CSA STANDARDS

C22.2 No. 141-10

Emergency lighting equipment

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Title: *Emergency lighting equipment* — originally published September 2010

The following revisions have been formally approved and are marked by the symbol delta (Δ) in the margin on the attached replacement pages:

Revised	Clauses 3, D.1, and D.3.1.2 and Table D.1
New	None
Deleted	None

- Update your copy by inserting these revised pages.
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CIE (International Commission on Illumination)
15-2004
Colorimetry

69-1987
Methods of Characterizing Illuminance Meters and Luminance Meters: Performance, Characteristics and Specifications

National Research Council Canada
National Building Code of Canada, 2010

UL (Underwriters Laboratories Inc.)
746C-2004
Standard for Polymeric Materials — Use in Electrical Equipment Evaluations

1414-2000
Standard for Across-the-Line Antenna-Coupling and Line-By-Pass Capacitors for Radio- and Television-Type Appliances

3 Definitions

The following definitions shall apply in this Standard:

Central power system — systems equipment consisting of a central storage battery bank, automatic battery charging equipment with or without a low frequency inverter, automatic control relays, multi-circuit distribution equipment, derangement alarm equipment and other applicable accessories. Such equipment may be integrally housed in a single overall enclosure or may be separately enclosed for remote connection to a central control unit.

> **AC central system** — a system that provides ac voltage to normally off and/or normally on emergency lighting loads with or without momentary transfer.
>
> **DC central system** — a system that provides dc voltage to normally off and/or normally on emergency lighting loads.
>
> **AC/DC central system** — a system that provides ac voltage when the line is healthy and dc voltage when in emergency mode to normally off and/or normally on emergency lighting loads with or without momentary transfer.

Class 2 circuit — a circuit supplied by an isolating source that complies with CAN/CSA-C22.2 No. 223 or CSA C22.2 No. 66.1 and CSA C22.2 No. 66.3 for low voltage transformers.

Derangement alarm equipment — any audible or visible (or both) signalling equipment intended to indicate disruption or failure of one or more of the individual circuits included in the central system.

Design voltage — the terminal voltage of a lamp or a combination of a lamp and auxiliary device for which a luminance rating is stated.
Note: *If the lamp has some auxiliary device, e.g., a high frequency inverter, connected between it and the battery, the lamp voltage is considered to be the voltage at the input terminals of the auxiliary device. It is recognized that the manufacturer of the unit equipment will assign this voltage.*

Diffuser — a device used to redirect, scatter, and/or change the light colour, primarily by the process of diffuse transmission, used for required illuminated legend of an exit sign.

Directional indicator — a graphic symbol used in conjunction with a legend on an exit sign to indicate a preferred direction of egress. The *National Building Code of Canada* requirements for directional indicators are described in Annex B of this Standard.

Edge-lit sign — a type of exit sign in which the light from an enclosed light source is directed through a light-transmitting plate that has the legend etched in or attached to its surface. The sign face appears luminous when light leaves disruptions in the plate.

Emergency luminaire — a luminaire permanently connected to a single external source of power (usually ac) and provided with a factory-installed emergency battery pack that meets the requirements of Annex C.

Enclosure, electrical — a part of the luminaire intended to reduce the risk of electric shock.

End-of-discharge voltage — the voltage measure at the battery terminals at the end of the rated time as declared by the emergency lighting manufacturer.

Δ **Exit sign** — a device used in buildings to identify the most direct path of egress for emergency purposes.

Notes:

(1) *Exit signs contain a legend and optional directional indicator(s).*

(2) *Exit signs are considered to be internally illuminated if the legend (and optional directional indicator) or background, or both, are illuminated by a light source contained within the assembly supporting the legend and optional directional indicator.*

Type 1 exit sign — an internally illuminated exit sign that is permanently connected to a normal source of power (usually ac).

Type 2 exit sign — an internally illuminated exit sign that is permanently connected to a normal source of power (usually ac) and a separate source of power (usually dc) that is activated upon failure of the normal power supply.

Note: *Type 2 exit signs include those supplied as a component of a combination of an exit sign and unit equipment.*

Example A: *An exit sign operating on a normal source of ac with a connection to a remotely located emergency unit. The remote emergency unit has an ac or dc input that is only energized during power failure.*

Example B: *A combination of exit sign and emergency unit (commonly referred to as a combo) consisting of an emergency unit mechanically attached to an exit sign. The emergency unit has dc output that is only energized during power failure. Additional dc outputs may be included for remote emergency lighting loads. Both components operate on a normal source of ac and electrical wiring may be routed and/or combined through either of the components. Only the power consumed by the exit sign components is to be considered for power consumption measurements for energy efficiency verification purposes.*

Example C: *A combination of exit sign and emergency unit. The emergency battery pack within the housing has more capacity than what is required to power the exit sign during power failure and can be connected to integral and/or external, emergency lighting loads. Internally, components may be shared between the exit sign and emergency unit but, for power consumption measurements for energy efficiency verification purposes, the two loads shall be isolated from each other. Only the power consumed by the exit sign components is to be considered for these measurements.*

Note: *The disconnecting of the battery is one acceptable way to separate the charger load from the exit sign luminance circuit. Only losses to maintain the batteries in full charge condition for the unit equipment capacity are not considered. However, the EEV threshold is 5 W per legend for compliance with the regulation.*

Type 3 exit sign — an internally illuminated exit sign that is permanently connected to a normal source of power (usually ac) and is provided with a factory-installed emergency battery pack.

Note: *The internal power supply can consist of an automatic load-control device, storage battery, and means for charging the battery.*

Example D: *An exit sign with its own emergency power supply contained within a single housing. The emergency battery pack within the housing has enough capacity to exclusively power the illumination of the exit sign legend(s) during power failure. Internally, components are shared between the exit sign and emergency battery pack and the two loads cannot be isolated from each other at the normal ac source input for power consumption measurements for energy efficiency verification purposes.*

f_1' — the degree to which the relative spectral responsivity of a photometric instrument matches the spectral luminous efficiency function, V(λ), of the human eye for photopic vision. It is independent of the illuminant being measured and does not allow positive departures from V(λ) to cancel negative ones.
Note: *See CIE 69.*

$f_2(u)$ — a measure of a luminance meter's immunity to luminous areas outside the measurement field.
Note: *See CIE 69.*

Faceplate — a part of an exit sign with cut openings that represent the required legend.

Fluorescent power (inverter/charger) pack — an enclosed unit assembly equipped with batteries, a charger, a high-frequency inverter, and control circuitry intended to be installed in a fluorescent fixture to provide an automatic source of power to lamp loads upon failure of normal power sources.

High-frequency inverter — an arrangement of solid-state circuitry designed to convert dc power to high-frequency (greater than 800 Hz) ac and the voltage required to operate electric discharge lamps.

Legend — a pictogram, with or without additional letters, characters, or symbols, appearing on an exit sign to indicate way of egress.

Legibility — the attributes of a pictogram and/or of alphanumeric characters, including contrast, luminance, stroke width, and shape, that make it possible for each one to be distinguished and identified.

Limited-energy circuit, limited power source (LPS) — a low-voltage circuit supplied by a source of maximum 30 V ac or 42.4 V peak open-circuit potential and maximum 8 A available current measured after 1 min of operation.

Limiting impedance circuit — a circuit supplied by an impedance that, when a direct short is applied across the source output
(a) has a calculated power dissipation of 15 W or less; and
(b) does not incur any opened or shorted components.
The limiting impedance shall additionally function as intended under any single-fault condition unless it consists of a single resistor, or of a single capacitor that complies with the Standard for capacitors, CSA TIL D-26 (or UL 1414).

Low-frequency inverter — an arrangement of solid-state circuitry designed to convert dc power to low-frequency (50 to 800 Hz) ac and the voltage required to operate lighting and power equipment.

Nominal battery voltage — the voltage determined on the basis of 2 V per cell for lead acid systems and 1.2 V per cell for nickel cadmium systems and other voltages as specified by the battery manufacturers.

Normally OFF load — a load that is energized only when there is a power failure.

Normally ON load — a load that is energized when the ac line is present and when there is a power failure.

Pictogram — a part of an exit sign with lines and area representing the required legend (see Figures B.1 and B.2).

Pictogram luminance contrast, *k* — luminance of the contrast, colour white, L_1, divided by the luminance of the safety green colour, L_2, where L_1 is greater than L_2, calculated as follows:

$$k = \frac{L_1}{L_2}$$

Pictogram uniformity — uniformity of the luminance within each colour, measured as the ratio of minimum to maximum luminance within that colour, as follows:

$U_{pictogram\ colour} = L_{min}/L_{max}$

Required legend — words or symbols intended to transmit a specific message associated with life safety, in accordance with the *National Building Code of Canada*.
Note: *Examples are words such as "EXIT" and "STAIRS", pictograms such as a running man, and directional arrows. Comparable text (in English or other languages as appropriate for the installation site) or graphical symbols identifying means of egress as shown in the applicable standard for fire safety symbols, the* National Building Code of Canada*, or similar standards are also considered required legends.*

Risk of fire — a risk of fire exists in all electrical circuits except:
(a) a Class 2 circuit;
(b) an isolated low-voltage limited-energy circuit; or
(c) a limited impedance circuit.

Stencil face — for the purposes of Annex A, a component of an exit sign in which the legend is luminous and the background is opaque or luminous.

Unit equipment for emergency lighting — equipment that
(a) is intended to provide automatically, in response to a failure of the power supply to which it is connected, a specified light output and a specified amount of power for illumination purposes, for a specified period of time, but in any case not less than 30 min;
(b) comprises, in a unit construction
  (i) a storage battery;
  (ii) a charging means to automatically maintain the battery in a charged condition;
  (iii) lamps or output terminals to which specifically listed lamps can be connected;
  (iv) a means to energize the lamps when the normal power supply fails and to de-energize the lamps when the normal power supply is restored; and
  (v) a means to indicate and test the operating condition of the equipment;
(c) is designed for use in applications in which the provision of emergency illumination is required by a governmental or other agency having jurisdiction; and
Δ (d) has a maximum capacity of 1.44 kW and can be constructed with a frequency inverter (Clauses 7.12.3.1 to 7.12.3.3).
Note: *Unless otherwise stated, the word "equipment" refers to exit signs, emergency luminaires, unit equipment, and central power systems.*

Visibility — the quality of a character or of a symbol that makes it detectable from its surrounding.

4 General requirements

4.1 General

Exit signs and unit equipment shall conform to the applicable requirements in CAN/CSA-C22.2 No. 0.

Central power systems shall conform to the applicable requirements in CSA C22.2 No. 107.1, and the additional requirements specified in this Standard.

In addition to the requirements of this Standard, luminaires shall comply with the applicable requirements of CSA C22.2 No. 250.0, as amended by Clauses 5.18.2, 6.11, 7.5.5, 7.14.1, and 7.15.1 of this Standard.

4.2 Output rating

4.2.1 Unit equipment and emergency luminaires

Unit equipment and emergency luminaires shall be rated by stating the following:

(a) the load in volts and watts that it is intended to supply; and
(b) the minimum period of time for which it is capable of supplying the stated load.

4.2.2 Central power system

The central power system shall be rated by stating the following:

(a) the load in watts and power factor, or amperes and volt-amperes, that it is intended to supply; and
(b) the minimum period of time for which it is capable of supplying the stated load at 91% of the rated voltage at the load terminal.

The central power system shall be rated in accordance with Clause 7.12.3.

Note: *This Clause specifies the information necessary to convey to the user the capability of equipment. Marking requirements are specified in Clause 6.*

4.2.3 Rated discharged time

The minimum period of time specified in Clauses 4.2.1 and 4.2.2 shall be 30 min or greater as specified in the lighting and emergency power systems section in the *National Building Code of Canada*.

4.3 Equipment performance

4.3.1 Criteria — Unit equipment and emergency luminaires

Unit equipment in which the marking includes replacement lamps conforming to Clause 6.3 and that is constructed such that lamps can be mounted as part of the equipment or located remotely from the equipment shall

(a) be capable of supplying the load conforming to the rating for the time specified without causing the voltage at the battery terminals to fall below the minimum end-of-discharge voltage recognized by the battery manufacturer for emergency lighting service at a temperature of 25 °C, but not below 87.5% of the nominal battery voltage;

Annex D (informative)
Tests for energy performance and relevant markings

Note: *This informative Annex has been written in mandatory language to facilitate adoption by anyone wishing to do so.*

Δ D.1 General

Type 3 exit signs containing an integral battery-charging system shall be tested with the charging system connected and the battery fully charged.

A pictogram sign with a directional indicator and a supplement legend shall be considered to be a bilingual sign for power consumption calculations.

D.2 Measuring voltage, current, and power

D.2.1 General

The following measurements shall be made for an exit sign when it is operating in the circuit containing the power supply and instrumentation shown in Figure D.1:

(a) rms voltage (*V*);
(b) rms current (*A*); and
(c) actual power (*W*)

where

$$\text{Power factor} = \frac{(W)}{(V)(A)}$$

D.2.2 Measuring the rms voltage

The rms voltage shall be measured when switches S1, S3, and S4 are closed and switch S2 is open, as shown in Figure D.1.

D.2.3 Measuring the rms current

The rms current shall be measured when switch S3 is closed and switches S1, S2, and S4 are open, as shown in Figure D.1.

D.2.4 Measuring the actual power

The actual power shall be measured when switches S2 and S4 are closed and switches S1 and S3 are open, as shown in Figure D.1.

D.2.5 Correcting the electrical measurements

The electrical measurements shall be corrected for any power consumed by the electrical instruments if the power losses are non-negligible.

D.3 Test requirements

D.3.1 Actual power — Signs

D.3.1.1
The actual power, determined in accordance with Clause D.2.4, consumed by an exit sign shall comply with Table D.1 when the exit sign is energized by a regulated ac power supply adjusted to the rated voltage for normal operation.

Δ

D.3.1.2
For the purpose of Clause D.3.1, legend is defined as the running man pictogram (see Annex B) or the word displayed on an exit sign, specifically "EXIT" or "SORTIE" (see Annex A). A bilingual sign shall be considered a two-legend and have a maximum input power of 10 W (see Table D.1). A Type 3 sign shall be allowed an additional 5 W to meet the charging circuit requirements.

D.3.1.3
The actual power consumed by an exit sign, determined in accordance with Clause D.2.4, shall comply with Table D.1 when the exit sign is energized by a regulated ac power supply adjusted to the rated voltage for normal operation.

D.3.1.4
For signs having more than two sides, each additional legend shall not consume more than 5 W per legend.

D.3.1.5
Components not directly related to the lighting of the signs (such as a heater) shall not be included in the consumption calculation.

D.3.2 Total harmonic distortion/power factor
Exit signs shall comply with the requirements of Table D.2. Signs with input power of 10 W or less shall be exempt from these requirements.

D.4 Marking

D.4.1
An exit sign shall be permanently marked with the following:
(a) manufacturer's identification;
(b) input voltage (V) and frequency (Hz); and
(c) total current (A) and power (W).

D.4.2
The following information shall be provided on the sign, on the packaging, or in the product literature:
(a) power factor (specify if lagging or leading); and
(b) total harmonic distortion.

Note: *This requirement does not apply to signs drawing* 10 W *or less from the ac service.*

Table D.1
Requirements for single- and double-sided exit signs
(See Clauses D.3.1.2 to D.3.1.3.)

	Unilingual			Bilingual		
	AC (Type 1)	AC/DC (Type 2)	SP (Type 3)	AC (Type 1)	AC/DC (Type 2)	SP (Type 3)
Maximum wattage	**5**	**5**	**10**	**10**	**10**	**15**
Total harmonic distortion (THD)	If > 10 W, THD shall be less than 32%					
Power factor	If > 10 W, power factor shall be at least 90%					

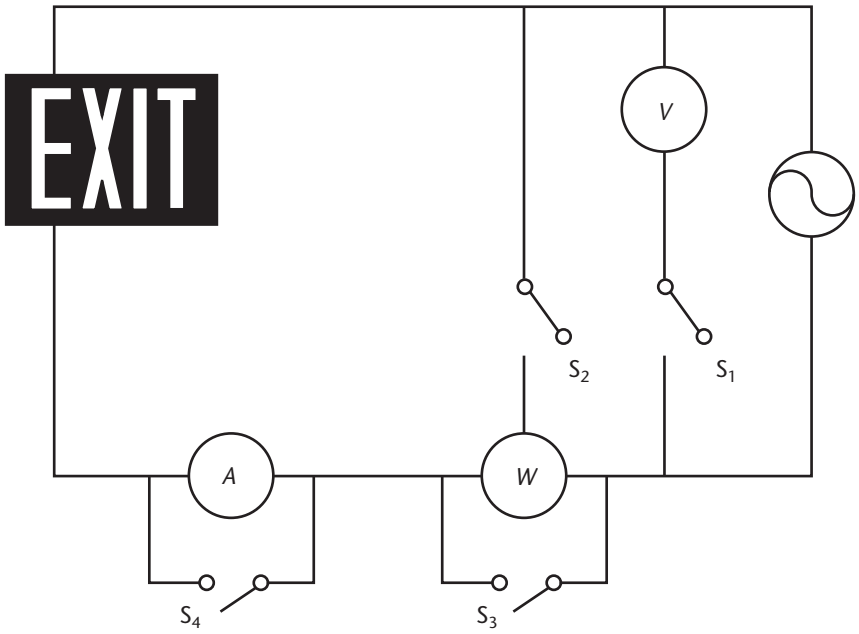
Δ **Notes:**

(1) *Energy performance tests are performed with the battery fully charged.*

(2) *In accordance with Clause D.1, a pictogram with a directional indicator and supplementary legend is considered a bilingual sign for power consumption calculations.*

Table D.2
Total harmonic distortion/power factor
(See Clause D.3.2.)

Parameter	Requirement	Test method
Effect on input current total harmonic distortion (THD)	≤ 32%	CAN/CSA-C22.2 No. 0.16
Power factor (PF)		CAN/CSA-C22.2 No. 0.16
if lagging	≥ 90%	
if leading	No limit	



Switch	RMS voltage (*V*)	RMS current (*A*)	Actual power (*W*)
S_1	Closed	Open	Open
S_2	Open	Open	Closed
S_3	Closed	Closed	Open
S_4	Closed	Open	Closed

Figure D.1
Electrical test circuit
(See Clauses D.2.1 to D.2.4.)

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J. Guarino	Kenall Manufacturing Company, Inc., Gurnee, Illinois, USA	
D.J. Heron	Electrical Safety Authority, Sudbury, Ontario	
D. Lenasi	CSA International, Richmond, British Columbia	*Associate*

G. Lue	Illumineer Ltd., Toronto, Ontario	
R. Mattatall	Mattatall Signs Limited, Dartmouth, Nova Scotia	
E. Mendoza	Philips Lighting Electronics, N.A., Rosemont, Illinois, USA	
S. Michaud	Thomas & Betts Fabrication Inc., Dorval, Québec	
A. Milne	21st Olympiad Sales, Agincourt, Ontario	
G. Montminy	Régie du bâtiment du Québec, Québec, Québec	
J.P. Neu	Electro-Federation Canada, Toronto, Ontario	*Associate*
M.S. O'Boyle	Lightolier Inc., Fall River, Massachusetts, USA	*Associate*
Z. Psarski	CSA International, Toronto, Ontario	*Associate*
D. Rittenhouse	Maple Ridge, British Columbia	
G.E. Schaefer	Canlyte Inc., Cambridge, Ontario	*Associate*
C.S. Seaby	Burlington, Ontario	
A.W. Serres	General Electric Company, Cleveland, Ohio, USA	
M.S. Shulman	Underwriters Laboratories Inc., Santa Clara, California, USA	*Associate*
S.K. Simon	Zaneen Lighting Inc., Toronto, Ontario	
D. Sorak	Cantar Pool Products Limited, Toronto, Ontario	
G. Steinman	Thomas & Betts Corporation, Memphis, Tennessee, USA	
A.Z. Tsisserev	Stantec, Vancouver, British Columbia	
K. Van Bavel	Fifth Light Technology Ltd., Oakville, Ontario	
K. Vannice	Leviton Manufacturing Co., Inc., Tualatin, Oregon, USA	

H.L. Wolfman	Lumispec Consulting, Northbrook, Illinois, USA	
J.L. Hernandez	Canadian Standards Association, Mississauga, Ontario	*Project Manager*

In addition to the members of the Integrated Committee on Lighting Products, the following people made a valuable contribution to the development of this Standard:

J. Beare	Stanpro Lighting Systems Inc., St. Laurent, Québec
C. Descarries	Thomas & Betts Fabrication Inc., Dorval, Québec
S. Leger	Stanpro Lighting Systems Inc., St. Laurent, Québec
K. Mitchell	Stanpro Lighting Systems Inc., St. Laurent, Québec
R. Rapeanu	Thomas & Betts Fabrication Inc., Dorval, Québec
P. Shilling	Beghelli Canada, Newmarket, Ontario

Preface

This is the fourth edition of CSA C22.2 No.141, *Emergency lighting equipment*, one of a series of Standards issued by the Canadian Standards Association under Part II of the *Canadian Electrical Code*. It supersedes the previous editions, published in 2002, 1985, and 1972.

For general information on the Standards of the *Canadian Electrical Code, Part II*, see the preface of CAN/CSA-C22.2 No. 0, *General Requirements — Canadian Electrical Code, Part II*.

This Standard establishes test methods and minimum requirements for evaluating the visibility and safety of emergency lighting equipment.

The following changes are reflected in this edition:

(a) The scope has been modified to clearly indicate that the Standard covers exit signs, emergency luminaires, and central power systems.
(b) Requirements for central power systems and for pictograms have been included.
(c) Flammability requirements for diffusers have been defined.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Integrated Committee on Lighting Products, under the jurisdiction of the Technical Committee on Consumer and Commercial Products and the Strategic Steering Committee on Requirements for Electrical Safety, and was formally approved by the Technical Committee.

Interpretations: The Strategic Steering Committee on Requirements for Electrical Safety has provided the following direction for the interpretation of standards under its jurisdiction: "The literal text shall be used in judging compliance of products with the safety requirements of this Standard. When the literal text cannot be applied to the product, such as for new materials or construction, and when a relevant committee interpretation has not already been published, CSA's procedures for interpretation shall be followed to determine the intended safety principle."

September 2010

Notes:

(1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*

(2) *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.*

(3) *This publication was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.*

(4) *To submit a request for interpretation of CSA Standards, please send the following information to* ***inquiries@csa.ca*** *and include "Request for interpretation" in the subject line:*
(a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;
(b) provide an explanation of circumstances surrounding the actual field condition; and
(c) where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.
Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are published in CSA's periodical* Info Update*, which is available on the CSA website at* ***http://standardsactivities.csa.ca****.*

(5) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee. To submit a proposal for change to CSA Standards, please send the following information to* ***inquiries@csa.ca*** *and include "Proposal for change" in the subject line:*
(a) Standard designation (number);
(b) relevant clause, table, and/or figure number;
(c) wording of the proposed change; and
(d) rationale for the change.

C22.2 No. 141-10
Emergency lighting equipment

1 Scope

1.1
This Standard applies to exit signs, unit equipment, emergency luminaires, and central power systems intended for connection to circuits with nominal voltages of 600 V and less and providing illumination in the event of a failure of the normal power supply for nonhazardous locations in accordance with the *Canadian Electrical Code, Part I*.

1.2
This Standard includes requirements for the construction of emergency lighting equipment to preclude fire and shock hazards and to ensure that the equipment has the minimum capability for performing its intended function.

1.3
In CSA standards, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (nonmandatory) to define their application.

1.4
The values given in SI units are the units of record for the purposes of this Standard. The values given in parentheses are for information and comparison only.

2 Reference publications
This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA (Canadian Standards Association)

C22.1-09
Canadian Electrical Code, Part I

C22.2
Canadian Electrical Code, Part II

CAN/CSA-C22.2 No. 0-M91 (R2006)
General Requirements — Canadian Electrical Code, Part II

C22.2 No. 0.8-09
Safety functions incorporating electronic technology