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OF CANADA

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(Including Amendment 1)

STANDARD ON BATTERIES FOR USE IN ELECTRIC VEHICLES

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Commitment for Amendments

This Standard is issued jointly by Underwriters Laboratories Inc. (UL) and ULC Standards. Amendments to this Standard will be made only after processing according to the Standards writing procedures by UL and ULC Standards.

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This ANSI/UL Standard for Safety consists of the Second Edition.

The most recent designation of ANSI/UL 2580 as an American National Standard (ANSI) occurred on June 17, 2016. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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ULC Preamble

International Classification for Standards (ICS): 29.220; 43.120

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Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patents rights. ULC Standards shall not be held responsible for identifying any or all such patents rights.

This Standard is intended to be used for conformity assessment.

The First Edition of this ULC Standard was based on, and superseded, the First Edition of Subject 2580. The First Edition has been amended.

The review and action to revise or reaffirm this Standard will not exceed 5 years from the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

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AMENDMENT NOTICE

ULC STANDARDS

Batteries for Use In Electric Vehicles	CAN/ULC-2580:2013-AM1
AMENDMENT 1	DATE OF AMENDMENT: JUNE 17, 2016

The following amendments are being incorporated into (CAN/ULC-2580:2013):

1. Correction of IEC Standard number.

2. Revision of samples numbers for cell testing in 16.2 and 16.3.

3. Clarification of the Overcharge Test and revision of the Isolation Test and External Fire Exposure Test.

NOTICE

PLEASE NOTE THAT THIS STANDARD INCLUDES AMENDMENT(S). THE CURRENT EDITION OF THIS STANDARD IS NOT VALID UNLESS USED TOGETHER WITH THE AMENDMENT(S).

IT IS POSSIBLE, HOWEVER, THAT CERTAIN CODES WILL REFER TO THE SUPERSEDED EDITION OF THIS STANDARD, WITHOUT THE AMENDMENT(S). IN THOSE INSTANCES, THE COMPILATION OF THIS DOCUMENT ALLOWS FOR REFERENCE TO BE MADE TO THE STANDARD PRIOR TO THE INCLUSION OF THE AMENDMENT(S).

IEC Standards

IEC 62660-2
Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing

B1.2 The test conditions of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2, Section 4 are to be applied for the test program outlined in Section B2 below.

B1.3 The capacity of the cells shall be determined as outlined in 5.2 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.1.1 The cell shall be subjected to the vibration test as outlined in 6.1.1 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.2.1 The cell shall be subjected to the mechanical shock test as outlined in 6.1.2 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 60662-2.

B2.3.1 The cell shall be charged in accordance with the manufacturer's specifications as outlined in 5.1 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2, and then subjected to a drop test as outlined in B2.3.2.

B2.4.1 The cell shall be subjected to the crush test as outlined in 6.1.3 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.5.1 The cell shall be subjected to the high temperature endurance test as outlined in 6.2.1 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.6.1 The cell shall be subjected to the temperature cycling test as outlined in 6.2.2.1.1 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.7.1 The cell shall be subjected to the external short circuit test as outlined in 6.3.1 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

B2.8.1 The cell shall be subjected to the overcharge test as outlined in 6.3.2 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

Exception: This test is not required if it can be determined that overcharge is reliably prevented by a control system meeting the requirements of 13.4 and cell state of charge is monitored at the cell level in the end use vehicle system.

B2.9.1 The cell shall be subjected to the forced discharge test as outlined in 6.3.3 of the Standard for Secondary lithium-Ion Cells for the Propulsion of Electric Road Vehicles – Part 2: Reliability and Abuse Testing, IEC 62660-2.

Exception: This test is not required if it can be determined that overdischarge is reliably prevented by a control system meeting the requirements of 13.4 that prevents overdischarge of cells and that monitors at the cell level in the end use vehicle system.

16.2 Lithium ion cells shall comply with the requirements for secondary lithium cells in the Standard for Lithium Batteries, UL 1642 per Table 5 with modifications as outlined in Exception No. 1 – 6 below.

Exception No. 1: The overall dimensions of the projectile test aluminum test screen may be increased from those outlined in the Standard for Lithium Batteries, UL 1642 to accommodate large cells intended for EV applications but the flat panels of the test screen shall not exceed a distance of 305 mm (12 in) from the cell in any direction.

Exception No. 2: The overall external resistance for the short circuit test shall be less than or equal to 20 mΩ.

Exception No. 3: The crush test shall be a bar crush test rather than a flat plate crush using a bar with a 15-cm (5.9-in) diameter. The force is to be to be applied until one of the following occurs first:

a) A voltage (OCV) drop of one-third of the original cell voltage occurs; or

b) A deformation of 15% or more (in the direction of the crush) of initial cell dimension occurs; or

c) A force of 1000 times the weight of cell is reached.

Exception No. 4: For cells whose weight is greater than 500 g (1.1 lbs), the maximum temperature of the heating test shall be held for 30 min rather than 10 min.

Exception No. 5: The requirements outlined in Annex B may be used instead of the Standard for Lithium Batteries, UL 1642 for lithium ion cells and Exception No. 1 – 3 above.

Exception No. 6: The sample numbers for cell testing are to be reduced from 5 samples per test to 2 samples per test.

16.3 Nickel based cells shall comply with the cell requirements in the Standard for Household and Commercial Batteries, UL 2054 per Table 6 with modifications as outlined in Exception No. 1 – 6 below.

Exception No. 1: The overall dimensions of the projectile test aluminum test screen may be increased from those outlined in the Standard for Household and Commercial Batteries, UL 2054 to accommodate large cells intended for EV applications but the flat panels of the test screen shall not exceed a distance of 305 mm (12 in) from the cell in any direction.

Exception No. 2: The overall external resistance for the short circuit test shall be less than or equal to 20 mΩ.

Exception No. 3: The crush test shall be a bar crush test rather than a flat plate crush using a bar with a 15-cm (5.9-in) diameter. The force is to be to be applied until one of the following occurs first:

a) A voltage (OCV) drop of one-third of the original cell voltage occurs; or

b) A deformation of 15% or more (in the direction of the crush) of initial cell dimension occurs; or

c) A force of 1000 times the weight of cell is reached.

Exception No. 4: For cells whose weight is greater than 500 g (1.1 lbs), the maximum temperature of the heating test shall be held for 30 min rather than 10 min.

Exception No. 5: The sample numbers for cell testing are to be reduced from 5 samples per test to 2 samples per test.

Exception No. 6: Nickel based cells that are sealed and formed as part of a monobloc battery, need only comply with the test requirements of this standard as part of the assembled battery/module.

Table 5 – Cell Tests from UL 1642
(See 16.2)

UL 1642 test	UL 1642 reference
Short-Circuit Test	Section 10
Abnormal Charging Test	11.7 – 11.10
Crush Test	Section 13
Impact Test	Section 14
Shock Test	Section 15
Vibration Test	Section 16
Heating Test	Section 17
Temperature Cycling Test	Section 18
Low Pressure (Altitude Simulation) Test	Section 19
Projectile Test	Section 20

Table 6 – Cell Tests from UL 2054
(See 16.3)

UL 2054 test	UL 2054 reference
Short-Circuit Test	9.1 – 9.6
Abnormal Charging Test	10.7 – 10.9
Crush Test	Section 14
Impact Test	Section 15
Shock Test	Section 16
Vibration Test	Section 17
Projectile Test	Section 22
Heating Test	Section 23
Temperature Cycling Test	Section 24

25.3 The test is to continue until ultimate results occur. Ultimate results are considered to have occurred when one of the following occurs:

a) The sample charging is terminated by the protective circuitry whether it is due to voltage or temperature controls. The DUT is monitored per 18.5 and 20.2; or

b) Where an automatic interrupt function fails to operate, or no such function for the charging is provided and the DUT is charged to 110% of its rated charge capacity or a manufacturer-specified limit. (reaching 110% of the rated charge capacity or the manufacturer-specified charging limit would be considered as a failure of the overcharge evaluation); or

c) EESA failure occurs as evidenced by explosion, fire.

31.2.1 As an exception to the method outlined in the Standard for Electrically Propelled Road Vehicles – Safety Specifications – Part 1: On-Board Rechargeable Energy Storage System (RESS), ISO 6469-1, an insulation resistance test using a dc voltage applied to the circuit under test may be conducted. For this method, the insulation resistance is to be measured using a megohmmeter after application of a dc voltage for 1 min that is higher than the circuit under test. (i.e. at least have the working voltage of the high voltage dc bus or circuit under test if higher).

31.5 For both (a) and (b) of 31.2 and 31.2.1, the isolation resistance divided by the maximum working voltage of the circuit under test, shall be at least 100 Ω/V for dc and 500 Ω/V for ac or for circuits containing both ac and dc parts.

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ANNEX C (NORMATIVE) Electrochemical Potentials

Preface

This is the common UL and ULC Standard for Batteries for Use In Electric Vehicles. It is the First edition of CAN/ULC-S2580 and the Second edition of ANSI/UL 2580.

This Joint Standard was prepared by Underwriters Laboratories Inc., ULC Standards, and the Technical Committee on Batteries for Use in Electric Vehicles (EVs). The standard was formally approved by the UL/ULC Technical Committee on Batteries for Use in Electric Vehicles (EVs). The efforts and support of the Technical Committee are gratefully acknowledged.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Annex A, Annex B, and Annex C are identified as normative, as such, form mandatory parts of this Standard.

> **Note:** *Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.*

Level of Harmonization

This Standard is published as an identical standard between UL and ULC Standards. An identical standard is a standard that is the same in technical content except for conflicts in Codes and Governmental Regulations. Presentation shall be word for word except for editorial changes.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard shall be based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

A INTRODUCTION

1 Scope

1.1 These requirements cover electrical energy storage assemblies such as battery packs and combination battery pack-electrochemical capacitor assemblies and the subassembly/modules that make up these assemblies for use in electric-powered vehicles as defined in this standard.

1.2 This standard evaluates the electrical energy storage assembly's ability to safely withstand simulated abuse conditions and prevents any exposure of persons to hazards as a result of the abuse. This standard evaluates the electric energy storage assembly and modules based upon the manufacturer's specified charge and discharge parameters at specified temperatures. It does not evaluate the assembly's interaction with other control systems within the vehicle.

1.3 This standard does not evaluate the performance or reliability of these devices.

1.4 This standard does not include requirements for the evaluation of batteries for light electric vehicles such as electrical assist bicycles, wheel chairs, electric scooters and similar devices as defined in the Standard for Batteries for Use In Light Electric Vehicle (LEV) Applications, UL 2271 / CAN/ULC-S2271.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this Standard shall comply with the requirements for that component. See Annex A for a list of Standards covering components generally used in the products covered by this Standard. A component shall comply with the Standards of CSA or UL Standards as appropriate for the country where the product is to be used.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard; or

b) Is superseded by a requirement in this standard.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information. The values given in SI (metric) units shall be normative.