, we believe there is no need to specify the type of monitoring system. The only requirement contained in today's final rule is that the monitoring systems meet the performance criteria in S5.4 when tested according to the procedure in S8. Therefore, rather than adding the additional term ''or periodic,'' as suggested by Honda, we are deleting the specification for the monitoring system to be ''continuous'' in S5.3, S5.4, and S8 to address its concern. We are also modifying the regulatory text of S5.4 slightly to improve clarity.

We agree with Honda that electrical isolation monitoring systems may only monitor the whole vehicle system. However, the regulatory requirements in S5.4 only apply to those DC high voltage sources that manufacturers have chosen to certify to the 100 ohms/volt electrical isolation requirement and do not comply with the 500 ohms/volt electrical isolation requirement. Therefore, the test procedure in S8 evaluates the performance of the monitoring system for each DC high voltage source that is certified to 100 ohms/volt electrical isolation. The procedures in S8 are intended to test for the condition when electrical isolation of each DC high voltage source (certified to the 100 ohms/volt requirement) falls below 100 ohms/volt. Therefore, we do not grant Honda's request to remove the phrase ''For each continuously monitored DC high voltage source'' from the regulatory text in S5.4.

Finally, Honda also petitioned for flexibility in the use of any higher resistor in the test procedure to determine if the isolation monitoring system is operating correctly. It argued that allowing a higher resistance would not compromise the stringency of the requirements since it would provide for a worse case condition. In the June 14, 2010 final rule, the resistance of the external resistor applied in the test procedure detailed in S8 is calculated such that the combined electrical isolation resistance of the high voltage source and the external resistor results in electrical isolation of 95 ohms/volt which is 95 percent of the required electrical isolation. The electrical isolation monitor is required to display a warning when the electrical isolation falls to 95 ohms/volt. If the resistance of the external resistor applied in the test is greater than that specified in S8, as requested by Honda, then we agree that the combined electrical isolation for which the monitoring system will need to display a warning may be greater than 100 ohms/volt, thereby making the requirement more stringent.

The final rule requires 100 ohms/volt electrical isolation for monitored DC high voltage sources. For compliance purposes, we are assessing the operation of the monitoring system when the electrical isolation falls just below the required value. The final rule does not preclude manufacturers from having the isolation monitor warning display come on at a higher value than the minimum electrical isolation of 100 ohms/volt. Therefore, we do not believe it is necessary to grant Honda's request to change S8(4) to include an external resistor of higher resistance than that specified by the calculation.

However, we do see merit in including some flexibility in the resistance of the external resistor selected to evaluate the electrical isolation monitoring system such that it is easy for the testing personnel to select an off-the-shelf resistor instead of having to build a resistor to meet the exact computed resistance of the external resistor. Therefore, we are specifying that the resistance of the external resistor be such that the combined electrical isolation is greater or equal to 95 ohms/volt but less than 100 ohms/volt. This will allow the agency to test the operation of the monitoring system when the electrical isolation falls just below the required 100 ohms/volt, and will provide manufacturers additional flexibility in selecting resistors for testing.

f. Electric Energy Storage Device State-of-Charge

In the June 14, 2010 final rule, we required that prior to the crash test, the electric energy storage device be at the maximum state-of-charge recommended by the manufacturer, as stated in the vehicle owner's manual or on a label that is permanently affixed to the vehicle; or if the manufacturer has made no recommendation in the owner's manual or on a label permanently affixed to the vehicle, at a state-of-charge of not less than 95 percent of the maximum capacity of the electric energy storage device; or if the electric energy storage device(s) is/are rechargeable only by an energy source on the vehicle, at any state-of-charge within the normal operating voltage defined by the vehicle manufacturer. These state-of-charge provisions in the June 14, 2010 final rule were substantively identical to the original FMVSS No. 305 that existed before the NPRM in this rulemaking.

In its petition asking the agency to reconsider these provisions, the Alliance requested that FMVSS No. 305 be amended to allow testing at ''any state-of-charge which allows the normal operation of the power train as recommended by the manufacturer.'' In support of this request, the Alliance stated that the United Nations Economic Commission for Europe (UNECE) draft regulations (ECE R.94 and 95) [12] already propose to permit testing of electric vehicles at any state-of-charge. The Alliance stated that this proposed change would (1) allow for systems with external charging capability to be tested at lower state-of-charge (similar to hybrid electric vehicles), (2) result in reduced facility/test personnel risk (similar to the current use of stoddard in fuel systems), and (3) further provide an opportunity for harmonization with UNECE regulations. Thus, the Alliance argued that in the interest of safety in the testing environment and harmonization, the UNECE allowance on state-of-charge should be adopted.

Ford also offered comments regarding the state-of-charge and the FMVSS No. 305 test conditions. Ford stated that state-of-charge does not affect the energy storage/conversion system mass, electrolyte volume or containment capability and does not affect electrical isolation. Ford presented theoretical examples of systems suffering loss of electrical isolation during the crash test prescribed in the standard. Using the electrical isolation test procedure outlined in the standard, Ford demonstrated that the loss in electrical isolation was detected when the system was energized at 95 percent and 5 percent of the maximum state-of-charge. Ford agreed with the Alliance that the lower state-of-charge would reduce potential risk to test personnel similar to the use of substitute liquids and gases in other FMVSSs.

In addition, Honda's petition stated that the state-of-charge testing requirements should be amended to address new technologies such as plug in hybrid electric vehicles (PHEVs) which will become common in the near future. Honda noted that the regulatory text indicates that if the manufacturer of vehicles (such as PHEVs) recommends a specific maximum state-of-charge, the test would be conducted at the specified maximum state-of-charge. However, if the manufacturer has no recommendation, the test would be conducted at a state-of-charge of not less than 95 percent of the maximum capacity of the electric energy storage device.

Honda argued that the state-of-charge for an electric energy storage device can vary due to environmental conditions such as temperature or service life and that it will not be recommending a specific state-of-charge in the owner's manual or on the label affixed to the vehicle because the electric energy storage device is charged appropriately by an off-board and/or on-board charger recommended by the manufacturer. Thus, Honda petitioned to have the regulatory text of S7.1 changed from ''recommended by the manufacturer, as stated in the vehicle owner's manual or on a label that is permanently affixed to the vehicle'' to ''in accordance with the vehicle manufacturer's recommended charging procedures.'' For those manufacturers that make no recommendation, Honda further petitioned to have the regulatory text of S7.1(b) changed from ''made no recommendation in the owner's manual or on a label permanently affixed to the vehicle'' to ''made no recommendation for charging procedures.''

NHTSA's Response: NHTSA does not agree with the Alliance and Ford that the electric energy storage device should be at any state-of-charge that allows for the normal operation of the power train as recommended by the manufacturer. Specifying the state-of-charge provides a uniform way of testing and ensures all electric powered motor vehicles are tested in a similar manner.

We agree with Ford that the electrical isolation resistance measurement remains unchanged for different operating voltages and that loss in electrical isolation can be detected by the method outlined in the standard for different states of charge. However, we are concerned that certain electric components, such as capacitor networks within the electric power train may not be tested to their design limits when tested at a lower state-of-charge. When the vehicle crash test is conducted at the maximum state-of-charge, there is potential for some of the capacitor voltages to reach their design limits which may result in an electric short and hence cause a loss in electrical isolation. This potential safety hazard may not occur when the vehicle is tested at a lower state-of-charge which results in a lower energy test condition. We also do not agree with petitioners that testing at lower state-of-charge to evaluate electrical safety is similar to fuel system integrity testing with stoddard fluid in gasoline powered vehicles and nitrogen in compressed natural gas vehicles. While use of stoddard fluids and nitrogen do not change the performance of the fuel containers during and after the test, using lower state-of-charge may not evaluate certain electrical components at their design limits.

We further note that the December 2010 draft of SAE J2929—''Electric and Hybrid Vehicle Propulsion Battery System Safety Standard for Lithium-Based Rechargeable Cells,'' requires the battery state-of-charge to be at the maximum possible during normal vehicle operation before the battery system is tested for mechanical shock hazard in a vehicle pursuant to FMVSS No. 305. While the draft SAE J2929 test applies to different safety concerns, it does involve the same crash tests as this standard and utilizes similar state-of-charge requirements. Therefore, the agency's position on the state-of-charge of the energy storage/conversion system prior to the crash test is consistent with the future voluntary industry standard for battery systems. We are therefore denying the petition from the Alliance and Ford to conduct the crash test at any state-of-charge which allows the normal operation of the power train as recommended by the manufacturer.

However, we agree with Honda that the maximum state-of-charge may vary based on environmental conditions such as the age of the battery, temperature and service life for today's battery technologies. Thus, having the label specify the maximum state-of-charge in the owner's manual or a label permanently affixed to the vehicle may not provide consumers the information they need to recharge their vehicle throughout the vehicle's life. However, manufacturers will likely provide information to consumers on the proper charging procedures to achieve

[12] ECE R.94—Uniform Provisions Concerning the Approval of Vehicles with Regard to the Protection of the Occupants in the Event of a Frontal Collision, draft modifications of September 2010. ECE R.95—Uniform Provisions Concerning the Approval of Vehicles with Regard to the Protection of the Occupants in the Event of a Lateral Collision, draft modifications of September 2010.

maximum range, as suggested by Honda. Therefore, we are modifying the regulatory text to indicate that the maximum state-of-charge in accordance with the vehicle manufacturer's recommended charging procedure, as stated in the vehicle owner's manual or on a label that is permanently affixed to the vehicle, will be used. In the case where no such recommendation is provided in the owner's manual or on a label permanently affixed to the vehicle, the test will be conducted with the electric energy storage/conversion device charged to 95 percent of its rated capacity.

g. Physical Barrier Compliance Option for Electrical Safety

The June 14, 2010 final rule did not include a physical barrier compliance option for electrical safety since it was beyond the scope of the rulemaking. In addition, the agency stated in the final rule that it was uncertain whether indirect contact failure modes would be sufficiently accounted for by the protective barrier compliance option and noted that it had initiated a research program to better understand the issues.

In its petition for reconsideration, the Alliance disagreed with the agency's concern that the physical barrier option may not appropriately address electrical shock from indirect contact. The Alliance stated its belief that the test procedure for the protective barrier compliance option is equally valid for assessing both direct and indirect contact. It stated that the basic premise of the protective barrier compliance option is that if a person cannot contact high voltage sources, then there is little chance of injury from such sources.

The Alliance further stated that there is worldwide recognition and acceptance of the barrier option as a means for providing electrical safety, and updating FMVSS No. 305, as requested, would be a key enabler facilitating the introduction of all forms of electric-powered vehicles into the U.S. mainstream vehicle fleet. It argued that such vehicle technologies are vital to achieving the current Administration's energy and emissions goals. The Alliance further stated that given the urgent need for the barrier option and the fact that the barrier option in the draft GTR language (the ELSA document) is fully accepted by the international community, it is not necessary to delay a rulemaking proposal. Accordingly, the Alliance requested that NHTSA initiate a new rulemaking to incorporate the barrier option into FMVSS No. 305, and to complete this rulemaking with an urgency that is consistent with the national priorities to improve energy independence and reduced emissions.

NHTSA's Response: Our position on the requested physical barrier option has not substantively changed since the June 14, 2010 final rule. As noted in the June 14, 2010 final rule, NHTSA is doing research to evaluate the suitability of including the protective barrier option in FMVSS No. 305. NHTSA is aware that other countries have adopted a similar option in their regulations for electrical safety, but that does not eliminate the need for the agency to obtain the necessary supporting research to fully understand the consequences of adding this option as a means for providing electrical safety in FMVSS No. 305. Prior to changing any safety standard, NHTSA must first ensure that the proposed requirement provides an adequate level of safety and does not create an inadvertent safety risk to the motoring public, or first responders responding to the scene of a crash. Upon completion of the agency's research, NHTSA will make a decision whether to include physical barriers as an option for providing electrical safety in FMVSS No. 305. If the agency decides that a proposal for the protective barrier compliance option has merit, it will propose performance requirements, as well as a test procedure, at that time.

h. Use of Alternative Gas for Testing Hydrogen Fuel Cell Vehicles

The June 14, 2010 final rule also did not include a provision for testing hydrogen fuel cell vehicles using an inert gas, such as helium. When testing with an inert gas, the fuel cell stacks are not energized and consequently will not generate any electrical energy from which to measure electrical output. The final rule stated that the agency was researching potential crash test procedures for testing fuel cell vehicles, but would not address this issue as part of the June 14, 2010 final rule.

Petitions for reconsideration from the AIAM and Honda requested the agency to expedite this research so that a decision can be made in the near future for testing hydrogen fuel cell vehicles with helium-filled fuel containers. The organizations noted that fuel cell vehicles will be required to comply with FMVSS No. 305 by September 1, 2011. They argued that testing for those vehicles will then have to be conducted using hydrogen gas in accordance with the current regulation, if no changes are made. The AIAM and Honda further stated that other FMVSS crash test procedures (*i.e.* FMVSS Nos. 208, ''Occupant crash protection,'' 214, ''Side impact crash protection,'' 301, ''Fuel system integrity,'' and 303, ''Fuel system integrity of compressed natural gas vehicles'') require filling the fuel tank with alternative fuel to ensure safety during and after the crash test and the use of gasoline, diesel, and compressed natural gas in such tests is prohibited. The organizations requested that the test procedure for FMVSS No. 305 be aligned with the procedures of other existing crash-related regulations. Both organizations further reiterated their original comments to the NPRM that current Japanese regulations require the use of helium gas in crash tests, and prohibit the use of hydrogen.

NHTSA's Response—As noted in the June 14, 2010 final rule, the agency has ongoing research in developing a test procedure for evaluating the electrical safety of fuel cell vehicles with an inert gas and inactive fuel cells and the agency's position has not substantively changed since then. When an inert gas is used instead of hydrogen in fuel cell vehicles, some of the electrical components of the electric power train may be rendered inactive. Currently, the agency has not developed a test procedure to test the electrical safety of all high voltage sources accurately when an inert gas is used during testing of fuel cell vehicles. We note that while the Japanese regulation and the ELSA document permit the use of helium gas in crash tests of hydrogen powered vehicles, both the Japanese regulation and the ELSA document do not specify a test procedure to evaluate the electrical safety of such vehicles when an inert gas is used in place of hydrogen.

Therefore, the agency believes further work is needed to resolve the identified issues in testing hydrogen fuel cell vehicles. While there are currently no explicit provisions for using an alternative gas in lieu of hydrogen, comparable to the fuel system integrity standards for gasoline or compressed natural gas powered vehicles, the test procedures in an FMVSS are those that the agency will use to determine compliance to the particular standard. Manufacturers are not prohibited from using other test procedures for compliance certification and may elect to conduct crash tests of hydrogen fuel cell vehicles with a less volatile gas such as helium.

i. Low-Energy Compliance Option for Electrical Safety

Although the NPRM sought comment on whether or not the requested low-energy compliance option for electrical safety should be included, it did not include this option in the proposed rule. After carefully considering the comments received, the agency did not include the low-energy compliance option in the June 14, 2010 final rule as we remained unconvinced that the option was necessary and that it would adequately address the safety concerns of FMVSS No. 305. In its petition for reconsideration, the Alliance stated its continued belief that the low-energy option has merit and should be included in FMVSS No. 305. However, the Alliance also recognized that more research may be required in order to fully understand the safety implications of this option. Given the available information on the low-energy compliance option for electrical safety has not significantly changed, NHTSA's position on the low-energy compliance option remains as expressed in the June 14, 2010 final rule.

V. Rulemaking Analyses and Notices

a. Executive Order 12866, Executive Order 13563, and DOT Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under Executive Order 12866, Executive Order 13563, and the Department of Transportation's regulatory policies and procedures. This rulemaking document was not reviewed by the Office of Management and Budget under E.O. 12866, ''Regulatory Planning and Review.'' It is not considered to be significant under E.O. 12866 or the Department's Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). NHTSA has determined that the effects of this final rule are minor and that a regulatory evaluation is not needed to support the subject rulemaking. Today's final rule only makes slight changes to the regulatory text of the June 14, 2010 final rule to add clarification and does not impose significant costs beyond those already required by the June 14, 2010 final rule.

b. Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.,* as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of proposed rulemaking or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (*i.e.,* small businesses, small organizations, and small governmental jurisdictions). No regulatory flexibility analysis is required if the head of an agency certifies the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

NHTSA has considered the effects of this final rule under the Regulatory Flexibility Act. I certify that this final rule does not have a significant economic impact on a substantial number of small entities. Any small manufacturers that might be affected by this final rule are already subject to the requirements of FMVSS No. 305. Further, the agency believes the testing associated with the requirements added by this final rule are not substantial and to some extent are already being voluntarily borne by the manufacturers pursuant to SAE J1766, SAE J2578, ECE regulations, and other voluntary industry standards. Therefore, the impacts on any small businesses affected by this rulemaking would not be substantial.

c. Executive Order 13132 (Federalism)

NHTSA has examined today's final rule pursuant to Executive Order 13132 (64 FR 43255; Aug. 10, 1999) and concluded that no additional consultation with States, local governments, or their representatives is mandated beyond the rulemaking process. The agency has concluded that the final rule does not have sufficient federalism implications to warrant consultation with State and local officials or the preparation of a federalism summary impact statement. The final rule does not have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' Today's final rule does not impose substantial additional requirements. Instead, it clarifies the existing requirements from the June 14, 2010 final rule.

NHTSA rules can have preemptive effect in two ways. First, the National Traffic and Motor Vehicle Safety Act contains an express preemption provision:

> When a motor vehicle safety standard is in effect under this chapter, a State or a political subdivision of a State may prescribe or continue in effect a standard applicable to the same aspect of performance of a motor vehicle or motor vehicle equipment only if the standard is identical to the standard prescribed under this chapter.

49 U.S.C. 30103(b)(1). It is this statutory command that preempts any non-identical State legislative and administrative law [13] addressing the same aspect of performance, not today's rulemaking.

The express preemption provision described above is subject to a savings clause under which ''[c]ompliance with a motor vehicle safety standard prescribed under this chapter does not exempt a person from liability at common law.'' 49 U.S.C. 30103(e). Pursuant to this provision, State common law tort causes of action against motor vehicle manufacturers that might otherwise be preempted by the express preemption provision are generally preserved. However, the Supreme Court has recognized the possibility, in some instances, of implied preemption of State common law tort causes of action by virtue of NHTSA's rules—even if not expressly preempted.

This second way that NHTSA rules can preempt is dependent upon the existence of an actual conflict between an FMVSS and the higher standard that would effectively be imposed on motor vehicle manufacturers if someone obtained a State common law tort judgment against the manufacturer—notwithstanding the manufacturer's compliance with the NHTSA standard. Because most NHTSA standards established by an FMVSS are minimum standards, a State common law tort cause of action that seeks to impose a higher standard on motor vehicle manufacturers will generally not be preempted. However, if and when such a conflict does exist—for example, when the standard at issue is both a minimum and a maximum standard—the State common law tort cause of action is impliedly preempted. See *Geier* v. *American Honda Motor Co.,* 529 U.S. 861 (2000).

Pursuant to Executive Order 13132, NHTSA has considered whether this rule could or should preempt State common law causes of action. The agency's ability to announce its conclusion regarding the preemptive effect of one of its rules reduces the likelihood that preemption will be an issue in any subsequent tort litigation.

To this end, the agency has examined the nature (*e.g.,* the language and structure of the regulatory text) and objectives of today's rule and finds that this rule merely clarifies the requirements and definitions contained in the June 14, 2010 final rule. As such, NHTSA does not intend that this rule preempt state tort law that would effectively impose a higher standard on

[13] The issue of potential preemption of state tort law is addressed in the immediately following paragraph discussing implied preemption.

motor vehicle manufacturers than that established by today's rule. Additionally, in the June 14, 2010 final rule, the agency did not assert preemption. Establishment of a higher standard by means of State tort law would not conflict with the exemption announced here. Without any conflict, there could not be any implied preemption of a State common law tort cause of action.

d. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

e. Executive Order 12988 (Civil Justice Reform)

When promulgating a regulation, agencies are required under Executive Order 12988 to make every reasonable effort to ensure that the regulation, as appropriate: (1) Specifies in clear language the preemptive effect; (2) specifies in clear language the effect on existing Federal law or regulation, including all provisions repealed, circumscribed, displaced, impaired, or modified; (3) provides a clear legal standard for affected conduct rather than a general standard, while promoting simplification and burden reduction; (4) specifies in clear language the retroactive effect; (5) specifies whether administrative proceedings are to be required before parties may file suit in court; (6) explicitly or implicitly defines key terms; and (7) addresses other important issues affecting clarity and general draftsmanship of regulations.

Pursuant to this Order, NHTSA notes as follows. The preemptive effect of today's final rule is discussed above. NHTSA notes further that there is no requirement that individuals submit a petition for reconsideration or pursue other administrative proceeding before they may file suit in court.

f. Privacy Act

Please note that anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78), or online at *http://www.dot.gov/privacy.html.*

g. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA), a person is not required to respond to a collection of information by a Federal agency unless the collection displays a valid OMB control number. There are no information collection requirements associated with this final rule.

h. National Technology Transfer and Advancement Act

Under the National Technology Transfer and Advancement Act of 1995 (NTTAA) (Pub. L. 104–113), "all Federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments." Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies, such as the Society of Automotive Engineers (SAE). The NTTAA directs us to provide Congress, through OMB, explanations when we decide not to use available and applicable voluntary consensus standards. FMVSS No. 305 has historically drawn largely from SAE J1766. Prior to this update, FMVSS No. 305 was based on the April 2005 version of SAE J1766. However, today's final rule has made certain amendments to the standard to reflect the development of new voluntary consensus standards that have superseded SAE J1766. Thus, today's final rule makes revisions to the June 14, 2010 final rule that updated FMVSS No. 305.

i. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or Tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted for inflation with base year of 1995). Today's final rule, which clarifies the June 14, 2010 final rule, will not result in expenditures by State, local or Tribal governments, in the aggregate, or by the private sector in excess of $100 million annually.

j. Plain Language

Executive Order 12866 requires each agency to write all rules in plain language. Application of the principles of plain language includes consideration of the following questions:

- Have we organized the material to suit the public's needs?
- Are the requirements in the rule clearly stated?
- Does the rule contain technical language or jargon that isn't clear?
- Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?
- Would more (but shorter) sections be better?
- Could we improve clarity by adding tables, lists, or diagrams?
- What else could we do to make the rule easier to understand?

If you have any responses to these questions, please notify the agency in writing.

k. Regulation Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

VI. Regulatory Text

List of Subjects in 49 CFR part 571

Imports, Motor vehicles, Motor vehicle safety.

In consideration of the foregoing, NHTSA amends 49 CFR part 571 as follows:

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority citation for part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

■ 2. Amend § 571.305 by revising S1, S2, S3, S4, S5.2, S5.3, S5.4, S7.1, S7.2, S7.6.1, S7.6.4, S7.6.5, S7.6.6, S7.6.7, S7.7, and S8 and Figures 1 through 5 as follows:

§ 571.305 Standard No. 305; Electric-powered vehicles: Electrolyte spillage and electrical shock protection.

S1. *Scope.* This standard specifies requirements for limitation of electrolyte spillage, retention of electric energy storage/conversion devices, and protection from harmful electric shock during and after a crash.

S2. *Purpose.* The purpose of this standard is to reduce deaths and injuries during and after a crash that occurs because of electrolyte spillage from electric energy storage devices, intrusion of electric energy storage/conversion devices into the occupant compartment, and electrical shock.

S3. *Application.* This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks and buses with a GVWR of 4,536 kg or less, that use electrical propulsion components with working voltages more 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.

S4. *Definitions.*

Automatic disconnect means a device that when triggered, conductively separates a high voltage source from the electric power train or the rest of the electric power train.

Electric energy storage device means a high voltage source that stores energy for vehicle propulsion. This includes, but is not limited to, a high voltage battery or battery pack, rechargeable energy storage device, and capacitor module.

Electric energy storage/conversion device means a high voltage source that stores or converts energy for vehicle propulsion. This includes, but is not limited to, a high voltage battery or battery pack, fuel cell stack, rechargeable energy storage device, and capacitor module.

Electric energy storage/conversion system means an assembly of electrical components that stores or converts electrical energy for vehicle propulsion. This includes, but is not limited to, high voltage batteries or battery packs, fuel cell stacks, rechargeable energy storage systems, capacitor modules, inverters, interconnects, and venting systems.

Electric power train means an assembly of electrically connected components which includes, but is not limited to, electric energy storage/conversion systems and propulsion systems.

Electrical chassis means conductive parts of the vehicle whose electrical potential is taken as reference and which are: (1) conductively linked together, and (2) not high voltage sources during normal vehicle operation.

Electrical isolation of a high voltage source in the vehicle means the electrical resistance between the high voltage source and any of the vehicle's electrical chassis divided by the working voltage of the high voltage source.

High voltage source means any electric component contained in the electric power train or conductively connected to the electric power train that has a working voltage greater than 30 VAC or 60 VDC.

Propulsion system means an assembly of electric or electro-mechanical components or circuits that propel the vehicle using the energy that is supplied by a high voltage source. This includes, but is not limited to, electric motors, inverters/converters, electronic controllers, and associated wire harnesses and connectors, and coupling systems for charging rechargeable energy storage systems.

* * * * *

S5.2 *Electric energy storage/conversion device retention.* During and after each test specified in S6 of this standard:

(a) Electric energy storage/conversion devices shall remain attached to the vehicle by at least one component anchorage, bracket, or any structure that transfers loads from the device to the vehicle structure, and

(b) Electric energy storage/conversion devices located outside the occupant compartment shall not enter the occupant compartment.

S5.3 *Electrical safety.* After each test specified in S6 of this standard, each high voltage source in a vehicle must meet the electrical isolation requirements of subparagraph (a) or the voltage level requirements of subparagraph (b).

(a) The electrical isolation of the high voltage source, determined in accordance with the procedure specified in S7.6, must be greater than or equal to one of the following:

(1) 500 ohms/volt for an AC high voltage source; or

(2) 500 ohms/volt for a DC high voltage source without electrical isolation monitoring during vehicle operation; or

(3) 100 ohms/volt for a DC high voltage source with electrical isolation monitoring, in accordance with the requirements of S5.4, during vehicle operation.

(b) The voltages V1, V2, and Vb of the high voltage source, measured according to the procedure specified in S7.7, must be less than or equal to 30 VAC for AC components or 60 VDC for DC components.

S5.4 *Electrical isolation monitoring.* Each DC high voltage source with electrical isolation monitoring during vehicle operation pursuant to S5.3(a)(2) shall be monitored by an electrical isolation monitoring system that displays a warning for loss of isolation when tested according to S8. The system must monitor its own readiness and the warning display must be visible to the driver seated in the driver's designated seating position.

* * * * *

S7.1 *Electric energy storage device state-of-charge.* The electric energy storage device shall be at the state-of-charge specified in either subparagraph (a), (b), or (c):

(a) At the maximum state-of-charge in accordance with the vehicle manufacturer's recommended charging procedures, as stated in the vehicle owner's manual or on a label that is permanently affixed to the vehicle; or

(b) If the manufacturer has made no recommendation for charging procedures in the owner's manual or on a label permanently affixed to the vehicle, at a state-of-charge of not less than 95 percent of the maximum capacity of the electric energy storage device; or

(c) If the electric energy storage device(s) is/are rechargeable only by an energy source on the vehicle, at any state-of-charge within the normal operating voltage defined by the vehicle manufacturer.

S7.2 *Vehicle conditions.* The switch or device that provides power from the electric energy storage/conversion system to the propulsion system is in the activated position or the ready-to-drive position.

* * * * *

S7.6.1 Prior to any barrier impact test, the energy storage/conversion system is connected to the vehicle's propulsion system, and the vehicle ignition is in the "on" (propulsion system energized) position. Bypass any devices or systems that do not allow the propulsion system to be energized at the time of impact when the vehicle ignition is on and the vehicle is in neutral. For a high voltage source that has an automatic disconnect that is physically contained within itself, the electrical isolation measurement after the test is made from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train. For a high voltage source that has an automatic disconnect that is not physically contained within itself, the electrical isolation measurement after the test is made from both the high voltage source side of the automatic disconnect and from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train.

* * * * *

S7.6.4 The voltage(s) is/are measured as shown in Figure 2, and the voltage(s) (V1) between the negative side of the high voltage source and the electrical chassis.

S7.6.5 The voltage(s) is/are measured as shown in Figure 3, and the voltage(s) (V2) between the positive side of the high voltage source and the electrical chassis.

S7.6.6 If V1 is greater than or equal to V2, insert a known resistance (Ro) between the negative side of the high voltage source and the electrical chassis. With the Ro installed, measure the voltage (V1′) as shown in Figure 4 between the negative side of the high voltage source and the electrical chassis. Calculate the electrical isolation resistance (Ri) according to the formula shown. Divide Ri (in ohms) by the working voltage of the high voltage source (in volts) to obtain the electrical isolation (in ohms/volt).

S7.6.7 If V2 is greater than V1, insert a known resistance (Ro) between the positive side of the high voltage source and the electrical chassis. With the Ro installed, measure the voltage (V2′) as shown in Figure 5 between the positive side of the high voltage source and the electrical chassis. Calculate the electrical isolation resistance (Ri) according to the formula shown. Divide Ri (in ohms) by the working voltage of the high voltage source (in volts) to obtain the electrical isolation (in ohms/volt).

S7.7 *Voltage measurement.* For the purpose of determining the voltage level of the high voltage source specified in S5.3(b), voltage is measured as shown in Figure 1. Voltage Vb is measured across the two terminals of the voltage source. Voltages V1 and V2 are measured between the source and the electrical chassis. For a high voltage source that has an automatic disconnect that is physically contained within itself, the electrical isolation measurement after the test is made from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train. For a high voltage source that has an automatic disconnect that is not physically contained within itself, the electrical isolation measurement after the test is made from both the high voltage source side of the automatic disconnect and from the side of the automatic disconnect connected to the electric power train or to the rest of the electric power train if the high voltage source is a component contained in the power train.

S8. Test procedure for on-board electrical isolation monitoring system. Prior to any impact test, the requirements of S5.4 for the on-board electrical isolation monitoring system shall be tested using the following procedure.

(1) The electric energy storage device is at the state-of-charge specified in S7.1.

(2) The switch or device that provides power from the high voltage system to the propulsion motor(s) is in the activated position or the ready-to-drive position.

(3) Determine the isolation resistance, Ri, of the high voltage source with the electrical isolation monitoring system using the procedure outlined in S7.6.2 through S7.6.7.

(4) Insert a resistor with resistance Ro equal to or greater than 1/(1/(95 times the working voltage of the high voltage source) − 1/Ri) and less than 1/(1/(100 times the working voltage of the high voltage source) − 1/Ri) between the positive terminal of the high voltage source and the electrical chassis.

(5) The electrical isolation monitoring system indicator shall display a warning visible to the driver seated in the driver's designated seating position.

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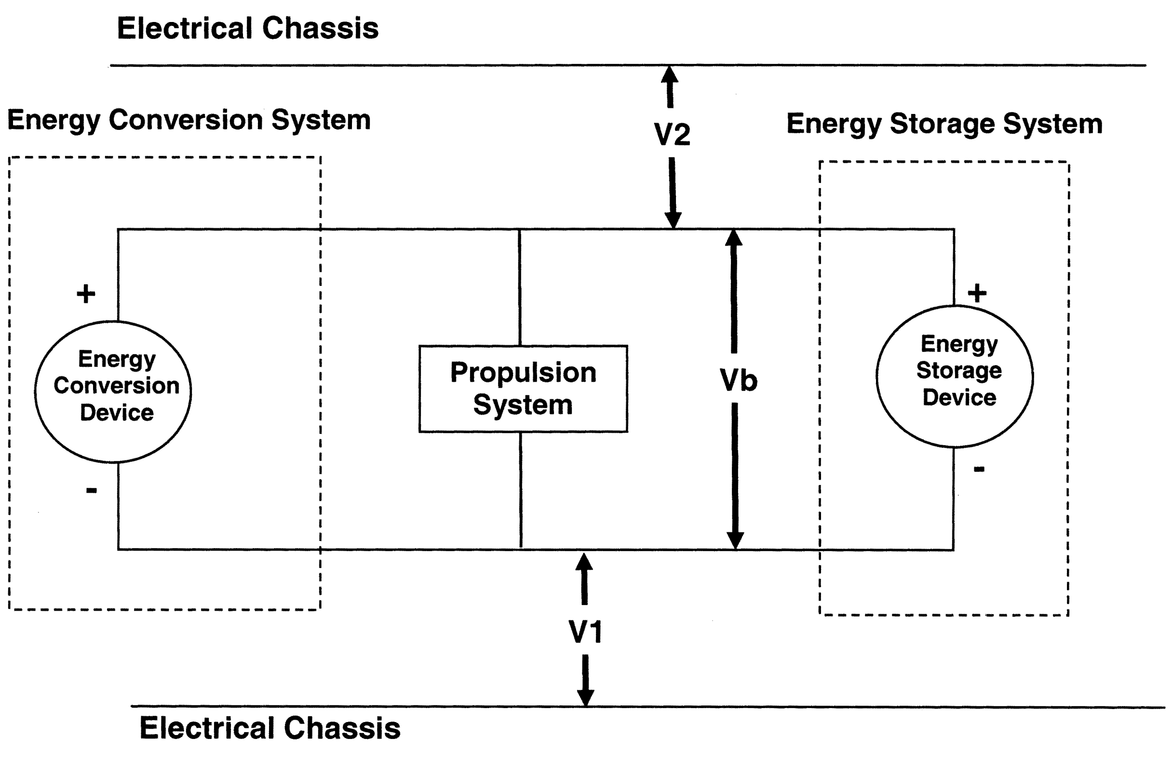


Figure 1. S7.6.3 and S7.7 Voltage Measurements of the High Voltage Source

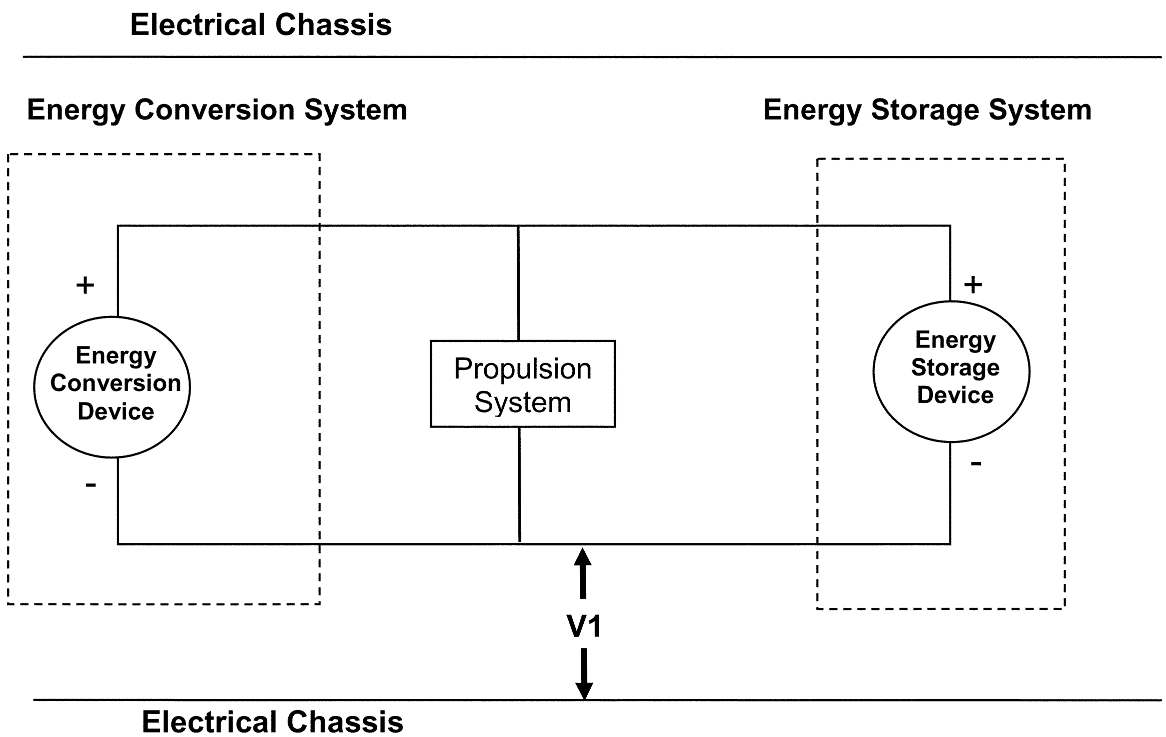


Figure 2. S7.6.4 Measurement for V1 Voltage between the Negative Side of the High Voltage Source and the Electrical Chassis

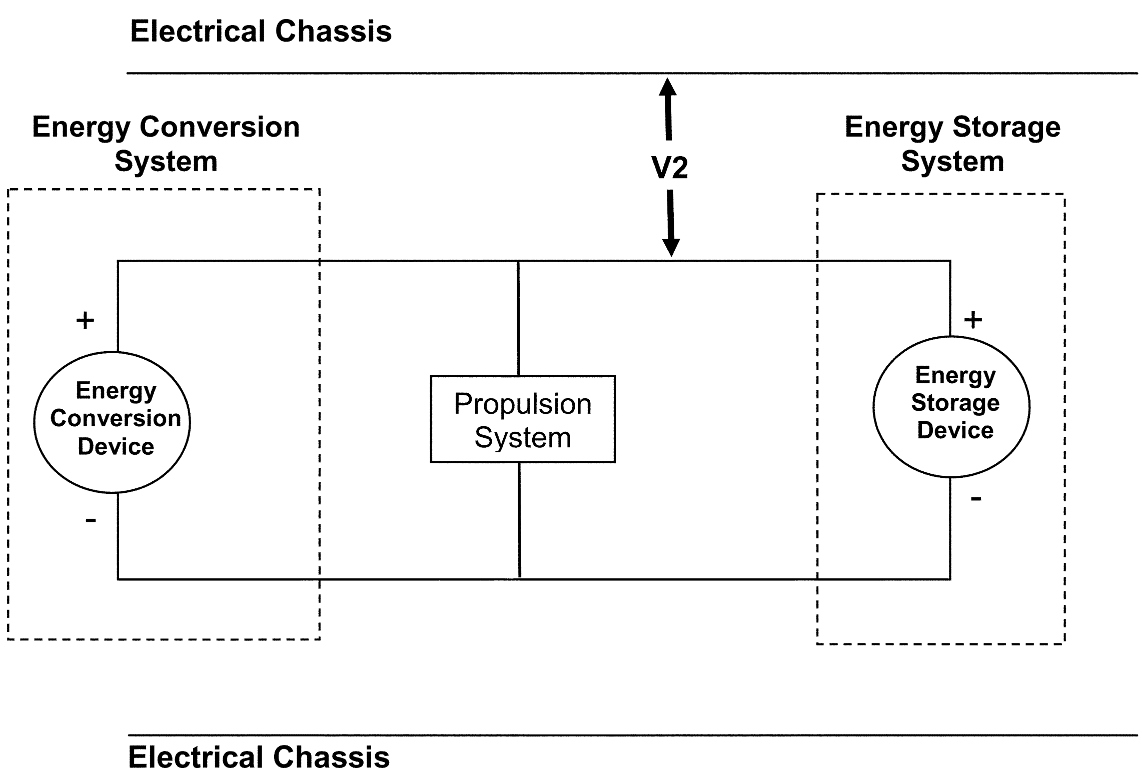


Figure 3. S7.6.5 Measurement for V2 Voltage between the Positive Side of the High Voltage Source and the Electrical Chassis

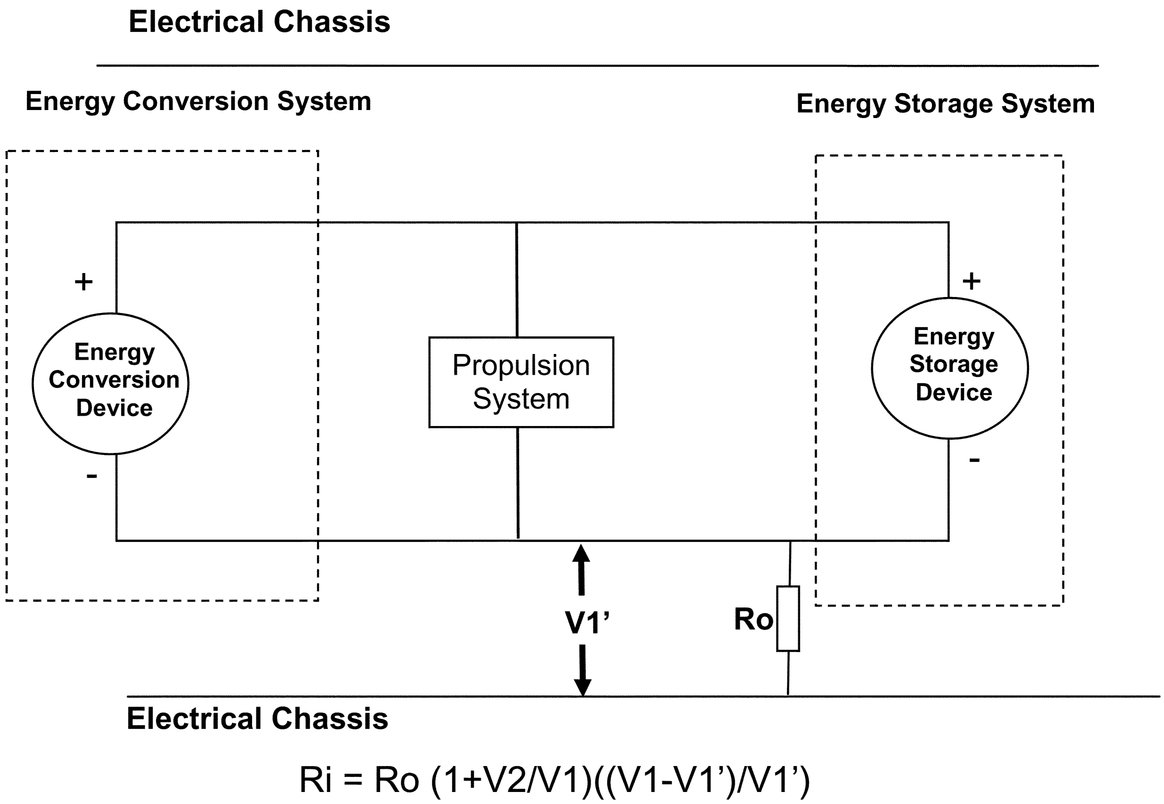
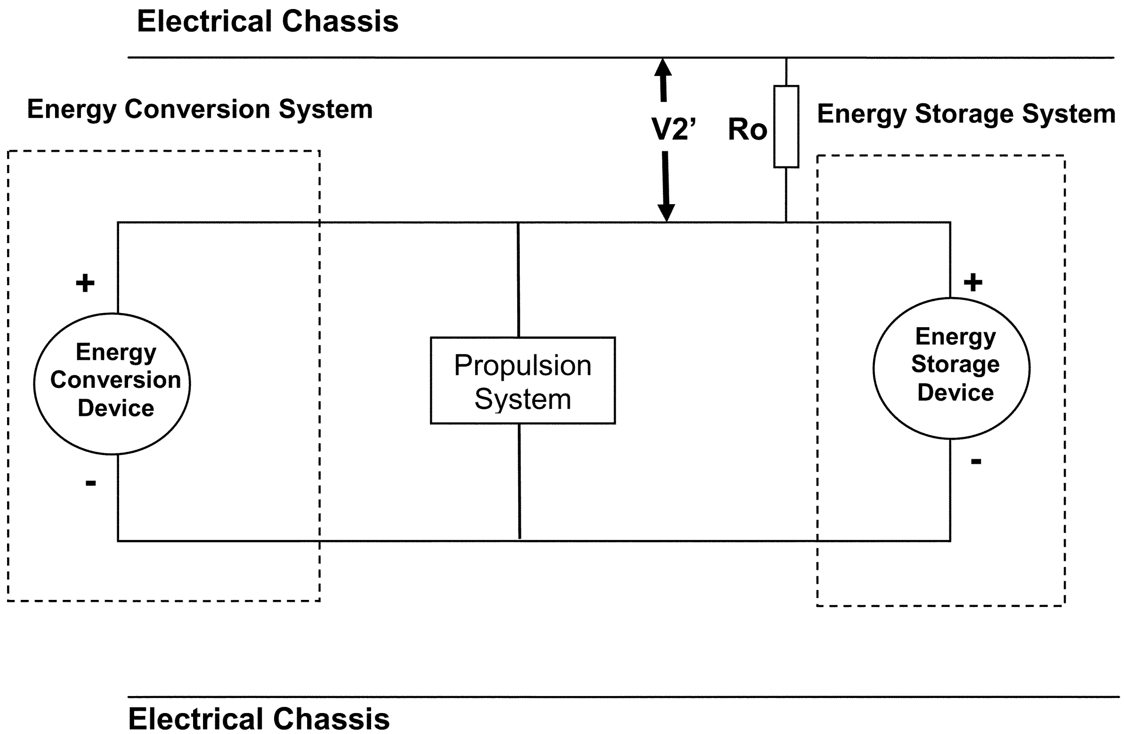


Figure 4. S7.6.6 Measurement for V1' Voltage across Resistor between Negative Side of the High Voltage Source and Electrical Chassis



$$Ri = Ro\ (1+V1/V2)((V2-V2')/V2')$$

Figure 5. S7.6.7 Measurement for V2' Voltage across Resistor between Positive Side of the High Voltage Source and Electrical Chassis

Issued on: July 25, 2011.

David L. Strickland,

Administrator.

[FR Doc. 2011–19216 Filed 7–28–11; 8:45 am]

BILLING CODE 4910–59–C

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 575

[Docket No. NHTSA–2010–0025]

RIN 2127–AK51

New Car Assessment Program (NCAP); Safety Labeling

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: New passenger vehicles manufactured on or after September 1, 2007 must be labeled with safety rating information published by the National Highway Traffic Safety Administration (NHTSA) under its New Car Assessment Program (NCAP). This information is required by statute to be part of the Monroney (automobile price sticker) label. Effective beginning in model year 2011 passenger vehicles, NHTSA enhanced the NCAP ratings program to include, among other things, the incorporation of an overall vehicle score that is derived from the vehicle's frontal crash, side crash, and rollover resistance ratings. This final rule amends NHTSA's regulation on vehicle labeling of safety rating information to reflect the enhanced NCAP ratings program.

DATES: The final rule is effective August 29, 2011.

Petitions for Reconsideration: If you wish to petition for reconsideration of this rule, your petition must be received by September 12, 2011.

ADDRESSES: If you wish to petition for reconsideration of this rule, you should refer in your petition to the docket number of this document and submit your petition to: Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., West Building, Washington, DC 20590.

The petition will be placed in the docket. Anyone is able to search the electronic form of all documents received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78).

For access to the docket to read background documents or comments received, go to *http://www.regulations.gov* and follow the online instructions for accessing the docket. You may also visit DOT's Docket Management Facility, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590–0001 for on-line access to the docket.

FOR FURTHER INFORMATION CONTACT: For non-legal issues, you may contact Ms. Jennifer N. Dang, Office of Crashworthiness Standards (*Telephone:* 202–366–1740) (*Fax:* 202–493–2739). For legal issues, you may call Mr. Steve Wood, Office of the Chief Counsel (*Telephone:* 202–366–2992) (*Fax:* 202–366–3820). You may send mail to both of these officials at the National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., West Building, Washington, DC 20590–0001.

SUPPLEMENTARY INFORMATION: