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TECHNICAL STANDARDS DOCUMENT

NO. 305, Revision 1

Electrolyte Spillage and Electrical Shock Protection

The text of this document is based on the U.S. *Code of Federal Regulations, Title 49, Chapter V, Part 571*, Federal Motor Vehicle Safety Standard No. 305, Electric-powered vehicles: electrolyte spillage and electrical shock protection, revised as of October 1, 2000, and the subsequent amendment published in the *Federal Register* on December 3, 2001 (Vol. 66, No. 232, p. 60157).

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Technical Standards Document
Number 305, Revision 1

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(Ce document est aussi disponible en français.)

Introduction

As defined by section 12 of the *Motor Vehicle Safety Act*, a Technical Standards Document (TSD) is a document that reproduces an enactment of a foreign government (e.g. a Federal Motor Vehicle Safety Standard issued by the U.S. National Highway Traffic Safety Administration). According to the Act, the *Motor Vehicle Safety Regulations* may alter or override some provisions contained in a TSD or specify additional requirements; consequently, it is advisable to read a TSD in conjunction with the Act and its counterpart Regulation. As a guide, where modifications have been made, the corresponding clause number is indicated in the margin of the TSD within parentheses.

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Identification of Changes

In order to facilitate the incorporation of a TSD, certain non-technical changes may be made to the foreign enactment. These may include the deletion of words, phrases, figures, or sections that do not apply under the Act or Regulations, the conversion of imperial to metric units, the deletion of superseded dates, and minor changes of an editorial nature. Additions are underlined, and provisions that do not apply are ~~stroked through~~. Where an entire section has been deleted, it is replaced by: "[CONTENT DELETED]". Changes are also made where there is a reporting requirement or reference in the foreign enactment that does not apply in Canada. For example, the name and address of the U.S. Department of Transportation are replaced by those of the Department of Transport.

Effective Dates

The original version of a TSD comes into effect on the date that the regulation in which it is first incorporated by reference is published in the *Canada Gazette* Part II. Subsequent revisions of a TSD come into effect on the date of publication of the Notice of Revision in the *Canada Gazette* Part I. The Effective Date is that of the publication of the final amendment or the notice of revision in the *Canada Gazette*. Compliance with the requirements of a newly issued TSD is not mandatory until six months following the effective date, during which time it is permissible to continue to comply with the requirements of the previous Regulation or TSD. Manufacturers and importers must comply with the requirements of a newly issued TSD as of the Mandatory Compliance Date.

Official Version of Technical Standards Documents

Technical Standards Documents may be consulted electronically in both HTML and Portable Document Format (PDF) on the Department of Transport's Web site at www.tc.gc.ca/RoadSafety/mvstm_tsd/index_e.htm. The PDF version is a replica of the TSD as published by the Department and is to be used for the purposes of legal interpretation and application. The HTML version is provided for information purposes only.

(Original signed by)

Director, Standards Research and Development
for the Minister of Transport
Ottawa, Ontario

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S1. Scope

This Technical Standards Document (TSD) ~~standard~~ specifies requirements for limitation of electrolyte spillage, retention of propulsion batteries during a crash, and electrical isolation of the chassis from the high-voltage system, to be met by vehicles that use electricity as propulsion power.

S2. Purpose

The purpose of this TSD ~~standard~~ is to reduce deaths and injuries during a crash which occur because of electrolyte spillage from propulsion batteries, intrusion of propulsion battery system components into the occupant compartment, and electrical shock.

(1) **S3. Application**

[CONTENT DELETED] For applicability, please see Schedule III and section 305 of Schedule IV to the *Motor Vehicle Safety Regulations*.

S4. Definitions

Battery system component means any part of a battery module, interconnect, venting system, battery restraint device, and battery box or container which holds the individual battery modules. *(Composant du système)*

Dummy means a 50th percentile male test dummy as specified in subpart F of part 572 of ~~this~~ Chapter V, Title 49, of the most recent edition of the *Code of Federal Regulations*, hereafter referred to as "this chapter". *(Mannequin)*

S5. General requirements

Each vehicle to which this TSD ~~standard~~ applies, when tested according to S6 under the conditions of S7, must meet the requirements of S5.1, S5.2, and S5.3.

S5.1 Electrolyte spillage from propulsion batteries

Not more than 5.0 liters of electrolyte from propulsion batteries shall spill outside the passenger compartment, and no visible trace of electrolyte shall spill into the passenger compartment. Spillage is measured from the time the vehicle ceases motion after a barrier impact test until 30 minutes thereafter, and throughout any static rollover after a barrier impact test.

S5.2 Battery retention

Battery modules located inside the passenger compartment must remain in the location in which they are installed. No part of any battery system component that is located outside the passenger compartment shall enter the passenger compartment during the test procedures of S6 of this TSD ~~standard~~, as determined by visual inspection.

S5.3 Electrical isolation

Electrical isolation between the battery system and the vehicle electricity-conducting structure after each test must be not less than 500 ohms/volt.

S6. Test requirements

Each vehicle to which this TSD ~~standard~~ applies, under the conditions of S7, must be capable of meeting the requirements of any applicable single barrier crash/static rollover test sequence, without alteration of the vehicle during the test sequence. A particular vehicle need not meet further test requirements after having been subjected to a single barrier crash/static rollover test sequence.

S6.1 Frontal barrier crash

The vehicle must meet the requirements of S5.1, S5.2, and S5.3 when it is traveling longitudinally forward at any speed, up to and including 48 km/h, and impacts a fixed collision barrier that is perpendicular to the line of travel of the vehicle, or at any angle up to 30 degrees in either direction from the perpendicular to the line of travel of the vehicle.

S6.2 Rear moving barrier impact

The vehicle must meet the requirements of S5.1, S5.2, and S5.3, when it is impacted from the rear by a barrier moving at any speed up to and including 48 km/h, with a dummy at each front outboard designated seating position.

S6.3 Side moving deformable barrier impact

The vehicle must meet the requirements of S5.1, S5.2, and S5.3 when it is impacted from the side by a barrier that conforms to part 587 of this chapter that is moving at any speed up to and including 54 km/h, with dummies positioned in accordance with S7 of Sec. 571.214 of this chapter.

S6.4 Post-impact test static rollover

The vehicle must meet the requirements of S5.1, S5.2, and S5.3, after being rotated on its longitudinal axis to each successive increment of 90 degrees after each impact test specified in S6.1, S6.2, and S6.3.

S7. Test conditions

When the vehicle is tested according to S6, the requirements of S5 must be met under the conditions in S7.1 through S7.6.7. Where a range is specified, the vehicle must be capable of meeting the requirements at all points within the range.

S7.1 Battery state of charge

The battery system is at the level specified in the following paragraph (a), (b), or (c), as appropriate:

(a) At the maximum state of charge recommended by the manufacturer, as stated in the vehicle operator's manual or on a label that is permanently affixed to the vehicle;

(b) If the manufacturer has made no recommendation, at a state of charge of not less than 95 percent of the maximum capacity of the battery system; or

(c) If the batteries are rechargeable only by an energy source on the vehicle, at any state of charge within the normal operating voltage, as defined by the vehicle manufacturer.

S7.2 Vehicle conditions

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

S7.2.1 The parking brake is disengaged and the transmission, if any, is in the neutral position. In a test conducted under S6.3, the parking brake is set.

S7.2.2 Tires are inflated to the manufacturer's specifications.

S7.2.3 The vehicle, including test devices and instrumentation, is loaded as follows:

(a) A passenger car is loaded to its unloaded vehicle weight plus its rated cargo and luggage capacity weight, secured in the luggage area, plus the necessary test dummies as specified in S6, restrained only by means that are installed in the vehicle for protection at its seating position.

(b) A multipurpose passenger vehicle, truck, or bus with a GVWR of 4 536 kg or less is loaded to its unloaded vehicle weight plus the necessary dummies, as specified in S6, plus 136 kg or its rated cargo and luggage capacity weight, whichever is less. Each dummy is restrained only by means that are installed in the vehicle for protection at its seating position.

S7.3 Static rollover test conditions

In addition to the conditions of S7.1 and S7.2, the conditions of S7.4 of Sec. 571.301 of this chapter apply to the conduct of static rollover tests specified in S6.4.

S7.4 Rear moving barrier impact test conditions

In addition to the conditions of S7.1 and S7.2, the conditions of S7.3 of Sec. 571.301 of this chapter apply to the conduct of the rear moving barrier impact test specified in S6.2. The rear moving barrier is described in S8.2 of Sec. 571.208 of this chapter and diagramed in Figure 1 of Sec. 571.301 of this chapter.

S7.5 Side moving deformable barrier impact test conditions

In addition to the conditions of S7.1 and S7.2, the conditions of S6.10, S6.11, and S6.12 of Sec. 571.214 of this chapter apply to the conduct of the side moving deformable barrier impact test specified in S6.3.

S7.6 Electrical isolation test procedure

In addition to the conditions of S7.1 and S7.2, the conditions in S7.6.1 through S7.6.7 apply to the measurement of electrical isolation specified in S5.3.

S7.6.1 Prior to any barrier impact test, the propulsion battery system is connected to the vehicle's propulsion system, and the vehicle ignition is in the "on" [traction (propulsion) system energized] position. If the vehicle utilizes an automatic disconnect between the propulsion battery system and the traction system that is physically contained within the battery pack system, the electrical isolation measurement after the impact is made from the traction side of the automatic disconnect to the vehicle chassis. If the vehicle utilizes an automatic disconnect that is not physically contained within the battery pack system, the electrical isolation measurement after the impact is made from the battery side of the automatic disconnect to the vehicle chassis.

S7.6.2 The voltmeter used in this test measures direct current values and has an internal resistance of at least 10 MΩ.

S7.6.3 The voltage is measured as shown in Figure 1 and the propulsion battery voltage (Vb) is recorded. Before any vehicle impact test, Vb is equal to or greater than the nominal operating voltage as specified by the vehicle manufacturer.

S7.6.4 The voltage is measured as shown in Figure 2, and the voltage (V1) between the negative side of the propulsion battery and the vehicle chassis is recorded.

S7.6.5 The voltage is measured as shown in Figure 3, and the voltage (V2) between the positive side of the propulsion battery and the vehicle chassis is recorded.

S7.6.6 If V1 is greater than or equal to V2, insert a known resistance (Ro) between the negative side of the propulsion battery and the vehicle chassis. With the Ro installed, measure the voltage (V1') as shown in Figure 4 between the negative side of the propulsion battery and the vehicle chassis. Calculate the electrical isolation (Ri) according to the formula shown. This electrical isolation value (in ohms) divided by the nominal operating voltage of the propulsion battery (in volts) must be equal to or greater than 500.

S7.6.7 If V2 is greater than V1, insert a known resistance (Ro) between the positive side of the propulsion battery and the vehicle chassis. With the Ro installed, measure the voltage and record the voltage (V2') between the positive side of the propulsion battery and the vehicle chassis as shown in Figure 5. Calculate the electrical isolation (Ri) according to the formula shown. This electrical isolation value (in ohms) divided by the nominal operating voltage of the propulsion battery (in volts) must be equal to or greater than 500.

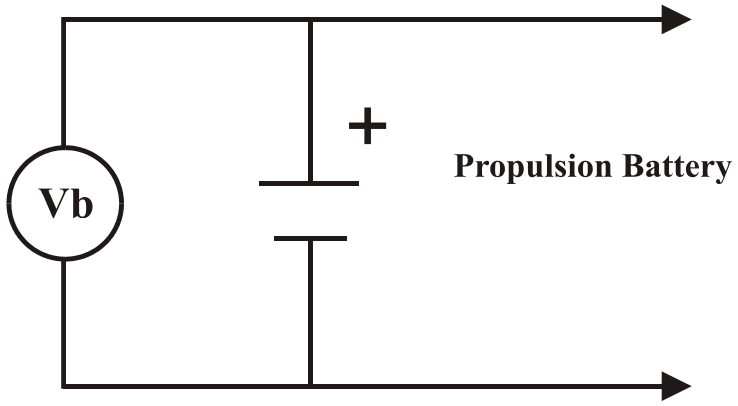

Figure 1: S7.6.3 Measurement Location For Vb Voltage

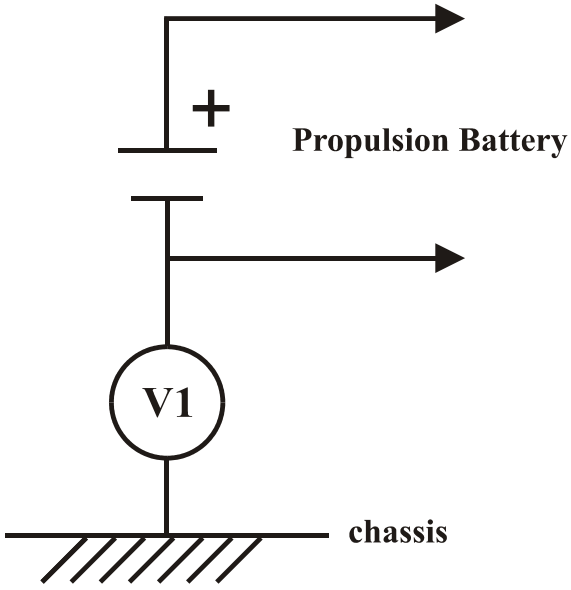

Figure 2: S7.6.4 Measurement Location For V1 Voltage

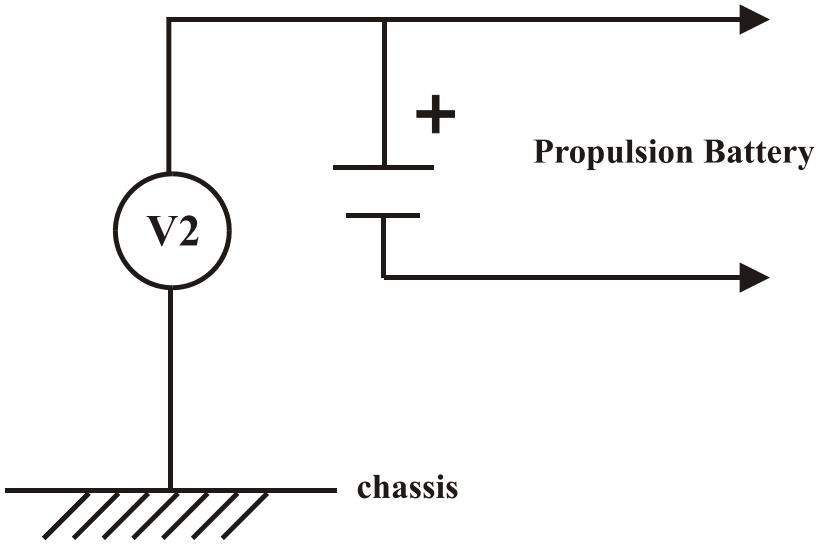

Figure 3: S7.6.5 Measurement Location For V2 Voltage

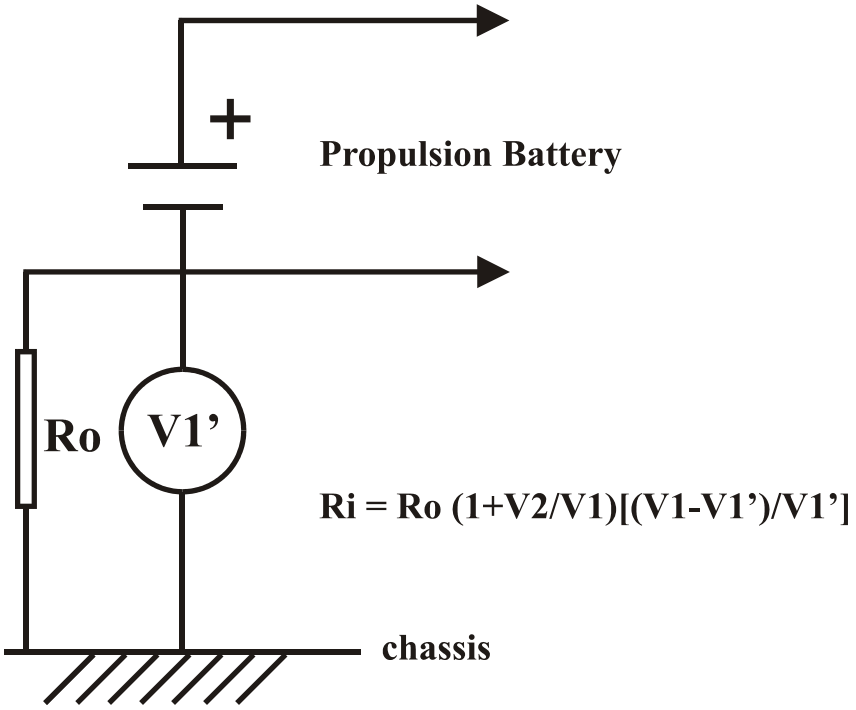

Figure 4: S7.6.6 Measurement Location For V1' Voltage

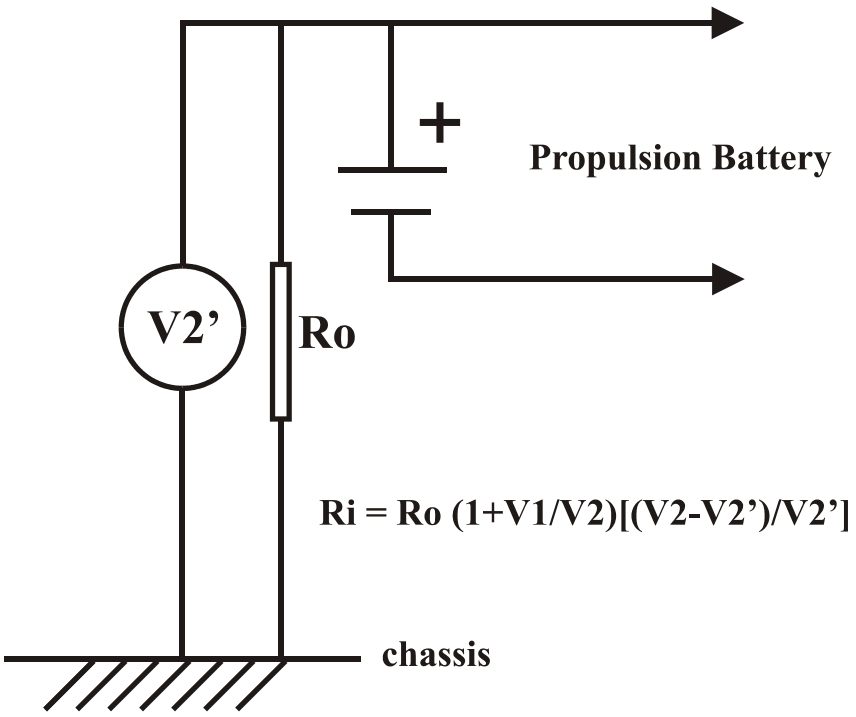

Figure 5: S7.6.7 Measurement Location For V2' Voltage