

UL 1786

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Direct Plug-In Nightlights

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UL Standard for Safety for Direct Plug-In Nightlights, UL 1786

Third Edition, Dated December 9, 2005

Summary of Topics

This new edition of UL 1786 contains requirements for nightlights from the second edition of the Standard for Nightlights, UL 1786, that have been harmonized with the requirements of the Canadian Standards Association. The standard has been renamed Direct Plug-In Nightlights to better reflect the type products covered by the requirements.

The new and revised requirements are substantially in accordance with UL's Bulletin(s) on this subject dated December 12, 2003 and July 15, 2005. The bulletin(s) is now obsolete and may be discarded.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net/ulforeword.html>

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New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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This Standard consists of pages dated as shown in the following checklist:

Page	Date
1-62	December 9, 2005

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Canadian Standards Association
CSA C22.2 No. 256-05
First Edition



Underwriters Laboratories Inc.
UL 1786
Third Edition

Direct Plug-In Nightlights

December 9, 2005



ANSI/UL 1786-2005

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Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

The most recent designation of ANSI/UL 1786 as an American National Standard (ANSI) occurred on December 8, 2005.

This ANSI/UL Standard for Safety, which consists of the Third edition, is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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Preface

This is the common CSA and UL Standard for *Direct Plug-In Nightlights*. It is the first edition of CSA C22.2 No. 256 and the third edition of UL 1786. This edition of CSA C22.2 No. 256 supersedes the plug-in night-light requirements of CSA C22.2 No. 12, *Portable Luminaires*, published in 1982. This edition of UL 1786 supersedes the previous editions published in 1995 and 1988.

This common Standard was prepared by the Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL). The efforts and support of the CANENA Technical Harmonization Committee are gratefully acknowledged.

This Standard was reviewed by the CSA Subcommittee on Lighting Products, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard will be submitted to the Standards Council of Canada (SCC) for approval as a National Standard of Canada.

This Standard has been approved by the American National Standards Institute (ANSI) for publication as an American National Standard.

A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

Where reference is made to a specific number of samples to be tested, the specified number is considered to be a minimum quantity.

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 uses the IEC format but is not based on, nor is it to be considered equivalent to, an IEC Standard. This Standard is published as an equivalent Standard for CSA and UL. An equivalent Standard is a Standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

There is not an IEC Standard that is equivalent to the requirements contained in this Standard.

Interpretations

The interpretation by the standards development organization of an identical or equivalent Standard is 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 is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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CSA Effective Date

The effective date for CSA International will be announced through *CSA Informs* or a CSA Certification Notice.

UL Effective Date

As of December 9, 2005 all products Listed or Recognized by UL must comply with the requirements in this Standard except for clauses, figures, and tables in the following list, which are effective December 9, 2007.

Clauses 7.2, 7.6 – 7.8, 7.10, 7.13, 7.14, 7.16 – 7.18, 9.1, 9.2, 11.6 – 11.9 and 13, Figures 1, 9, 13 – 15, Tables 1 – 3, and 6, and Annex B.

Between December 9, 2005 and December 9, 2007, new product submittals to UL may be evaluated under all requirements in this Standard or, if requested in writing, evaluated under presently effective requirements only. The presently effective requirements are contained in the second edition of UL 1786.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved Standard.

1 Scope

1.1 This Standard applies to direct plug-in nightlights not exceeding 10 W input, for indoor use only, in non-hazardous locations and intended to be used in accordance with the *Canadian Electrical Code, Part I*, CSA C22.1, and the *National Electrical Code*, ANSI/NFPA 70. Light source types include incandescent candelabra base lamps, non-replaceable lamps, [fluorescent, neon, or light-emitting diode (LED) type] or electroluminescent panels.

1.2 These requirements cover direct plug in nightlights for insertion into a parallel slot receptacle rated 125 volts maximum.

1.3 These requirements do not cover:

- (a) cord-connected luminaires;
- (b) nightlights with more than one receptacle; or
- (c) direct plug-in devices with other primary functions, such as room deodorizers, insect repellents, or rechargeable flashlights.

2 Reference Publications

2.1 For undated references to Standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this Standard was approved. For dated references to Standards, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the Standard was approved.

2.2 Products covered by this Standard shall comply with the reference installation codes and Standards as appropriate for the country where the product is to be used. When the product is intended for use in more than one country, the product shall comply with the installation codes and Standards for all countries where it is intended to be used. A list of reference publications is provided below.

CSA (Canadian Standards Association)

C22.1-02

Canadian Electrical Code, Part I

C22.2 No. 0.4-04

Bonding of Electrical Equipment

CAN/CSA-C22.2 No. 0.17-00 (R2004)

Evaluation of Properties of Polymeric Materials

C22.2 No. 1-04

Audio, Video, and Similar Electronic Equipment

C22.2 No. 42-99 (R2004)

General Use Receptacles, Attachment Plugs, and Similar Wiring Devices

UL (Underwriters Laboratories Inc)

UL 94

Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

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UL 498
Attachment Plugs and Receptacles

UL 498A
Current Taps and Adapters

UL 746C
Polymeric Materials – Use in Electrical Equipment Evaluations

UL 796
Printed-Wiring Boards

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

UL 1449
Transient Voltage Surge Suppressors

ANSI/NEMA (American National Standards Institute / National Electrical Manufacturers Association)

ANSI/NEMA C81.61-1990 (R 1996)
Electrical Lamp Bases – Supplement

ANSI/NEMA C81.63a-1993
Gauges for Electric Lamp Bases and Lampholders

ASTM (American Society for Testing and Materials)

D 1000-99
Standard Test Method for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

IEC (International Electrotechnical Commission)

IEC 60061-1:2005
Lamp caps and holders together with gauges for the control of interchangeability and safety Part 1: Lamp caps

IEC 60664-1:2002
Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

ISA (The Instrumentation, Systems, and Automation Society)

ISA MC 96.1-1982
Temperature-Measurement Thermocouples

NFPA (National Fire Protection Association)

ANSI/NFPA 70-2005
National Electrical Code (NEC)

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3 Components

3.1 Except as indicated in Clause 3.2, 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 CSA or UL Standards as appropriate for the country where the product is to be used.

3.2 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.

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

3.4 Specific components are accepted as being 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 Units of Measurement

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

Note: Wire gauge sizes are expressed in American Wire Gauge sizes because of its widespread usage.

4.2 Temperatures are given in degrees Celsius only.

4.3 Unless indicated otherwise, all voltage and current values mentioned in this Standard are root-mean-square (rms).

5 Application of Requirements

5.1 The requirements of the national installation code and other practices of Canada and the United States have been addressed in the requirements of this Standard.

5.2 Products intended to be used in both Canada and the United States shall comply with the requirements of this Standard.

5.3 Products to be used only in Canada or only in the United States shall comply with the requirements of this Standard, but need only comply with the applicable country-specific requirement, if provided.

6 Definitions

6.1 For the purpose of these requirements, the following definitions apply:

6.2 **Accessible** – able to be contacted by the articulate probe described in Clause 8.2.2.

6.3 **Device** – the general term used to denote all direct plug-in nightlights covered by this Standard. A more specific term is used if a requirement applies only to a certain type of device.

6.4 Direct Plug-In Nightlight – a nightlight with an integral parallel blade plug and a 10 W maximum light source, and which may incorporate a shade. It is used not for general illumination but for illuminating obstacles. For the purpose of this Standard, a nightlight may be referred to as “a device”.

6.5 Electroluminescent Panel – a solid phosphor layer, contained between two electrodes, that will emit light when subjected to alternating current.

6.6 Enclosure, Electrical – a part of the device intended to reduce the risk of contact with parts at hazardous voltage or hazardous energy levels.

6.7 Enclosure, Mechanical – a part of the device intended to reduce the risk of injury due to mechanical or other physical hazards.

6.8 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.

6.9 Measurement Indication Unit (MIU) – the output voltage across the meter, in millivolts RMS, in the measurement instrument in Figure 1, divided by 500 Ω . (The instrument indication is equal to the RMS value in milliamperes when the frequency is 60 Hz (sinusoidal current). The reading may not be a direct indication of the RMS or other common amplitude quantifier of leakage-current when the leakage-current is of complex waveform or frequency other than 50 or 60 Hz.).

6.10 Neon Lamp – a discharge light source, also known as a “glow lamp”, that has a current limiting resistor in series with the lamp and is filled with a neon gas.

6.11 Non-Relampable Direct Plug-In Nightlight – a device constructed with permanent non-replaceable lamps.

6.12 Relampable Direct Plug-In Nightlight – a device constructed in such a way as to allow user replacement of the lamp.

6.13 Risk Of Electric Shock – a risk that exists between any two uninsulated conductive parts of a nightlight or between an uninsulated conductive nightlight part and earth ground, if the continuous current flow through a 1500 resistor in parallel with a 0.015 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.

6.14 Shade – a diffuser intended to reduce the glare of the lamp.

6.15 Skeleton-Type Lampholder – a screw lampholder that does not use conductive screwshell threads to make electrical contact with the lamp screw base. Electrical contact with the lamp screw base is made with one or more separate contacts in the side wall of the lamp cavity or a ring contact in the bottom of the lamp cavity.

6.16 User Maintenance – servicing operations, such as relamping and cleaning, expected to be carried out by untrained persons.

7 Construction

7.1 Enclosures – General

7.1.1 Enclosures shall have the strength and rigidity required to resist the abuses to which they are liable to be 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.

7.1.2 The enclosure material shall be metal or a polymeric material that complies with Clause 7.2.

7.1.3 A device shall be constructed so that it is not necessary to open or remove the enclosure during normal use or user maintenance. Parts that can be removed during normal use or for user maintenance such as cleaning or relamping shall not be considered to be a part of the enclosure. The incorrect replacement or discarding of such parts shall not affect the intended operation of the device.

7.1.4 A live part shall be contained within an enclosure. A part that is intended to be live at any time during the normal maintenance and use of a device shall be considered to be a live part. An enclosure shall comply with Clause 8.2.

7.1.5 Lampholder contacts need not be enclosed if live parts are not accessible with the lamp in place as determined by the requirements of Clause 9.2 for lampholder and lamp base accessibility.

7.1.6 The blades of a nightlight are not required to be enclosed.

7.1.7 An enclosure shall comply with the enclosure impact test of Clause 10.7.

7.1.8 There shall not be any method of construction, such as sharp edges or burrs, that causes damage to electrical insulation, reduces electrical spacings, or increases the risk of personal injury to the user.

7.1.9 If knobs on switches are removable from outside the enclosure, their removal shall not expose live parts.

7.1.10 A non-relampable device shall comply with the pull test described in Clause 10.6.

7.2 Polymeric materials for enclosure and electrical insulation

7.2.1 An enclosure of polymeric material (thermoplastic or thermoset) that encloses a live part shall:

- (a) have a flammability rating of V-O, V-1, or V-2 in accordance with CAN/CSA-C22.2 No. 0.17 or UL 746C;
- (b) comply with the appropriate lamp cavity separation test of Clause 10.5 or the pull test of Clause 10.6;
- (c) comply with the enclosure impact test of Clause 10.7; and
- (d) if thermoplastic, comply with the mold stress-relief distortion test of Clause 10.4.

7.2.2 A polymeric material, thermoplastic or thermoset, used as electrical insulation shall comply with the requirements of Clauses 7.2.3 and 7.2.4 when the polymeric part is:

- (a) in direct contact with a live part;
- (b) used to enclose a live part and is within 0.8 mm (0.032 in) of a live part; or
- (c) used to enclose arcing parts and within 13 mm (0.50 in) of such live parts. The high current arc ignition (HAI) shown in Table 1 only applies in this application.

7.2.3 A polymeric material (thermoplastic or thermoset) used as electrical insulation shall have a flammability rating in accordance with Table 1.

7.2.4 A polymeric material used as electrical insulation or enclosure as defined in Clause 7.2.2 shall be able to withstand the hot wire ignition (HWI), the comparative tracking index test (CTI), and the high current arc ignition (HAI) to a level not exceeding the values in accordance with Table 1.

7.2.5 A polymeric material used as an enclosure or electrical insulation shall have a relative thermal index (RTI) equal to or exceeding the values as determined by the temperature test of Clause 9.1 and, as a minimum, specified in Table 2.

7.3 Enclosure assembly methods

7.3.1 Mechanical fastenings

7.3.1.1 Construction of mechanical joints or fastening of parts shall prevent turning if turning can result in movement of internal wiring or components. Frictional contact alone between parts shall not be used to prevent turning. Parts in a brush and slip-ring arrangement, such as the front of a device intended to be rotated regardless of the orientation of the supply receptacle, shall not involve the movement of internal wiring or components.

7.3.1.2 Screws used to mount components shall be provided with a means to reduce the likelihood of loosening.

7.3.2 Adhesives

7.3.2.1 An adhesive, glue, or ultrasonic or chemical bonding that is relied upon to hold together parts of an enclosure shall be evaluated by the mechanical tests of this Standard.

7.4 Corrosion protection

7.4.1 Iron or steel, other than stainless steel, shall be protected from corrosion by painting, coating, or plating. Non-plated iron or steel alloys may be used for lead wires that are part of a neon lamp.

7.5 Current-carrying parts

7.5.1 Current-carrying parts shall be copper, copper alloy, or aluminum unless otherwise specified in this Standard.

7.5.2 Stainless steel may be used for current-carrying parts not subject to arcing.

7.5.3 Iron or steel, other than stainless steel, may be used for lead wires that are part of a neon lamp.

7.6 Plug blades

7.6.1 Current-carrying parts shall be copper or copper alloy unless otherwise specified in this Standard.

7.6.2 Plug blade shall conform to the dimensional requirements as specified in Figure 2 or 3.

7.6.3 Plug blades shall comply with the plug blade secureness test of Clause 10.2 and, if applicable, with the folded blade compression test of Clause 10.3.

7.7 Plug face dimensions

7.7.1 The minimum plug face dimensions shall be in accordance with Figure 5 or with the plug blade accessibility test of Clause 8.4.

7.7.2 No part of a device plugged into a duplex receptacle shall interfere with the full insertion of an attachment plug into the adjacent receptacle, unless it fully covers the adjacent receptacle. The dimensions for a duplex receptacle are shown in Figure 4.

7.7.3 A device shall not be provided with a means for being permanently mounted to a duplex receptacle face.

7.8 Polarization and identification

7.8.1 A device provided with a relampable candelabra screwshell lampholder or switch shall be polarized. The plug blades shall comply with the dimensions of either Figure 2 or 3. The lampholder screw-shell shall be connected to the grounded supply conductor (such as the wide blade of the attachment plug).

7.8.2 When a switch is provided, it shall interrupt the electrical connection to the center contact of the lampholder.

7.9 Switching mechanisms

7.9.1 A switching mechanism shall comply with the switching mechanism tests of Clause 10.1. A component switch with a load rating that is equal to or greater than the load intended in this application is not required to be tested.

7.9.2 When a manual switching mechanism is operated as in actual service, the rate of motion of the contactor shall not be subject to control by the operator at the point of break.

7.9.3 A removable switch knob shall not expose live parts when removed in accordance with Clause 8.2.

7.10 Lampholder

7.10.1 A device intended for use with screw-base lamps shall be the E-12 candelabra size only.

7.10.2 A screwshell shall be tested with GO and NOT GO gauges made in accordance with ANSI/NEMA C81.63a. A skeleton-type lampholder shall provide an equivalent mechanical engagement. A skeleton-type of construction shall make electrical contact with at least two threads of the threaded lamp base. An equivalent mechanical construction generally consists of one or more narrow strips of metal secured to a molded, threaded body of insulating material. The strip generally extends the length, and conforms to the shape, of the molded threads.

7.10.3 A device incorporating a replaceable lamp shall comply with the lampholder and lamp base accessibility tests of Clause 9.2.

7.10.4 A device using a replaceable lamp shall comply with the lamp cavity separation test specified in Clause 10.5.

7.10.5 The minimum thickness of the candelabra base screw shell shall be:

- (a) 0.25 mm (0.010 in) for copper-alloy; or
- (b) 0.33 mm (0.013 in) for aluminum.

7.11 Wiring and terminal connections

7.11.1 A soldered connection shall be made mechanically secure before soldering by one of the following acceptable methods:

- (a) twisting of conductors together;
- (b) insertion of a bare conductor through a hole in a flat terminal;
- (c) insertion of a bare conductor straight into a terminal sleeve; and
- (d) wrapping at least halfway (180 degrees) around a terminal.

7.11.2 A printed-wiring board connection need not be mechanically secure if an automatic soldering operation is employed.

7.11.3 A live part shall be secured by means other than friction alone so that it cannot be turned relative to the surface on which it is mounted in a way that can reduce the spacing of the live part to another part.

7.11.4 Two live parts shall be joined by brazing, soldering, or crimping. Two parts may be held together by a fit where the parts are wedged into a molded slot of the enclosure. The pad contact of an electroluminescent panel may be joined to another live part by a fit where the two parts are held together by the enclosure.

7.12 Internal wiring

7.12.1 Insulated wire shall be suitable for the temperature and voltage encountered.

7.12.2 Conductors shall be not smaller than No. 18 AWG. However, conductors as small as No. 24 AWG may be used where the wire is selected in relation to the maximum current during normal operating conditions, and the time and level of the current flowing during fault conditions do not result in a risk of fire, in conjunction with the following conditions:

- (a) The wire is completely enclosed and not used in a swivel joint.
- (b) The length of the wire is not more than 152 mm (6 in).
- (c) Wiring is connected to the supply via an internal current-limiting device (e.g., lamp current control device, circuit cutouts, energy limited or isolated transformers).

7.12.3 In Canada, a printed-wiring board shall be suitable for the application. The criteria shall include and comply with:

- (a) the bonding of the foil to the substrate for the minimum conductor width and maximum unpierced area in accordance with Annex C.
- (b) the temperatures measured during the temperature test of Clause 9.1 shall be less than the relative thermal index (RTI) rating of the substrate in accordance with CAN/CSA-C22.2 No 0.17.
- (c) the printed-wiring board substrate shall:
 - (1) have a flammability rating of no less than V-2; and
 - (2) be suitable for direct support, in accordance with CAN/CSA-C22.2 No. 0.17.

In the United States, a printed-wiring board shall be suitable for the application. The criteria shall include and comply with:

- (a) the bonding of the foil to the substrate for the minimum conductor width and maximum unpierced area in accordance with UL 796;
- (b) the temperatures measured in the temperature test of Clause 9.1 shall be less than the relative thermal index (RTI) rating of the substrate in accordance with UL 746C;
- (c) the printed-wiring board substrate shall:
 - (1) have a flammability rating of no less than V-2; and
 - (2) be suitable for direct support in accordance with UL 746C.

7.13 Spacing of conductive parts

7.13.1 Spacing of conductive parts through air and over surface of insulating materials shall comply with the minimum spacing requirements in Table 3 for:

- (a) uninsulated live parts of opposite polarity; and
- (b) an uninsulated live part and a non-current-carrying metal part that may be grounded or a metal part exposed to contact by persons.

7.13.2 With reference to Clause 7.13.1, the requirement does not apply when an insulating barrier or liner is used. In lieu of the spacing required, it shall be:

- (a) of electrical grade paper not less than 0.3 mm (0.011 in) thick;
- (b) of polyester film not less than 0.25 mm (0.01 in) thick; or
- (c) capable of withstanding the dielectric voltage-withstand test of Clause 8.3.

7.13.3 A complete device shall comply with the dielectric voltage-withstand test of Clause 8.3.

7.13.4 With reference to Clause 7.13.1, the requirement does not apply at the body of a neon light if, when the lead wires are short-circuited at the base of the light, the series resistor does not operate in excess of its nominal rating.

7.13.5 In Canada, the spacings between uninsulated live parts of opposite polarity on a printed-wiring board may be less than specified in Table 3 when a printed wiring board is conformally coated with material that complies with the conformal-coating requirements specified in Annex C.

In United States, the spacings between uninsulated live parts of opposite polarity on a printed-wiring board may be less than specified in Table 3 when a printed wiring board is conformally coated with material that complies with the conformal-coating requirements specified in UL 746C.

7.13.6 In Canada, the spacings between uninsulated live parts of opposite polarity on a printed-wiring board may be less than as specified in Table 3 when a printed wiring board complies with clearances and creepage specified in IEC 60664-1 for overvoltage category 2 and:

- (a) for pollution degree 1 for conformally coated printed-wiring boards; or
- (b) for pollution degree 2 for uncoated printed-wiring boards.

In the United States, the spacings between uninsulated live parts of opposite polarity on a printed-wiring board may be less than as specified in Table 3 when a printed wiring board complies with clearances and creepage specified in UL 840.