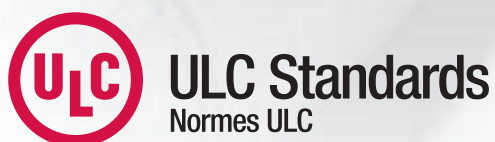




CAN/ULC-S8753-13-R2018 (Reaffirmed 2018)

STANDARD FOR FIELD-REPLACEABLE LIGHT EMITTING DIODE (LED) LIGHT ENGINES



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ANSI/UL 8753-2018 (R2018)



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Standard for Field-Replaceable Light Emitting Diode (LED) Light Engines, CAN/ULC-S8753-13-R2018

First Edition, Dated July 2013

Summary of Topics

This revision of CAN/ULC-S8753 is being issued to update the title page to reflect the reaffirmation of this First Edition National Standard of Canada. No changes in requirements are involved.

The requirements are substantially in accordance with Proposal(s) on this subject dated February 16, 2018.

PLEASE NOTE THAT CERTAIN CODES MAY REFER TO A SUPERSEDED VERSION OF THIS STANDARD. IN THOSE INSTANCES, THE RELEVANT VERSIONS ARE AVAILABLE FOR PURCHASE.

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Prepared by:



ULC Standards
CAN/ULC-S8753-13-R2018
First Edition



Underwriters Laboratories Inc.
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First Edition

Standard for Field-Replaceable Light Emitting Diode (LED) Light Engines

July 31, 2013

(Title Page Reprinted: August 3, 2018)



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This ANSI/UL Standard for Safety consists of the First Edition including revisions through August 3, 2018.

The most recent designation of ANSI/UL 8753 as a Reaffirmed American National Standard (ANS) occurred on August 3, 2018. 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): 29.140.01; 29.140.40; 31.080.10

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

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The First Edition of this ULC Standard was based on, and superseded, the First Edition of Subject 8753.

This CAN/ULC-S8753 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

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CONTENTS

Preface	11
1 Scope	12
2 Reference Publications	12
3 Definitions	13
4 General Requirements	15
4.1 Components	15
4.2 Units of measurement	16
4.3 Assembly and packaging	16
4.4 Principles	16
5 Mechanical Construction	18
5.1 Enclosures	18
5.2 Openings	18
5.3 Polymeric materials	18
5.4 Mass	19
5.5 Defined-fit system	20
6 Electrical Construction	21
6.1 Light engine bases	21
6.2 Current-carrying parts	21
6.3 Printed circuit boards	22
6.4 Integral LED drivers	22
6.5 Spacing of electrical parts	23
6.6 Accessibility of live parts	24
6.7 LED arrays and modules	25
6.8 Grounding	25
6.9 Polarization	26
7 Environmental Locations	26
7.1 Dry locations	26
7.2 Damp locations	26
7.3 Wet locations	26
8 Tests	27
8.1 General	27
8.2 Input measurements	28
8.3 Leakage-current test	28
8.4 Temperature test	28
8.5 Dielectric voltage-withstand test	30
8.6 Harmonic distortion test	30
8.7 Drop test	30
8.8 Mold-stress relief conditioning	31
8.9 Deflection test	31
8.10 Tests of dimmer circuits	31
8.11 Humidity conditioning	32
8.12 Water spray test	32
8.13 Cold drop test	32
8.14 Abnormal condition tests – light engine	32
8.15 Millivolt drop test	33
8.16 Mechanical cycling test	33
8.17 Abnormal overload test	33
8.18 Grounding contact test	34
8.19 Abnormal temperature test	34

8.20	15-VA available power measurement test	35
8.21	Dimensional conformity tests	36
9	Test Apparatus	36
9.1	General	36
9.2	Instrumentation	36
9.3	Thermocouples	37
9.5	Test floor	37
9.6	Articulated probe	37
9.7	Water spray apparatus	37
9.8	Cheesecloth	37
9.10	Abnormal temperature test setup	38
10	Device Markings	38
10.1	General	38
10.2	Identifications and ratings	39
10.3	Instructions	40
11	TABLES	41
12	FIGURES	45

ANNEX A (NORMATIVE) – Reference Standards

ANNEX B (NORMATIVE) Manufacturing and Production Tests

B.1	Dielectric Voltage-Withstand Test	B1
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ANNEX C (NORMATIVE) Markings – French Translation

Preface

This is the common UL and ULC Standard for Field-Replaceable Light Emitting Diode (LED) Light Engines. It is the First edition of both CAN/ULC-S8573 and ANSI/UL 8753.

This Joint Standard was prepared by Underwriters Laboratories Inc., ULC Standards, and the Technical Committee on Field-Replaceable LED Light Engines. The standard was formally approved by the UL/ULC Technical Committee on Field-Replaceable LED Light Engines. 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. Annex D is an informative (non-mandatory) part of this Standard and is not part of the ANSI approved 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.

1 Scope

1.1 This standard specifies the requirements applicable to field replaceable light-emitting diode (LED) light engines rated up to 347 volts (nominal) and provided with integral lamp bases of other than the screw, bayonet, or pin type configurations typically found on incandescent or fluorescent light sources.

1.2 This standard does not cover:

- a) LED devices that are integral components and which form a non-replaceable part of a luminaire, such that they cannot be tested separately from the luminaire;
- b) LED lamps or light engines with screw, bayonet or pin-type bases, intended as replacements for incandescent or fluorescent lamps; or
- c) LED light engines having a means of supply connection other than the lamp bases allowed by 1.1, such as custom wiring harnesses.

1.3 This standard does not cover the holders, sockets, and the like to which these LED light engines are intended to be mounted. Such products are covered by UL 8754 / ULC-S8754.

2 Reference Publications

2.1 See Annex A for a list of publications referenced in this standard. Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

2.2 Where any clauses from other standards are referenced in this standard, this is to be interpreted as meaning that all requirements of the referenced clauses apply, except where it is clearly non-applicable to the product being evaluated, or superseded by requirements in this standard.

2.3 Throughout this standard, the CSA and ULC standard references apply to products intended for use in Canada, while the UL standard references apply to products intended for use in the United States. Combined references are commonly separated by a slash (“ / ”).

2.4 For the purposes of this standard, referenced text in the CSA C22.2 No. 1993 / UL 1993, using the word “ballast” is understood to apply to LED drivers, while text using the word “lamp” is understood to apply to LED light engines.

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3 Definitions

3.1 The following terms and definitions apply in this standard.

3.2 CIRCUIT, CLASS 2 –

In Canada:

A circuit for which the isolation and electrical output characteristics comply with either CAN/CSA C22.2 No. 223 or both CAN/CSA C22.2 No. 66.1 and the Class 2 requirements in CAN/CSA C22.2 No. 66.3, and that is therefore eligible to be installed as such in accordance with Section 16 of CSA C22.1.

In the United States:

A circuit for which the isolation and electrical output characteristics comply with UL 1310 or the Class 2 requirements in UL 5085-3 and that is therefore eligible to be installed as such in accordance with Article 725 of ANSI/NFPA 70.

3.3 CIRCUIT, ISOLATED LOW VOLTAGE, LIMITED ENERGY (LVLE) – A circuit for which the isolation and electrical output characteristics comply with CAN/CSA-C22.2 No. 250.13 / UL 8750 requirements for LVLE circuits.

3.4 CIRCUIT, LIMITED POWER SOURCE (LPS) – A circuit for which the isolation and electrical output characteristics comply with CAN/CSA-C22.2 No. 60950-1 / UL 60950-1 requirements for LPS circuits.

3.5 DEVICE – A general term for a light engine. A more specific term is used if a requirement applies only to a certain type of device.

3.6 ENCLOSURE – A material or housing provided to enclose parts and components that can involve a risk of fire or electric shock.

3.7 INSULATION, BASIC – The insulation necessary to provide basic protection against the risk of electric shock. This insulation may be in the form of vulcanized fiber, an inorganic or polymeric material, or an air gap.

3.8 INSULATION, DOUBLE – An insulation system comprised of both basic insulation and supplementary insulation.

3.9 INSULATION, OPERATIONAL – Insulation that is necessary for the correct operation of the equipment but that is not relied upon for protection against electric shock.

3.10 INSULATION, REINFORCED – A single insulation system with such mechanical and electrical qualities that it, in itself, provides the same degree of protection against the risk of electric shock as does double insulation.

Note: The term “single insulation system” does not necessitate that the insulation must be in one homogeneous piece. The insulation system may comprise two or more layers that cannot be tested as supplementary or basic insulation.

3.11 INSULATION, SUPPLEMENTARY – An independent insulation provided in addition to the basic insulation to provide protection against the risk of electric shock in case of breakdown of the basic insulation.

3.11.1 LAMP BASE – The part of the device that engages the lampholder and makes contact with the electrical circuits of the lampholder.

3.12 LED ARRAY (LED MODULE) – An assembly of one or more LED packages or dies on a printed circuit board or substrate, possibly with optical elements and additional thermal, mechanical, and electrical interfaces that are intended to connect to the load side of an LED driver.

3.13 LED DRIVER (CONTROL GEAR) – A component comprised of a power source and control circuitry designed to operate an LED array or module. The control circuitry can range from a simple (bridge rectifier and resistor) to complex (incorporating power factor control, constant voltage or constant current outputs, and the like).

3.14 LED LENS, INTEGRAL – The optical element integral to an LED package that redirects the light from the LED die(s). Optical assemblies secured to the LED package after package manufacture (such as during the assembly of an LED array) are not considered integral LED lenses.

3.15 LED LIGHT ENGINE (LIGHT ENGINE) – An integrated assembly comprised of an LED array (LED module), LED driver, and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a custom or industry-standard lamp base. This lamp base shall be of a type not typically found on incandescent or fluorescent light sources.^a

^aWith permission from ANSI/IES RP-16, Nomenclature and Definitions for Illuminating Engineering, by the Illuminating Engineering Society of North America.

3.16 LED PACKAGE – A discrete assembly of one or more LED dies that includes wire bond or other type of electrical connections, possibly with an optical element and thermal, mechanical and electrical interfaces.

3.17 LIVE PART – A metal or other conductive part that, during intended use, has an electrical potential difference with respect to earth ground or any other conductive part. By definition, the grounded (or neutral) mains supply conductor is considered to be a live part.

3.18 LIVE PART, HAZARDOUS – Any live part in which potential can represent a risk of electric shock under any normal or single-fault operating condition. By definition, the grounded (or neutral) mains supply conductor is considered to be a hazardous live part.

3.19 LOCATION, DAMP – An interior or exterior location that is normally or periodically subject to condensation of moisture, including partially protected locations. The interior of a luminaire or sign intended for wet locations is considered a damp location.

Note: Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold storage warehouses.

3.20 LOCATION, DRY – A location not normally subject to dampness, but may include a location subject to temporary dampness, as in the case of a building under construction, provided ventilation is adequate to reduce the likelihood of accumulation of moisture.

3.21 LOCATION, WET – A location in which water or other liquid can drip, splash, or flow on or against a device.

Note: Examples include vehicle washing areas, showers, or unprotected locations exposed to weather.

3.22 LUMINAIRE, RECESSED – A luminaire that is designed to be either wholly or partially recessed in a mounting surface.

3.23 POLARIZATION (POLARIZED) – A permanent construction feature (e.g., keyed base, rejection pin) that prevents a light engine from engaging its lampholder in more than one electrical configuration (not related to polarization of light).

3.24 SYSTEM, DEFINED-FIT – A group of modular lighting components (e.g., lampholders, light engines, associated mounting and thermal control hardware) defined and evaluated as a unique lighting system for use in luminaires and similar equipment (see 5.5).

3.25 TEST POINT, CASE TEMPERATURE (t_C) – A temperature limit assigned by the manufacturer to a specific location marked on the outer surface of the light engine that is not to be exceeded under normal operating conditions.

3.26 THERMAL INTERFACE – The surface on a light engine intended to make physical contact with a non-integral heat sink, so as to transfer heat away from the light engine. Because of its function, this surface would be inaccessible to contact when the light engine is installed in the end product with its intended lampholder.

3.27 WORKING VOLTAGE – The highest voltage to which an electrical component or insulating barrier could be subjected when the equipment is operating under any condition of normal use.

4 General Requirements

4.1 Components

4.1.1 Except as indicated in 4.1.2, 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 standard(s) appropriate for the country where the product is to be used.

4.1.2 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.

4.1.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

4.2 Units of measurement

4.2.1 The values given in SI (metric) units shall be normative. Any other values are for information only.

4.2.2 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4.2.3 All values of voltage and current are root mean square (rms) values unless otherwise noted.

4.3 Assembly and packaging

4.3.1 A device shall be completely assembled and wired with each electrical component mounted in place and with each splice and connection completed when shipped from the factory.

4.4 Principles

4.4.1 Risk of electric shock

4.4.1.1 Risk of electric shock can occur due to a number of factors, including:

- a) Voltage between conductive parts,
- b) Current available,
- c) Whether the current is pulsed or continuous,
- d) Frequency of voltage and current,
- e) Pathway through the human body, and
- f) Skin resistance.

4.4.1.2 Risk of electric shock is usually defined only in terms of electrical voltage, current, and frequency. Throughout this standard, voltage between parts greater than 30 V rms, 42.4 V peak (and DC) – half of these limits for wet locations – is considered to be a risk of electric shock. When the current available is greater than 0.5 mA rms for perception and greater than 5.0 mA rms for let-go, for direct current and alternating current up to 1 kHz, the current is considered to be a risk of electric shock.

4.4.1.3 A passive network connected across the meter input terminals of a measuring instrument compensates for the pathway body impedance and frequency. The test method and meter network are described in CSA C22.2 No. 0 / UL 101.

4.4.1.3.1 By definition, live parts within the following circuits are not considered to be a risk of electric shock for the purposes of this standard:

- a) Class 2 circuits complying with CAN/CSA C22.2 No. 223 / UL 1310,
- b) Low-voltage, limited-energy (LVLE) circuits complying with CAN/CSA-C22.2 No. 250.13 / UL 8750, and
- c) Limited Power Sources (LPS) complying with CAN/CSA-C22.2 No. 60950-1 / UL 60950-1.

4.4.2 Risk of fire

4.4.2.1 The risk of fire can occur when electrical energy is converted to heat, and the heat is entrapped. It is difficult to define the energy level in terms of electrical parameters alone because the degree of entrapped heat will determine whether or not there would be combustion. In addition, risk of fire can be abated by a suitable enclosure (fire can be confined by the enclosure).

4.4.2.2 There are several possible indicators that are used while conducting a given test. Throughout this standard, the check for fire hazard is either by a specific temperature limit or a change of an indicator. For example, one fire indicator is a layer of cheesecloth, and its change of state occurs when it ignites and causes combustion.

4.4.2.3 Throughout this standard, an energy level of 15 VA is considered to be a sufficient level to support a fire. A circuit having less than 15 VA of available power, as determined by the 15-VA Available Power Measurement Test (see 8.20), is not considered to be a fire-hazardous circuit.

4.4.2.3.1 By definition, live parts within the following circuits are not considered to be a risk of fire for the purposes of this standard:

- a) Class 2 circuits complying with CAN/CSA C22.2 No. 223 / UL 1310,
- b) Low-voltage, limited-energy (LVLE) circuits complying with CAN/CSA-C22.2 No. 250.13 / UL 8750, and
- c) Limited Power Sources (LPS) complying with CAN/CSA-C22.2 No. 60950-1 / UL 60950-1.

4.4.2.4 The requirements for enclosures are described in Mechanical Construction, Section 5.

5 Mechanical Construction

5.1 Enclosures

5.1.1 Enclosures shall have the strength and rigidity to resist the abuses to which they are subjected, without increasing the risk of fire, electric shock, or injury to persons due to a reduction of the required spacing for live parts or the loosening or displacement of live parts.

5.1.2 An enclosure shall be of metal or of a polymeric material that complies with 5.3.

5.1.3 A metal enclosure shall comply with the minimum thickness specified in Table 1.

5.1.4 An enclosure constructed of iron or steel shall be protected against corrosion by plating, painting, or the equivalent on both inside and outside surfaces.

5.1.5 Lamp enclosures can be partially or entirely made of glass. The suitability of the glass shall be determined by the mechanical tests outlined in Tests, Section 8.

5.1.6 Housings and compartments containing only Class 2, LPS or LVLE circuits are not required to comply with 5.1.

5.2 Openings

5.2.1 An enclosure shall not have openings wider than 2 mm (0.078 in), unless they do not permit a 2 mm (0.078 in) diameter rod of any length to contact live parts. The electrical contacts used to engage its intended lampholder are not required to comply.

Exception: Contact is permitted with live parts that are not considered to be a risk of fire.

5.2.2 No openings are permitted on devices designated for wet locations.

5.3 Polymeric materials

5.3.1 A polymeric material used to enclose electrical parts, or used to provide direct or indirect support of live parts, shall comply with the requirements for portable equipment specified in CAN/CSA-C22.2 No. 0.17 / UL 746C, and with the requirements of 5.3.2 – 5.3.10.

Exception: Polymeric materials solely used to enclose an LED array may alternatively comply with the pertinent polymeric requirements in CAN/CSA-C22.2 No. 250.13 / UL 8750.

5.3.2 A polymeric material used to enclose electrical parts shall have a Relative Thermal Index (RTI), including electrical and mechanical, with impact properties of at least the temperature measured during the Temperature Test of 8.4, unless the measured temperature is less than 65°C (149°F).

5.3.3 A polymeric material used as an enclosure shall have a flammability rating of 5-VA, 5-VB, or V-0 in accordance with CAN/CSA-C22.2 No. 0.17 / UL 94.

Exception: Polymeric materials used solely to enclose electrical parts that are not part of a fire-hazardous circuit may have a minimum flammability rating of HB for this purpose.

5.3.4 A polymeric enclosure of a device marked for wet location use shall comply with the ultraviolet light exposure test specified in CAN/CSA-C22.2 No. 0.17 / UL 746C.

5.3.5 With respect to CAN/CSA-C22.2 No. 0.17 / UL 746C, the following tests are not required to be conducted:

- a) The abnormal operation and severe conditions test,
- b) The input after mold-stress relief distortion test, and
- c) The volume resistivity test.

5.3.6 A polymeric material shall comply with the Mold-Stress Relief Conditioning Test of 8.8.

5.3.7 A polymeric material used for direct support of live parts or as electrical insulation shall have the hot wire ignition (HWI), the comparative tracking index test (CTI), and high current arc ignition (HAI) values tabulated in Table 2.

5.3.8 A polymeric sheet insulating material used between a live part and an accessible non-current-carrying metal part, such as a heat sink, shall comply with the applicable requirements of 5.3 and is considered basic insulation.

5.3.9 A conductive coating applied to a surface such as the inside surface of a cover, enclosure, reflector, or the like shall comply with the requirements for metallized parts in CAN/CSA-C22.2 No. 0.17 / UL 746C.

Exception: This does not apply to coatings applied to compartments or in locations where the electrical parts would represent neither a risk of fire nor a risk of electric shock if they were to come into contact with conductive debris under any condition of use.

5.3.10 Adhesives used to secure the enclosure of a product that poses a risk of electric shock or risk of fire shall comply with the adhesive support test of CAN/CSA-C22.2 No. 250.13 / UL 8750. Fusion techniques, such as solvent cementing, ultrasonic welding, electromagnetic induction, and thermal welding are not subject to this test.

5.4 Mass

5.4.1 The mass of a light engine shall not exceed 200 g.

Exception No. 1: The mass of a light engine that is part of a defined-fit system shall not exceed the mass limit of its system.

Exception No. 2: The mass limit does not apply to a light engine intended for special use applications, where the light engine is used exclusively with a holder that has been evaluated to support it.