

May 31, 2011

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SUBJECT 1598C

OUTLINE OF INVESTIGATION

FOR

LIGHT-EMITTING DIODE (LED) RETROFIT LUMINAIRE CONVERSION KITS

Issue Number: 2

MAY 31, 2011

Summary of Topics

The second issue of the Outline of Investigation for Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits, Subject 1598C, which includes miscellaneous clarifications becomes effective July 16, 2012.

The following table lists the future effective dates with the corresponding reference.

Future Effective Date	Reference
July 16, 2012	Entire Outline of Investigation

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INTRODUCTION

1 Scope

Section 1 effective July 16, 2012

1.1 These requirements apply to light-emitting diode (LED) retrofit luminaire conversion kits that are intended to replace existing light sources and systems including incandescent, fluorescent, induction, and high intensity discharge (HID) light sources in previously installed luminaires that already comply with the requirements in the Standard for Luminaires, UL 1598. The kits are intended for use on:

- a) Luminaires where specific luminaire model or part numbers are identified in the kit installation instructions; or
- b) One or more generic type luminaires that meet specific criteria identified in the installation kit instructions.

1.2 This outline of investigation contains requirements that supplement the luminaire requirements contained in the Standard for Luminaires, UL 1598, that apply to the retrofit kit and the luminaire.

1.3 LED retrofit kits covered by these requirements include but are not limited to LED lamps and arrays, LED control modules, LED drivers, LED power supplies, wiring, lampholders, brackets, wire connectors, reflectors, diffusers, and other associated mechanical, electrical, or optical devices.

1.4 This outline of investigation does not cover luminaire reflector kits covered by the Standard for Supplemental Requirements for Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires, UL 1598B.

1.5 This outline of investigation does not cover luminaire conversion lamps that are intended to replace existing lamps without any modification, rewiring, or component replacement in the luminaire other than direct replacement of the lamp using the existing lampholder. Requirements for these direct replacement lamps are specified in the Standard for Self-Ballasted Lamps and Lamp Adapters, UL 1993.

1.6 This outline of investigation does not cover retrofit luminaire conversion kits for amateur movie lights; aquarium lights, cabinet lights, decorative lighting strings, combination fan/IR lamps used for heating, electric signs, exit signs, junction boxes for swimming pool fixtures, lamp adapters, low-level path marking and lighting systems, low-voltage landscape lighting, low voltage lighting fixtures for use in recreational vehicles, low voltage marine lighting, luminaires for hazardous locations, luminaires for recreational vehicles, marine navigational lights, marine-type fixtures, portable electric displays, portable hand lamps, portable luminaires, portable sun/heat lamps, self-ballasted lamps and lamp adapters, stage and studio luminaires, submersible luminaires, swimming pool luminaires, temporary lighting strings, therapeutic lamps, track lighting systems, under-cabinet lights and cord-connected under-cabinet lights, and unit equipment for emergency lighting.

2 Components

Section 2 effective July 16, 2012

2.1 Except as indicated in 2.2, a component of a product covered by this outline of investigation shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this outline of investigation.

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

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this outline of investigation; or
- b) Is superseded by a requirement in this outline of investigation.

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

3 Units of Measurement

Section 3 effective July 16, 2012

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

4 Undated References

Section 4 effective July 16, 2012

4.1 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.

5 Glossary

Section 5 effective July 16, 2012

5.1 For the purposes of this outline of investigation, the following definitions apply.

5.2 RETROFIT LUMINAIRE CONVERSION – The act of modifying, with additional parts, a luminaire that was already manufactured and in service in order to convert the luminaire to a LED light source, from an incandescent, fluorescent, or high intensity discharge light source. For purposes of this outline of investigation, direct replacement of an incandescent to LED lamp, without any electrical or mechanical changes, is not considered to be a luminaire conversion.

5.3 RETROFIT KIT – In the context of these requirements, a kit includes all component parts needed, including instructions, for retrofit luminaire conversion.

MECHANICAL CONSTRUCTION

6 General

Section 6 effective July 16, 2012

6.1 After installation of the retrofit kit, a luminaire shall comply with the requirements in Mechanical Construction, Section 5, of the Standard for Luminaires, UL 1598.

6.2 After installation of a retrofit kit, all components of the retrofit kit and all components of the luminaire that were affected by the installation of the retrofit kit shall be secured in place so that lamp replacement, inspection of splices to the branch-circuit supply wires, and routine maintenance will not loosen components or joints in the assembly.

7 Polymeric Materials

Section 7 effective July 16, 2012

7.1 A polymeric material serving to complete the enclosure required in Enclosures, Section 5.3, of the Standard for Luminaires, UL 1598, or providing structural support for any electrical component or for any non-electrical component weighing more than 3 ounces (85 g) shall comply with the requirements in Polymeric Materials, Section 5.7, of UL 1598.

7.2 A metallized polymeric reflector that is spaced within 3 inches (76.2 mm) from any lampholder, lamp contact, lampholder lead, wiring, or other electrical component that are below the metallized surface shall comply with the applicable requirements for metallized plastic parts in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

8 Adhesives

Section 8 effective July 16, 2012

8.1 Except as noted in 8.2, an adhesive or adhesive tape shall not be relied upon to secure any part to a panel, bracket, or component of a luminaire.

8.2 An adhesive or adhesive tape that complies with the requirements for temperature, humidity, and indoor cyclic conditioning for adhesives in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, may be relied upon to secure a part of a retrofit kit to another part of a retrofit kit. With regard to the temperature conditioning, a normal operating temperature of 90°C (194°F) shall be assumed unless temperature testing of the luminaire/kit combination indicates that a lower normal operating temperature applies. This requirement applies to all adhesives including an adhesive used to secure a metal foil reflecting surface or a laminate reflecting surface to the reflector base material.

9 Metal Thickness

Section 9 effective July 16, 2012

9.1 Metal parts of a retrofit kit and those portions of a luminaire affected by installation of the retrofit kit shall comply with the requirements in Metal Thickness for Enclosures, Section 5.5, of the Standard for Luminaires, UL 1598.

ELECTRICAL CONSTRUCTION

10 General

Section 10 effective July 16, 2012

10.1 After installation of a retrofit kit, a luminaire shall comply with the requirements in Electrical Construction, Section 6, of the Standard for Luminaires, UL 1598.

11 Grounding

Section 11 effective July 16, 2012

11.1 Except as noted in 11.2, an electrically conductive part of the retrofit kit spaced within 3 inches (76.2 mm) from all lampholders, lamp contacts, lampholder leads, wiring, and other electrical components shall be grounded.

11.2 For dead metal parts such as heat sinks that are integral to the lamp, the need for grounding shall be determined by the basic lamp requirements in the Standard for Self-Ballasted Lamps and Lamp Adapters, UL 1993, and as specified in Supplement SA of this outline of investigation that specifies requirements for LED tubular lamps.

11.3 A connector provided with a contact, or pole, for grounding shall be arranged so the grounding connection is the first to make and the last to disconnect.

12 Wiring and Conductors

Section 12 effective July 16, 2012

12.1 Supplemental wiring including wires for interconnection of kit components and connectors required for installation of the retrofit kit shall be included in the kit.

12.2 The supplemental wiring provided with the retrofit kit shall comply with applicable requirements in Electrical Construction, Section 6, of the Standard for Luminaires, UL 1598. Wiring requirements do not apply to integral leads of luminaire components evaluated for use in the retrofit kit.

12.3 Connectors shall be suitable for the number and size of conductors to be spliced and comply with the requirements in either the Standard for Splicing Wire Connectors, UL 486C, or the Standard for Insulated Multi-Pole Splicing Wire Connectors, UL 2459. See also 11.3 regarding configuration requirement for connector with a contact or pole for grounding.

13 LED Components

Section 13 effective July 16, 2012

13.1 Component parts of light emitting diode (LED) equipment, including LED drivers, controllers, arrays, modules, and packages shall comply with the Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750.

13.2 LED lamps included in the retrofit kit shall comply with the the Standard for Self-Ballasted Lamps and Lamp Adapters, UL 1993.

13.3 Tubular LED lamps that are intended to replace fluorescent lamps and use existing lampholders only for mechanical support and are powered by separate supply connections shall comply with:

a) the requirements for tubular lamps in the Standard for Self-Ballasted Lamps and Lamp Adapters, UL 1993, and

b) the requirements in Supplement SA of this outline of investigation including all of the tests in Supplement SA except for the tests in Risk of Electric Shock – Relamping, Section SA25, Isolation of Lamp Pins, Section SA26, and Mis-Application of Lamp Supply Connections, Section SA27.

14 Power Supplies and Transformers

Section 14 effective July 16, 2012

14.1 General

14.1.1 Power supplies and transformers are required to operate within their rated input and output ratings.

14.1.2 Power supplies and transformers are permitted to have more than one separate Class 2 or LPS outputs.

14.2 Power supplies

14.2.1 Except for features specified in this outline of investigation, power supplies shall comply with the Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products, UL 8750.

14.3 Transformers

14.3.1 Except for features specified in this outline of investigation, a transformer shall comply with the requirements of one of the following standards:

- a) The Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1, and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3;
- b) The Standard for Transformers and Motor Transformers for Use in Audio-, Radio- and Television-Type Appliances, UL 1411;
- c) The Standard for Low Voltage Transformers – Part 2: General Purpose Transformers, UL 5085-2; or
- d) The Standard for Dry-Type General Purpose and Power Transformers, UL 1561.

14.4 LED arrays and modules

14.4.1 LED arrays and LED modules shall comply with the requirements in the Standard for Light Emitting Diode (LED) Equipment for Use In Lighting Products, UL 8750.

PERFORMANCE

15 General

Section 15 effective July 16, 2012

15.1 Installation of the retrofit kit on the intended luminaire when conducted in accordance with the installation instructions provided with the retrofit kit and using components and materials provided with the kit shall facilitate continued compliance of the retrofitted luminaire with the requirements in the Standard for Luminaires, UL 1598. Compliance with this requirement includes, but is not limited to, grounding and bonding, wire routing for mechanical protection of insulation, segregation of circuits such as line and Class 2 wiring, suitability of existing leads (length) for splicing, and any wire routing or mechanical issues that may be a result of abandoned components during the retrofit.

15.2 Compliance shall take into consideration all modifications made to the luminaire as a result of the luminaire retrofit conversion. For specific model conversions, evaluation of compliance with this outline of investigation and the Standard for Luminaires, UL 1598, would include a review and, if necessary, a trial installation of the retrofit kit using a sample of the specific luminaire installed as intended.

15.3 Compliance of a retrofit kits when intended for use with defined generic types of luminaires shall include evaluation of any necessary adaptations to address all potential luminaire construction variables within the scope of the luminaire as defined in the installation instructions.

MARKING AND INSTRUCTIONS

16 General

Section 16 effective July 16, 2012

16.1 A retrofit kit shall be legibly marked using one of the following methods, in accordance with Table 16.1:

- a) Lettering on a pressure-sensitive label;
- b) Paint stenciled lettering;
- c) Ink-stamped machine lettering;
- d) Ink-hand-stamped lettering;
- e) Indelibly printed lettering;
- f) Die-stamped lettering;
- g) Embossed lettering;
- h) Molded or cast lettering; or
- i) Etched lettering in metal.

16.2 "Verbatim," shown in the column labeled text of Table 16.1 indicates that the marking shall consist of only the exact words shown or a marking including those words and conveying the original intent. Alternative wording for other markings in Table 16.1 are not prohibited, subject to evaluation.

Table 16.1
List of required markings

Item	Installation instructions	Text	Format ^a	Reference
1.1	WARNING – Risk of fire or electric shock. Luminaire wiring and electrical parts may be damaged when drilling for installation of LED retrofit kit. Check for enclosed wiring and components.		S24-L3 and S24-L5	18.1, 19.1.8
1.2	WARNING – Risk of fire or electric shock. LED Retrofit Kit installation requires knowledge of luminaires electrical systems. If not qualified, do not attempt installation. Contact a qualified electrician.		S24-L5	19.1.5
1.3	WARNING – Risk of fire or electric shock. Install this kit only in the luminaires that have the construction features and dimensions shown in the photographs and/or drawings.		S24-L5	19.1.5