



**Summary of Substantive Changes
between the
3rd edition, dated September 17, 2008, including updates through October 17, 2012,
and the
4th edition, dated August 28, 2018 of
UL 1598 “Luminaires”**

Presented to the IAPMO Standards Review Committee on January 7, 2018

General: Currently listed products may be affected by the changes to this standard. The major changes are:

- Expanded scope to include LED components and assemblies (see Sections 1.3, 2, 3, 5.7, 10, 11.6.4, 15.8)
- Included more CSA and UL Standards referenced in the standard and included the IAPMO UMC and the ICC IMC. (see Section 2)
- Expanded the electrical spacings permitted to include spacings from UL and CSA Standards (see Section 6.11)
- Added requirements for recessed luminaires that are installed with air handling spaces to comply with heat and smoke release protocols in accordance with the NEC, UMC, IMC or CAN codes (see Section 12.1)
- Added additional testing and marking for LED Type Non-IC (see Sections 12.7 and 12.8)
- Included an allowance for making luminaries with polymeric parts exposed to air-handling spaces (see Section 12.8)
- Added requirements for luminaries suitable for use in clothes closet storage spaces, including a temperature and impact test (see Section 13)
- Added conditions for the performance requirements of luminaries following the rain test and sprinkler test (see Section 17.5)
- Added a metal strength test for reduced spacings (see Section 17.42)
- Added figures for the testing added in Section 13 (see Figures 13.8.2.1, 13.8.2.2, and 13.8.2.3)
- Updated format for some markings (see Tables 20.1.1 and 20.1.2)

Section 1, Scope: Expanded scope to include LED components and assemblies as follows:

[1.3 Requirements applicable to light emitting diode \(LED\) components and subassemblies integral to a luminaire covered by this standard are provided in UL 8750 and CSA C22.2 No. 250.13.](#)

Section 2, Reference Publications: The following reference publications were added, deleted or revised as follows:

CSA (Canadian Standards Association) Group

[CAN/CSA-C22.2 No. 0-10 \(R2015\) General requirements - Canadian Electrical Code, Part II](#)

[CSA C22.2 NO. 0.2-16, Insulation coordination](#)

[C22.2 No. 250.13-17 Light emitting diode \(LED\) equipment for lighting applications](#)



UL (Underwriters Laboratories Inc.)

UL 840 Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment

UL 1012 Power Units Other Than Class 2

*UL 2043 Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories
Installed in Air-Handling Spaces*

UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products

IAPMO (International Association of Plumbing and Mechanical Officials)

2015 Uniform Mechanical Code

ICC (International Code Council)

2015 International Mechanical Code

ISA (The Instrumentation, Systems, and Automation Society)

ISA-MS 96.1-1982

Temperature Measurement Thermocouples

Section 3, Definitions: Revised the definitions of risk of electric shock and risk of fire and added additional definitions as follows:

Circuit, Isolated Low Voltage Limited Energy (LVLE) - a circuit supplied by a source with no direct electrical connection between input and output, such as provided by a transformer or optical isolator, and with output parameters as follows: source with a maximum output voltage of 42.4 V peak ac (30 V rms) or 60 V de, and a maximum output current limited to:

a) 8 Amps for 0 to 42.4 V peak ac, or 0 to 30 V de; or

b) 150NA, for a voltage between 30 and 60 V de.

LED (light emitting diode) - a solid-state component embodying a p-n junction, emitting optical radiation when excited by an electric current.

LED array (LED module) - an assembly of one or more LED discrete electronic components on a printed circuit board, typically with optics and additional thermal, mechanical, and electrical interfaces.

LED control module (LED controller) - electronic circuitry interposed between the power source and an LED array to dim, switch, or otherwise control the electrical energy to the LED array. The device does not contain a power source and is not connected directly to the branch circuit.

LED driver - a power source that adjusts the voltage or current to LEDs, ranging in complexity from a resistor to a constant voltage or constant current power supply. Also referred to as "Lamp Control Gear".

LED package - an assembly of one or more LED die that contains wire bond connections and can include an optical element and thermal, mechanical, and electrical interfaces. The package does not include a power source and is not connected directly to the branch circuit.

Light source, non-replaceable - a light source that requires removal of wiring to the light source, or tools to remove the light source from its installed position.

Luminaire, recessed, LED Type Non-IC inherently protected (evaluated for insulation contact) - an LED recessed luminaire that does not require a thermal protective device and that complies with the requirements for a Type IC, inherently protected luminaire.



Risk of electric shock - in Canada and the United States, a risk of electric shock exists between any two uninsulated conductive parts of a luminaire or between an uninsulated conductive luminaire part and earth ground if the continuous current flow through a 1500 Ω resistor in parallel with a 0.15 μ F capacitor connected between the two points exceeds 5 mA rms (7 mA peak) and if the open circuit voltage exceeds **30 V rms or 42.4 V peak** the following limits for dry, damp, and wet locations^a:

<u>Waveform Type</u>	<u>Maximum Voltage</u>	
	<u>Dry and Damp Locations</u>	<u>Wet Locations</u>
<u>Sinusoidal ac</u>	<u>30 V rms</u>	<u>15 V rms</u>
<u>Non-sinusoidal ac</u>	<u>42.4 V peak</u>	<u>21.2 V peak</u>
<u>dcb,c</u>	<u>60V</u>	<u>30V</u>

^a For a combined ac + dc waveform, the wet location voltage limit must be the non-sinusoidal ac limit where the dc voltage is no more than 10.45 V, and must be (16.5 + 0.225*dc voltage)V where the dc voltage is greater than 10.45 V. The dry and damp location voltage limit must be twice these amounts.
^b If the peak-to-peak ripple voltage on a dc waveform exceeds 10% of the dc voltage, the waveform must be considered a combined waveform per footnote a.
^c DC waveforms interrupted at frequencies between 10 and 200 Hz must be limited to 24.8 V in dry and damp locations, and 12.4 V in wet locations.

Risk of fire - a risk of fire exists **between two conductive parts if V_{max} , I_{max} , or VA_{max} exceeds Class 2 circuit limitations as defined in Section 725 of NEC, Section 16 of CEC, and Section 725 of NOM-001-SEDE in all electrical circuits except:**

- a) when V_{max} , I_{max} , or VA_{max} are within the Class 2 circuit limitations as defined in Section 725 of the NEC, Section 16 of the CEC, and Section 725 of NOM-001-SEDE; or
- b) an LVLE circuit, when contained within the luminaire.

User maintenance - a servicing operations, such as re-lamping ~~and~~ or cleaning of the inside surface of an optical part, expected to be carried out by untrained persons.

Notes:

- (1) A luminaire having a non-replaceable light source and a sealed optical chamber such that cleaning maintenance is not needed should be regarded as a luminaire that does not require "user maintenance."
- (2) A luminaire designed for mounting at a height greater than 3.6 m (12 ft) from the ground plane, such as in a parking lot or a street light, is an example of a luminaire where servicing is not expected to be carried out by untrained persons. This type of luminaire does not lend itself to "user maintenance."

Section 4, General Requirements: Expanded the general requirements to include requirements for Canada as follows:

4.1.5 (CAN) In Canada, general requirements applicable to these products are provided in CAN/CSA-C22.2 No. 0.

Section 5.3, Enclosures: Expanded the material requirements for enclosures to include metal, glass, ceramic, and polymeric material as follows:



5.3.2 An enclosure shall be constructed of metal (see Clause 5.5), glass (see Clause 5.16), ceramic [3 mm (0.118 in) minimum thickness], or a polymeric material (see Clause 5.7).

~~5.3.2~~ 5.3.3 All splices, open coil devices, capacitors, live parts (including traces on a printed circuit board having voltage levels that present a risk of shock or a risk of fire), leads or terminals for field connection of supply wires, and other arcing live parts shall be provided with an enclosure.

Section 5.7, Polymeric materials: Included LED in the polymeric materials as follows:

5.7.1.3 An LED lens or diffuser that serves as an enclosure where all live parts are insulated or spaced more than 0.8 mm (0.032 in) from the lens or diffuser shall have a minimum V-0 flammability rating or comply with the V-0 flame test of Clause 17.26 and shall comply with the minimum flammability requirement in Clause 5.7.1.2 (b) through (d).

Section 5.10, Mechanical joints and fastenings: Included glass assemblies to be tested in accordance with the loading test in Clause 17.15 as follows:

5.10.15 An assembly of glass and frame or glass and recessed trim, where the combination is secured to the luminaire using friction such as spring loaded clips, shall comply with the loading test in Clause 17.15.

Section 6.3, Lampholders: Clarified the requirements as follows:

6.3.3 A husk or sleeve made of treated cellulosic fibre, provided to electrically insulate the terminals and screwshell of a lampholder, shall be at least 0.8 mm (0.032 in) thick and shall be positively retained. If the husk or sleeve is not positively retained and the wire terminals of the lampholder are accessible with the husk or sleeve removed, they shall be additionally enclosed in accordance with Clause 5.3.

Section 6.11, Electrical Spacings: Expanded the electrical spacings permitted to include spacings from UL and CSA Standards as follows:

6.11.2 As an alternative to those spacings required in Clause 6.11.1, for locations other than for wiring terminals or spacings to a dead-metal conductive enclosure, spacings are permitted to be in accordance with UL 840 and CSA C22.2 No. 0.2. Overvoltage Category II applies to circuits directly connected to the branch circuit. Printed wiring boards are presumed to have a minimum CTI of 100 unless known to be greater.

~~6.11.10 (CAN) In Canada, spacings for printed circuit boards shall comply with Annex F.~~

~~6.11.10 (USA)~~ 6.11.11 In the United States, spacings for printed circuit boards and for board-mounted components shall comply with applicable component and end product standards or the electrical spacings requirements in UL 8750, or CSA C22.2 No. 250.13, or Annex F (CAN) of this standard, as applicable.

6.11.12 The dielectric voltage-withstand option in UL 8750 or CSA C22.2 No. 250.13 to evaluate spacings on printed circuit boards shall not be used to evaluate spacings between traces on the board and other metal mounting hardware such as screws which serve to secure the board to other non-current carrying metal parts of the luminaire, or between spacings on the board and the metal of a metal-backed printed circuit board. Between these points, the dimensional spacings requirements in UL 8750 or CSA C22.2 No. 250.13 shall be applied.



6.11.13 Spacings between traces or components on a printed circuit board and non-current-carrying metal parts, other than those identified in Clause 6.11.12, shall:

- a) comply with Table 6.11.1; or
- b) comply with spacing requirements in UL 8750 or CSA C22.2 No. 250.13 if the distances are reliably maintained and the metal part and board assembly comply with metal strength tests for reduced spacings specified in Clause 17.42 of this standard.

Section 9.6, Marking: Added marking requirements for combination HID/Incandescent lamp for remoted ballasted HID luminaires as follows

9.6.4 A remote ballasted HID luminaire may bear a lamp replacement marking for both an HID and an incandescent lamp provided that:

- a) the luminaire complies with the construction and performance requirements in this Standard for both HID and incandescent luminaires;
- b) the luminaire is additionally marked in accordance with Table 20.1.1, Item 3.15; and
- c) the installation instructions provide clear direction for the installer to place a check mark on the appropriate lamp replacement marking option based on the lamp type for the particular installation.

Section 10, LED luminaires – supplementary requirements: Added requirements for LED luminaires as follows:

10 LED luminaires - supplementary requirements

10.1 General

10.1.1 The requirements in this clause are supplemental requirements for LED luminaires.

10.2 Lampholders

10.2.1 A lampholder shall have an electrical rating suitable for the LED lamp load to be used.

10.3 Printed wiring boards

10.3.1 A printed wiring board shall comply with the requirements in UL 8750 and CSA C22.2 No. 250.13.

10.4 Emergency battery packs

10.4.1 A luminaire provided with a factory-installed emergency battery pack shall be:

- a) installed in accordance with the installation instructions marked on or provided with the pack; and
- b) marked to indicate emergency backup in accordance with Table 20.1.1, Item 1.43.

10.5 Markings

10.5.1 A luminaire having an integral LED driver shall be marked with the input rating in volts, frequency in hertz, and total amperes or watts, in accordance with Table 20.1.1, Item 1.3.

10.5.2 A luminaire intended for connection to a remote LED driver that requires a driver with a constant voltage output shall include the following marking information on the luminaire in the format S16-L3: constant voltage - voltage; nature of the supply (AC or DC); frequency (for ac rating only); and current or wattage.

10.5.3 A luminaire intended for connection to a remote LED driver that requires a driver with a constant current output shall include the following marking information on the luminaire in the format S16-L3: constant current - current; nature of the supply (AC or DC); frequency (for ac rating only); and voltage or wattage.



10.5.4 Luminaires having a replaceable lamp of the type specified in Annex G shall be marked with a lamp replacement marking as noted in Annex G.

10.5.5 A luminaire having a replaceable lamp of a type other than those specified in Annex G shall be marked, in a location visible during lamp replacement: "CAUTION - RISK OF FIRE. REPLACE ONLY WITH LAMP MODEL, MANUFACTURED BY". The marking shall be in the format S24-L 1.

Section 11.6, Electrical construction: Included cord pendant luminaires to electrical construction, added LED luminaires and added another method for luminaires that can be adjusted to change the angle of light as follows:

11.6.2 A cord pendant luminaire shall be provided with a flexible cord type as specified in Clause 11.2.12 for connection to the branch circuit.

~~10.6.3~~ 11.6.4 A fluorescent or HID, or LED pendant luminaire designed for a chain, cable, hook, or similar means of suspension and intended to be mounted directly below an outlet is permitted to may be provided with a flexible power cord.

11.6.7 A luminaire that can be adjusted, after installation, to change the angle of light, and where the supply connection point is on the adjustable portion, is permitted to shall be provided with one of the following:

- a) a cord bushing and a length of flexible cord of hard-usage type or heavier for connection to branch circuit conductors;
- b) a length of flexible cord of hard-usage type or heavier with a grounding type attachment plug or cord connector; or
- ~~b~~c) a junction box cord grip bushing without a length of flexible cord.

Section 12, Recessed luminaires – supplementary requirements:

Section 12.1 General: Added requirements for recessed luminaires that are installed with air handling spaces to comply with heat and smoke release protocols in accordance with the NEC, UMC, IMC or CAN codes as follows:

12.1.5 A recessed luminaire with polymeric parts intended to be installed where these parts are exposed to air-handling spaces* within a building shall comply with the heat and smoke release requirements in UL 2043 and marked in accordance with Clause 12.8.5.3.

*Products evaluated in accordance with these requirements are considered to comply with the fire retardant and low smoke producing requirements of Section 300 of the National Electrical Code, ANSI/NFPA 70; Chapter 4 of the Standard for the Installation of Air-Conditioning and Ventilating Systems, NFPA 90A; Section 602 of the ICC's International Mechanical Code; and Section 602 of IAPMO's Uniform Mechanical Code.

12.1.5 (CAN) In Canada, polymeric light diffusers and lenses shall comply with the flame spread rating and smoke developed classification requirements in the National Building Code of Canada.



Section 12.5, Thermal protectors: Added specific LED cases to the list of exceptions for luminaires that are not required to be provided with a thermal protector as follows:

12.5.1 General

12.5.1.1 A recessed luminaire shall be provided with a thermal protector unless the luminaire is:

- a) intended to be installed in concrete only, as specified in Clause 12.4.6;*
- b) inherently protected, complies with the temperature test of Clause 15.8, and is marked in accordance with Table 20.1.1, Item 2.24;*
- c) intended to be installed in the ground only and is marked in accordance with Table 20.1.1, Item 2.27;*
- d) intended to be installed in an outdoor canopy or marquee where it is not intended to be covered with thermal insulation, and is marked in accordance with Table 20.1.1, Item 2.26;*
- e) fluorescent when the ballast is required to have a thermal protector in accordance with Clause 8;*
- f) HID, Type IC, and marked in accordance with Table 20.1.1, Item 2.23; or*
- g) LED when the combination of LED driver and light source(s) has thermal protection that fulfills the thermal protection requirements in Clause 4.1, and complies with the relevant requirements of Clauses 15 and 16.*

Section 12.7, Tests: Added additional testing for LED type Non-IC as follows:

12.7.1.6 An LED Type Non-IC inherently protected luminaire shall comply with the normal temperature test of Clause 15.8.

Section 12.8, Markings: Added marking requirements for LED type Non-IC, and included an allowance for making luminaires with polymeric parts exposed to air-handling spaces as follows:

12.8.1.14 An LED Type Non-IC inherently protected Luminaire shall be marked with a caution to keep it away from insulation and with a statement that it is inherently protected, in accordance with Table 20.1.1, Items 1.13 and 2.24.

~~*11.8.5.2 12.8.5.2 A luminaire that is provided with a polymeric recessed housing shall be marked: ~~not~~ "For use in non-fire-rated installations only" and "For use in one- and two-family dwellings only", or ~~not~~ for use in environmental air spaces,*~~ in accordance with Table 20.1.1, Items 1.26 and 1.39.

12.8.5.3 A luminaire that is provided with polymeric parts intended to be installed where these parts are exposed to air-handling spaces within a building and in compliance with Clause 12.1.5 is permitted to be marked: "Exposed non-metallic materials suitable for use in air-handling spaces", in accordance with Table 20.1.1, Item 1.40.

Section 13 Miscellaneous luminaires - supplementary requirements: Added requirements for luminaires suitable for use in clothes closet storage spaces including a temperature and impact test as follows:

13.6 (USA) Luminaires suitable for use in clothes closet storage spaces

13.6.1 (USA) General

13.6.1.1 (USA) In the United States, the requirements in Clause 13.6 (USA) apply to both fluorescent and LED surface-mounted luminaires for use in clothes closet storage spaces.

13.6.2 (USA) Tests

13.6.2.1 (USA) Temperature

13.6.2.1.1 (USA) In the United States, fluorescent and LED surface-mounted luminaires intended for use in clothes closet storage spaces shall comply with the surface ceiling temperature test of Clause 15.2



with glass fibre insulation batting positioned over and in contact with the entire luminaire exposed surface. The insulation batting shall be Rsi 1.4 to Rsi 1.9 (RS to R11), in any convenient thickness.

13.6.2.1.2 (USA) In the United States, the glass fibre batting shall be secured in a manner that does not compress the insulation. The insulation may be cut or applied in sections to provide contact with the full exterior surface of the luminaire.

13.6.2.1.3 (USA) In the United States, during the temperature test, the maximum temperature limits of Table 15.1.2 shall not be exceeded and exterior surfaces of the luminaire shall not exceed 90 °C.

13.6.3 (USA) Marking

13.6.3.1 (USA) In the United States, fluorescent and LED surface-mounted luminaires intended for use in clothes closet storage spaces shall be marked in accordance with Table 20.1.1, Item 2.28.

13.7 (CAN) Clothes closet luminaires

13.7.1 (CAN) General

13.7.1 .1 (CAN) In Canada, a clothes closet luminaire is a type of luminaire intended to be installed on a ceiling or wall surface in accordance with ANSI/NFPA 70 (in the United States) and the Canadian Electrical Code, Part I (in Canada).

13.7.1.2 (CAN) In Canada, the light source of a clothes closet luminaire shall be covered by a lens or diffuser meeting the requirements of the temperature test of Clause 13.7.2.1 (CAN); the impact test of Clause 13.7.2.2 (CAN); and the compression test of Clause 13.7.2.3 (CAN).

13.7.1 .3 (CAN) In Canada, the lens or diffuser of a clothes closet luminaire shall be:

- a) attached to or removed from the luminaire base with the use of a tool;
- b) attached to or removed from the luminaire base by mechanical means requiring the combination of a minimum of two movements in different axes, such as a rotation combined with a translation (for example, a bayonet lock); or
- c) of the screw-on type requiring a minimum of two threads of engagement.

13.7.1.4 (CAN) In Canada, a clothes closet luminaire with an integral light source or incorporating a lens or diffuser shall be permitted if:

- a) this lens or diffuser cannot be removed from the light source without breakage;
- b) the requirements of Clauses 13.7.1.2 (CAN) and 13.7.1.3 (CAN) are met; and
- c) the light source cannot be substituted for another light source not meeting the requirements in Clauses 13.7.1.2 (CAN) and 13.7.1.3 (CAN).

13.7.2 (CAN) Tests

13.7.2.1 (CAN) Temperature test

13.7.2.1.1 (CAN) In Canada, a clothes closet luminaire shall be installed with a light source of the highest rated intensity and as intended on a simulated ceiling or wall surface of 12.3 mm (0.5 in) nominal thickness of gypsum board at the center of a test surface of 65 cm x 65 cm ±5 mm (25.6 in x 25.6 in ±0.2 in).

13.7.2.1.2 (CAN) In Canada, thermocouples shall be placed on the directly accessible surface of the lens or diffuser at its base, at its top, and at its central point, where the thermocouple will be most covered by insulation during this test.

13.7.2.1.3 (CAN) In Canada, insulation shall be placed in such a manner as to cover 50% or more of the lens or diffuser volume in accordance with Figures 13.7.2.1 (CAN), 13.7.2.2 (CAN), and 13.7.2.3 (CAN), and to be in direct contact with 35% or more of the lens or diffuser surface. The insulation thickness perpendicular to the surface of the lens or diffuser shall be 8 cm (3.1 in) minimum, 12 cm (4.7 in) maximum.



13.7.2.1.4 (CAN) In Canada, insulation shall be of the rigid type with a minimum insulating capacity of R20.

13.7.2.1.5 (CAN) In Canada, the temperature test shall be performed with the luminaire facing vertically down in accordance with Figures 13.7.2.1 (CAN) and 13.7.2.2 (CAN), and once with the luminaire facing horizontally in accordance with Figure 13.7.2.3 (CAN).

13.7.2.1.6 (CAN) In Canada, the light source shall be turned on and the temperature shall be allowed to rise until stabilization in an ambient room temperature of 20 to 25 °C (68 to 77 °F). Temperature at each thermocouple shall be recorded after stabilization has been attained.

13.7.2.1.7 (CAN) In Canada, the pass criterion is if the temperature is stabilized at 60 °C (140 °F) or less.

13.7.2.2 (CAN) Impact test

13.7.2.2.1 (CAN) In Canada, a clothes closet luminaire shall be installed on a rigid wooden surface and impacted on the lens or diffuser with a weight of 500 ±10 g (1.1 ±0.02 lb) from a distance of a minimum of 30 cm (11.8 in) to a maximum of 35 cm (13.8 in) in the worst possible direction to cause displacement of the lens or diffuser from the luminaire base. Edges of the weight shall be rounded and smooth.

13.7.2.2.2 (CAN) In Canada, the pass criterion is if the lens or diffuser remains in place securely. Cracking or chipping not affecting the assembly is acceptable.

13.7.2.2.3 (CAN) In Canada, cracking of the lens or diffuser exposing the light source and rendering the light source accessible with the finger probe is unacceptable.

13.7.2.3 (CAN) Compression test

13.7.2.3.1 (CAN) In Canada, a clothes closet luminaire shall be installed on a rigid wooden surface and subjected to a compression on the lens or diffuser with a weight of 5000 ±25 g (176 ±0.9 oz) in the worst possible direction to cause displacement of the lens or diffuser from the luminaire base. Edges of weight shall be rounded and smooth.

13.7.2.3.2 (CAN) In Canada, the pass criterion is if the lens or diffuser remains in place securely. Cracking or chipping not affecting the assembly is acceptable.

13.7.2.3.3 (CAN) In Canada, cracking of the lens or diffuser exposing the light source and rendering the light source accessible with the finger probe is unacceptable.

Section 15.8, Type IC and LED Type Non-IC inherently protected recessed luminaires: Added LED Type Non-IC to inherently protected recessed luminaires as follows:

14.8 15.8 Type IC and LED Type Non-IC inherently protected recessed luminaires

15.8.1 A Type IC or LED Type Non-IC inherently protected luminaire shall comply with the normal temperature test of Clause 15.7 and Clauses 15.8.2 to 15.8.4.

Section 17.5, Wet locations: Added conditions for the performance requirements of luminaires following the rain test and sprinkler test as follows:

16.5.2.7 17.5.2.7 Immediately after the rain test, the luminaire shall:

- a) withstand the dielectric voltage-withstand test of Clause 18.1;
- b) not have permitted water to enter and accumulate in quantities sufficient to interfere with the operation of the luminaire or to create a hazard; and
- c) not have permitted water to contact electrical parts, except lamps or components suitable for the condition. Drops of water are permitted to be present on the insulation of non-braided thermoplastic insulated wire. The insulation on non-braided thermoplastic insulated wire shall not be in a pool of water unless the insulation is identified as suitable for immersion.



~~16.5.3.8~~ 17.5.3.8 Immediately after the sprinkler test, the luminaire shall:

- a) withstand the dielectric voltage-withstand test of Clause 18.1;
- b) not have permitted water to enter and accumulate in quantities sufficient to interfere with the operation of the luminaire or to create a hazard; and
- c) not have permitted water to contact electrical parts, except lamps or components suitable for the condition. Drops of water are permitted to be present on the insulation of non-braided thermoplastic insulated wire. The insulation on non-braided thermoplastic insulated wire shall not be in a pool of water unless the insulation is identified as suitable for immersion.

Section 17.14, Self-threading screw torque: Added reference to Table 17.14.1 to clarify the torque applied as follows:

~~16.14~~ 17.14 Self-threading screw torque

~~16.14.1~~ 17.14.1 Self-threading or sheet metal screws may be used if threads are not stripped when the screw is tightened ~~with a~~ to the torque given in Table 17.14.1 and if the part or the assembly supported by the screw withstands for 1 min a force equal to four times the mass of the part or assembly, applied in a direction coincident with the axis of the screw.



Section 17.42, Metal strength tests for reduced spacings: Added a metal strength test for reduced spacings as follows:

[17.42 Metal strength tests for reduced spacings](#)

[17.42.1 In accordance with Clause 6.11.13, the assembly shall be subjected to the tests described in Clauses 17.42.2 and 17.42.3 without:](#)

[a\) permanent displacement to the extent that spacings are reduced below the values specified in UL 8750, CSA C22.2 No. 250.13, or Annex F \(CAN\) of this standard, as applicable;](#)

[b\) displacement during the test that results in contact with live parts other than those connected in a Class 2 circuit; and](#)

[c\) development of openings that expose parts that involve a risk of electric shock. Any openings resulting from the test are to be judged under the requirements for accessibility of live parts specified in Clause 6.13.](#)

[17.42.2 The dead metal part shall be subjected to a 111 N \(25 lbf\) force for 1 min. The force is to be applied by means of a steel hemisphere 12.7 mm \(1/2 in\) in diameter. The force is to be applied at the location\(s\) most likely to produce unacceptable results.](#)

[17.42.3 The enclosure is to be subjected to a single impact of 6.8 N-m \(5 ft-lbf\) at the location\(s\) most likely to produce unacceptable test results. The impacts are to be applied by means of a smooth, solid steel sphere 50.8 mm \(2 in\) in diameter and having a 535 g \(1.18 lb\) mass. The sphere is to fall freely from rest through a vertical distance of 1.29 m \(51 in\), or swung as a pendulum through the same vertical distance.](#)

Former Section 18, Factory production tests: Moved into a new Annex I.

Figure 13.8.2.1 (CAN), Temperature test for TF1: Added figure 13.8.2.1.

Figure 13.8.2.2 (CAN), Temperature test for TF2: Added figure 13.8.2.2.

Figure 13.8.2.3 (CAN) Temperature test with luminaire facing horizontally: Added figure 13.8.2.3.

Table 4.2.1, Summary of country-specific requirements: Revised table to remove spacings for printed circuit boards.

Table 12.7.1.1, Recessed luminaire temperature tests: Added LED to Table 12.7.1.1.

Table 20.1.1, List of required markings: Updated format for some markings (e.g from S24-L3 to S16-L3).

Table 20.1.2 Format minimum size designation for marking height and typeface: Updated font size and type for markings.

Table A.1, UL, CSA, IEC, NMX, and NOM Standards for components: Reference standards for LED components were added.