National Differences For

UL 60950-1.2

Information Technology Equipment - Safety - Part 1: General Requirements

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UL 60950-1

Information Technology Equipment - Safety - Part 1: General Requirements

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This revision of UL 60950-1 is being issued to incorporate the following:

- **Proposed Revisions to Align with Amendment 2 and Corrigendum 1 to IEC 60950-1**
- **Annexes P.1 and P.2 - Proposals Needed to Address the Editorial Maintenance of the Standard**
- **Updated References Based on the Latest Versions of the National Electrical Code (NEC) and the Canadian Electrical Code (CEC)**

UL 60950-1 is an adoption of IEC 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements (Second Edition, issued December 2005, including Amendment 1 issued December 2009).

This document provides a single listing of the National Differences included in the UL adoption of the corresponding IEC standard. Editorial differences appearing in the UL standard are not included in this technical compilation. The complete listing of National Differences is available in the UL standard.

[DE] **Preface**

[DE] This is the harmonized CSA Group and UL standard for Information Technology Equipment - Safety - Part 1: General Requirements. It is the second edition of CAN/CSA-C22.2 No. 60950-1 and the second edition of UL 60950-1. This harmonized standard has been jointly revised on October 14, 2014. For this purpose, CSA Group and UL are issuing revision pages dated October 14, 2014.

[DE] This harmonized standard is based on IEC Publication 60950-1, second edition, Information Technology Equipment - Safety - Part 1: General Requirements issued 12-2005, as revised by Corrigendum 1 (issued 12-2006), Amendment 1 (issued 12-2009), Amendment 2 (issued 5-2013) and Corrigendum 2 (issued 8-2013). IEC publication 60950-1 is copyrighted by the IEC.

[DE] Previous editions of this standard were designated CAN/CSA-C22.2 No. 950/UL 1950 and CAN/CSA-C22.2 No. 60950/UL 60950, third edition. This standard CAN/CSA-C22.2 No. 60950-1/UL 60950-1, second edition, replaces the previous standard CAN/CSA-C22.2 No. 60950-1/UL 60950-1, first edition. The standard number and edition number have been aligned to correspond with the equivalent IEC 60950-1 standard.

[DE] This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of representatives of leading industry companies and organizations are gratefully acknowledged.

[DE] This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

[DE] This standard was reviewed by the CSA Subcommittee on Safety of Electronic Equipment within the Field of Audio/Video, Information, and Communication Technology, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

[DE] This Standard has been approved as a National Standard of Canada by the Standards Council of Canada.

[DE] This Standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

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

> [DE] 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.

[DE] **Level of harmonization**

[DE] This standard adopts the IEC text with national differences. This standard is published as an equivalent standard for CSA Group and UL.

[DE] 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.

[DE] All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

[DE] **Interpretations**

[DE] 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.

[DE] **CSA Group effective date**

[DE] The effective date for CSA Group will be announced through a *CSA Informs* or *CSA Group Certification Notice*.

[DE] **UL effective date**

[DE] The effective date for UL is available on UL's website at www.ul.com.

[DE] **General**

[DE] National differences from the text of the International Electrotechnical Commission (IEC) Publication 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements, Copyright 2005, are indicated by the following margin notations:

[DE] There are six types of national differences, as noted below. The national difference type is noted in the margin next to the affected text. The standard may not include all types of these national differences.

[DE] D1 - national differences based on national regulatory requirements which result in equivalent or more stringent requirements than in IEC 60950-1.

[DE] D2 - national differences based on other than national regulatory requirements which result in equivalent or more stringent requirements than in IEC 60950-1.

[DE] DI - national differences based on IEC final draft international standards (FDIS). DI national differences may be less stringent than, equivalent to, or more stringent than requirements in IEC 60950-1.

[DE] DC - national differences based on UL and CSA component requirements. DC national differences may be less stringent than, equivalent to, or more stringent than component requirements in IEC 60950-1.

[DE] D3 - national differences based on bi-national requirements which result in less stringent requirements than in IEC 60950-1.

[DE] DE - editorial national differences that correct typographical errors in IEC 60950-1 or revise the terminology, but do not alter the technical intent of the requirements. This notation is also used for informative statements such as the Preface.

[DE] National differences have been incorporated into the body of the standard. If national differences necessitate the deletion of IEC 60950-1 text, the IEC 60950-1 text has been ~~lined out~~. Except for tables and figures and annexes, text added as a result of national differences has been underlined. Text added as the Preface is not underlined.

[DE] A number of additional annexes are included at the back of the standard as national differences. Pointers to these annexes are provided in the right-hand margin of the body of the standard to direct the user to these informative/normative annexes. The pointer text is provided in [P.2 NAA] *BOLD ITALICS*. Examples of such pointers are shown here in the right-hand margin.

[DE] **IEC Copyright**

[DE] For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements, copyright 2005, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

[DE] For UL, the text, figures and tables of IEC publication 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements, copyright 2005 are used in this standard with the consent of the IEC and the American National Standards Institute (ANSI). The IEC copyrighted material has been reproduced with permission from ANSI. ANSI should be contacted regarding the reproduction of any portion of the IEC material. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only. Copies of IEC Publication 60950-1 may be purchased from ANSI, 25 West 43rd Street, 4th Floor, New York, New York, 10036, (212) 642- 4900.

National Differences

1.1.1 Equipment covered by this standard. Modified by the following:

[D1] This standard is applicable … and designed to be installed in accordance with the Canadian Electrical Code, Part I; General Requirements - Canadian Electrical Code, Part II, CSA C22.2 No. 0-10; the National Electrical Code, NFPA 70-2014; and the National Electrical Safety Code, IEEE C2-2012.

[D1] The standard is also applicable to equipment, unless otherwise identified by a marking or instructions, designed to be installed in accordance with Article 645 of the National Electrical Code, ANSI/NFPA 70, and the Standard for the Protection of Information Technology Equipment, NFPA 75-2013.

[D1] See Annex NAE for examples of and references to regulatory requirements that apply to this equipment.

[D2] This standard also specifies requirements intended to reduce risks from acoustic outputs at communication receivers and similar devices used for voice telecommunication, regardless of transmission medium (e.g., TELECOMMUNICATION NETWORK, CABLE DISTRIBUTION NETWORK, wireless network). See Annex NAD.

1.1.3 Exclusions. Modified by the following:

[DC] Battery backup systems that are not an integral part of STATIONARY EQUIPMENT, such as provided in separate cabinets, are subjected to the appropriate standard for the battery backup systems, such as the Standard for Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications, UL 1973.

[DC] NOTE See Figures 1.1 and 1.2 of UL 1973 for more information on independent electric energy storage systems (EESS) covered by UL 1973, which can consist of both low voltage and hazardous voltage subsystems, battery management, thermal management, and related features and safeguards. When interconnected with AV, IT and CT Equipment, and typically used in conjunction with an uninterruptible power supply (UPS), such EESS typically serve as short term substitution of the mains supply during power outages and similar disturbances.

1.2.3 Equipment mobility. Modified by the following:

1.2.3.1 MOVABLE EQUIPMENT: …

[DE] NOTE MOVABLE EQUIPMENT includes wall-mounted equipment whose mounting means permits removal by an OPERATOR.

1.2.5 Connection to the supply. Modified by the following:

1.2.5.1 PLUGGABLE EQUIPMENT TYPE A: …

[DE] NOTE 1-15, 2-15, 2-20, 5-15 and 5-20 plugs and outlets as specified in IEC 60083 are considered to be non-industrial within the meaning of this standard.

1.2.8 Circuits and circuit characteristics. Modified by the following:

1.2.8.2 DC MAINS SUPPLY: …

[DE] NOTE 1 See ITU-T …

[D2] NOTE 2 See 1.6.1.2

1.4.4 Operating parameters for tests. Modified by the following:

[D1] - overcurrent protection devices provided as part of the building installation for protection against overcurrents, short-circuits, and earth faults. (See 1.4.14.)

1.4.14 Simulated faults and abnormal operations. Modified by the following:

[D1] When applying simulated faults or abnormal operating conditions, consideration should be given to the overcurrent protection devices provided as part of the building installation for protection against overcurrents, short-circuits, and earth faults.

[D1] For PLUGGABLE EQUIPMENT TYPE A, the protection in the installation shall be taken to be a fuse or circuit breaker rated 20 A.

[D1] For PLUGGABLE EQUIPMENT TYPE B, the protection in the installation shall be equal to the rated current of the plug or as specified in the installation instructions. (See 2.7.1.)

1.5.1 General. Modified by the following:

[DC] Components and subassemblies that comply with ~~IEC 62368-1~~ CSA/UL 62368-1 …

[DC] In this standard, certain IEC component standard requirements are replaced by the relevant requirements of component standards listed in Annex P.1.

[DC] In this standard, certain requirements (such as flammability tests) are alternatively satisfied by complying with relevant requirements of component standards listed in Annex P.2.

1.5.5 Interconnecting cables. Modified by the following:

[D1] INTERCONNECTING CABLES used for external interconnection between parts of equipment or systems shall be constructed of cable acceptable for external use and shall be rated for the application with respect to voltage, current, anticipated temperature, flammability, mechanical serviceability and the like.

[DC] Cable assemblies with lengths external to the unit not exceeding 3,05 m, coiled or uncoiled, may be constructed of jacketed appliance wiring material, suitable for the maximum voltage, current and temperature, rated VW-1 or FT-1 or better.

[DC] Cable assemblies or wiring with lengths external to the unit not exceeding 3,05 m, coiled or uncoiled, and supplied by a limited power source or CEC/NEC Class 2 source of supply as defined in the Canadian Electrical Code, CSA C22.1 and National Electrical Code, ANSI/NFPA 70, may be constructed of materials rated VW-1 or FT-1 or better with no additional requirements.

[D1] *Compliance is checked by inspection.*

1.6 Power interface. Modified by the following:

[DE] 1.6.1 ~~AC~~ Power distribution systems

[DE] 1.6.1.1 AC power distribution systems

[D2] 1.6.1.2 DC power distribution systems

[D2] A circuit for connection to the DC MAINS SUPPLY is classified as either a SELV CIRCUIT, TNV-2 CIRCUIT or HAZARDOUS VOLTAGE CIRCUIT depending on the maximum operating voltage of the supply. This maximum operating voltage shall include consideration of the battery charging ″float voltage″ associated with the intended supply system, regardless of the marked power rating of the equipment.

[D2] NOTE Equipment marked -60 V d.c. and connected to a DC MAINS SUPPLY may have a maximum operating voltage of up to -75 V d.c. per IEC TR 62102.

[D2] For the purposes of applying insulation requirements only, circuits connected to a DC MAINS SUPPLY shall be treated as indicated below:

Maximum Operating Voltage of DC MAINS SUPPLY	Classification of Circuit Connected to DC MAINS SUPPLY
> 60 V up to and including 80 V	TNV-2
> 80 V HAZARDOUS VOLTAGE	TNV-2
> 80 V	HAZARDOUS VOLTAGE

[D2] These circuits are not current-limited to TNV CIRCUIT limits when providing power for equipment connected to a DC MAINS SUPPLY but shall be appropriately current-limited when connected to a TELECOMMUNICATION NETWORK.

[D2] See 3.2.1.2 for additional connection requirements for equipment connected to a DC MAINS SUPPLY.

1.7 Markings and instructions. Modified by the following:

NOTE Additional requirements for markings and instructions …

[DE] ~~3.4.3~~ 3.4.2 Disconnect devices
[D2] Annex NAA

2.1.1.1, Access to energized parts. Modified by the following:

– bare parts of TNV CIRCUITS, except that access is permitted to:

[D3] • bare conductive parts in the interior of equipment that are normally protected against contact by a cover intended for occasional removal by the OPERATOR, such as for the installation of accessories, provided that the installation instructions include directions for the disconnection of the TNV CIRCUIT connector before removing the cover;

2.3.1 Limits. Modified by the following:

[D2] Except as permitted in 1.6.1.2, the voltages …

[D2] – when other telephone signals are present, voltages such that the signal complies with the criteria of Clause M.4;

[D2] – when telephone ringing signals or other telephone signals …

and for voltages exceeding 42,4 V peak or 60 V d.c., the current flowing through any resistance 2 000 ohms or greater connected across the voltage source with other loads disconnected does not exceed 7,1 mA peak or 30 Ma d.c.

[D2] • the voltage limits of …, except the limits after 200 ms specified in Figure 2F are replaced by the limits of M.3.1.4.

2.3.2.1 General requirements. Modified by the following:

SELV CIRCUITS, TNV-1 CIRCUITS …

[D2] b) the voltages … ~~in 2.3.1 b) for TNV-2 CIRCUITS and TNV-3 CIRCUITS under normal operating conditions~~ 2.2.3.

2.6.2 Functional earthing. Modified by the following:

If FUNCTIONAL EARTHING …

[D1] – ~~wiring terminals to be used only for FUNCTIONAL EARTHING shall not be marked by the symbol 60417-IEC-5017) or by the symbol 60417-IEC-5019), except that, where a wiring terminal is provided on a component (for example, a terminal block) or subassembly, the symbol is permitted; and~~

[D1] ~~NOTE Other markings such as one of the symbols, (IEC 60417-5018 (DB: 2002-10)) or (IEC 60417-5020 (DB: 2002-10)), if appropriate, are permitted.~~

[D1] – wiring terminals to be used only for the connection of FUNCTIONAL EARTHING shall be marked by the symbol (IEC 60417-5020:2002-10). These terminals shall not be marked with the symbol (60417-IEC-5017), or with the symbol (60417-IEC-5019). However, these symbols may be used for a wiring terminal provided on a component (for example, a terminal block) or subassembly; and

For equipment having a power …

[D1] ~~– the equipment may be marked with:~~

~~• the symbol , IEC 60417-5018 (2011-07); or~~

~~• the symbol, IEC 60417-6092 (2011-10).~~

– the equipment shall be marked with the symbol , IEC 60417-6092 (2011-10).

2.6.3.3 Size of protective bonding conductors. Modified by the following:

[D1] – the requirements of 2.6.3.4 and also, if the PROTECTIVE CURRENT RATING of the circuit is more than ~~16~~ 20 A, …

2.6.3.4 Resistance of earthing conductors and their terminations. Modified by the following:

[D1] PROTECTIVE BONDING CONDUCTORS and their terminals of non-standard constructions, such as printed wiring protective traces, shall also be evaluated in accordance with the Limited Short-Circuit Test in CSA C22.2 No. 0.4, Bonding of Electrical Equipment. PROTECTIVE BONDING CONDUCTORS that can be determined to meet the equivalent of the minimum conductor sizes in Table 2D and are provided with terminals not more than one size smaller than the sizes in Table 3E (see 3.3.5) shall be considered to comply without test.

[DE] NOTE Short-circuit values for d.c. equipment and systems are under consideration.

3.1.1 Current rating and overcurrent protection. Modified by the following:

[D1] All internal wiring (including busbars) and INTERCONNECTING CABLES used in the distribution of PRIMARY CIRCUIT power and all INTERCONNECTING CABLES …
[D1] Examples considered to comply with this requirement are:

[D1] – conductors provided with overcurrent protection in accordance with Article 240 of the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, Section 14;

[D1] – internal conductors supplied by a power source that is limited to the output voltage and current values specified in Table 2B or is limited to the output voltage values and provided with an overcurrent protective device with a RATED CURRENT value as specified in Table 2C;

[D1] - INTERCONNECTING CABLES supplied by a limited power source (see 2.5);

[D1] - a 20-A protective device used with any size wire in the primary.

3.1.9 Termination of conductors. Modified by the following:

Examples of constructions…

[D3] – wire-wrap terminals used for the connection of SELV and TNV CIRCUITS that are:

[D3] a) provided on equipment that forms part of the TELECOMMUNICATION NETWORK, up to and including the demarcation point, and is located in SERVICE ACCESS AREAS only. (This equipment is generally considered Central Office Equipment, although it may be deployed elsewhere in similarly controlled environments.) and

[D3] b) provided with a guard or cover that prevents unintentional contact during normal operation.

3.2.1 Means of connection. Modified by the following:

[D1] Where equipment is intended to be connected to a standard U.S. or Canadian source of supply by a power supply cord, the attachment plug shall be rated not less than 125 % of the RATED CURRENT of the equipment at the nominal system voltage range as defined by the configuration of the plug.

3.2.1.1 Connection to an a.c. mains supply. Modified by the following:

[D1] – a NON-DETACHABLE POWER SUPPLY CORD ~~for permanent connection to the supply, or~~ …

3.2.1.2 Connection to a d.c. mains supply. Modified by the following:

[D1] – a NON-DETACHABLE POWER SUPPLY CORD ~~for permanent connection to the supply, or~~ …

[D1] For equipment intended to be installed in RESTRICTED ACCESS LOCATIONS, … provided ~~the equipment installation instructions detail the proper earthing for the system~~ all of the following conditions are met:

[D1] - the equipment is intended to connect directly to the point of earthing of the d.c. system;

[D1] – bus bars, bonding jumpers and terminals are provided for the connection of the equipment earthing conductors and the earthing electrode conductor, by permanent wiring methods, to one of the d.c. supply conductors. Such hardware shall be constructed and sized in accordance with the Standard for Switchboards, UL 891, and Switchgear Assemblies, CSA C22.2 No. 31;

[D1] – the d.c. supply conductor may be earthed in more than one piece of equipment if all the equipment is located in the same immediate area as the point of earthing of the d.c. system (that is, within the ″earthing window″);

[D1] – means are provided for connection of the equipment to the d.c. source by permanent wiring methods, and no disconnecting device is located in the earthed d.c. circuit conductor between the point of connection to the supply and the point of connection to the earthing electrode and equipment earthing conductors;

[D1] – the equipment is marked with instructions or a reference to instructions for proper earthing and bonding of the system and equipment. The marking shall be permanent and located near and in plain view of the field wiring terminals and worded as indicated in Annex NAA for equipment that either:

[D1] a) has provisions to connect the earthed conductor of a d.c. supply circuit to the earthing conductor at the equipment or

[D1] b) has the earthed conductor of a d.c. supply circuit connected to the earthing conductor at the equipment; and

[D1] – installation instructions are provided for field assembly of earthing and bonding conductors where the connections are not conventional.

3.2.3 Permanently connected equipment. Modified by the following:

[DE] PERMANENTLY CONNECTED EQUIPMENT shall be provided with ~~either~~:

[D1] – a set of terminals as specified in 3.3; ~~or~~

[D1] ~~– a NON-DETACHABLE POWER SUPPLY CORD.~~

[D1] PERMANENTLY CONNECTED EQUIPMENT ~~having a set of terminals~~ shall:

3.2.6 Cord anchorages and strain relief. Modified by the following:

[D1] INTERCONNECTING CABLES shall be provided with strain relief unless strain relief is provided as part of the equipment. Where disconnection or breaking of wiring at the connections will not result in a hazard, strain relief need not be provided, for example, in a limited power circuit where breaking of a connection will not result in a reduction of CREEPAGE DISTANCE or CLEARANCE.

3.3.4 Conductor sizes to be connected. Modified by the following:

[D1] Terminals shall allow … ~~as shown in Table 3D~~ in accordance with Annex NAE.

[D1] *Compliance is checked by inspection, … ~~shown in Table 3D~~.*

[D1] ~~**Table 3D – Range of conductor sizes to be accepted by terminals**~~

~~RATED CURRENT of equipment A~~	~~Nominal cross-sectional area mm²~~					
	~~Flexible cords~~			~~Other cables~~		
~~Up to and including 3~~	~~0,5~~	~~to~~	~~0,75~~	~~1~~	~~to~~	~~2,5~~
~~Over 3 up to and including 6~~	~~0,75~~	~~to~~	~~1~~	~~1~~	~~to~~	~~2,5~~
~~Over 6 up to and including 10~~	~~1~~	~~to~~	~~1,5~~	~~1~~	~~to~~	~~2,5~~
~~Over 10 up to and including 13~~	~~1,25~~	~~to~~	~~1,5~~	~~1,5~~	~~to~~	~~4~~
~~Over 13 up to and including 16~~	~~1,5~~	~~to~~	~~1,5~~	~~1,5~~	~~to~~	~~4~~
~~Over 16 up to and including 25~~	~~2,5~~	~~to~~	~~2,5~~	~~2,5~~	~~to~~	~~6~~
~~Over 25 up to and including 32~~	~~4~~	~~to~~	~~4~~	~~4~~	~~to~~	~~10~~
~~Over 32 up to and including 40~~	~~6~~	~~to~~	~~6~~	~~6~~	~~to~~	~~16~~
~~Over 40 up to and including 63~~	~~10~~	~~to~~	~~10~~	~~10~~	~~to~~	~~25~~
		~~to~~	~~16~~			

3.3.5 Wiring terminal sizes

[D1] Table 3E – Sizes of terminals for mains supply conductors and protective earthing conductors [a]

Smaller of the RATED CURRENT of the equipment or the PROTECTIVE CURRENT RATING of the circuit under consideration, A, up to and including	Conductor size mm²	Minimum nominal thread diameter mm		Area of cross section mm²	
		Pillar type or stud type	Screw type [b]	Pillar type or stud type	Screw type [b]
10	1	3,0	3,5	7	9,6
16	1,5	3,5	4,0	9,6	12,6
25	2,5	4,0	5,0	12,6	19,6
32	4	4,0	5,0	12,6	19,6
40	6	5,0	5,0	19,6	19,6
63	10 [c]	6,0	6,0	28	28
80	16 [c]	7,9	7,9	49	49

[a] This table is also used for the sizes of terminals for PROTECTIVE BONDING CONDUCTORS if specified in 2.6.4.2.

[b] Screw type refers to a terminal that clamps the conductor under the head of a screw, with or without a washer. [c] As an alternative to the requirements of this table, the protective earthing conductor may be attached to special connectors, or suitable clamping means (for example, an upturned spade or closed loop pressure type; clamping unit type; saddle clamping unit type; mantle clamping unit type; etc.) that is secured by a screw and nut mechanism to the metal chassis of the equipment. The sum of the cross-sectional areas of the screw and the nut shall not be less than three times the cross-sectional area of the conductor size in Table 2D or Table 3B as applicable. The terminals shall comply with IEC 60998-1 and IEC 60999-1 or IEC 60999-2.

4.2.2 Steady force test, 10 N. Modified by the following:

[D3] *Wire-wrap terminals used for the connection of SELV and TNV CIRCUITS that are:*

a) provided on equipment that forms part of the TELECOMMUNICATION NETWORK, up to and including the demarcation point, and is located in SERVICE ACCESS AREAS only (This equipment is generally considered Central Office Equipment, although it may be deployed elsewhere in similarly controlled environments.); and

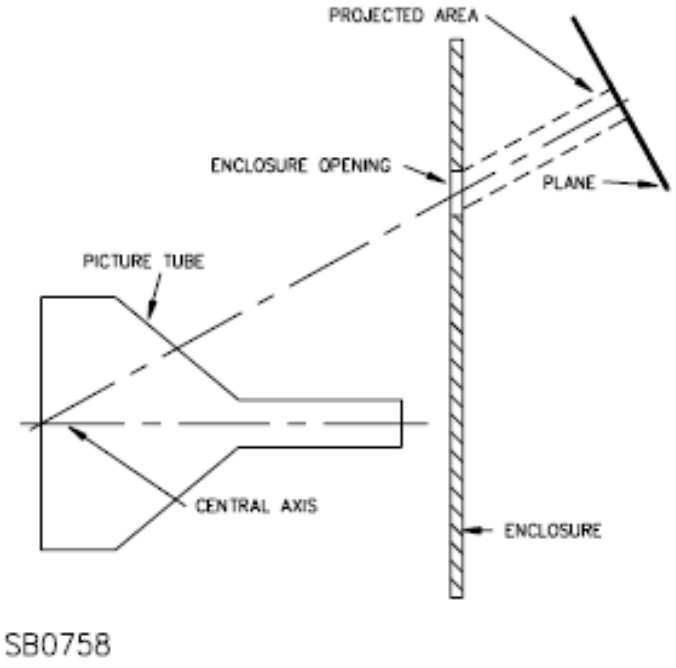
b) provided with a guard or cover that prevents unintentional contact during normal operation

are tested with a steady force of 2,5 N ± 0,25 N.

[D2] 4.2.8.1 Cathode ray tube enclosure. Modified by the following:

[D2] To reduce the risk of injury that can result from implosion of a cathode ray tube having a minimum diameter of 160 mm or equivalent face area, the projected area of any opening in the top, back, sides or front of the ENCLOSURE onto a plane perpendicular to a line passing through the centre of the opening and any point on the central axis of the bulb section of the picture tube shall not exceed 129 mm^2 unless the minor dimension of the projected area is not more than 9,5 mm. The cathode ray tube enclosure opening is illustrated in Figure 4A1.

[D2] *Compliance is checked by inspection and measurement.*



[D2] Figure 4A1 – Cathode ray tube enclosure opening

4.3.2 Handles and manual controls. Modified by the following:

[D2] A handle or handles intended to support more than 9,0 kg shall be capable of supporting four times the weight of the product without breakage of the handle, its securing means, or that part of the product to which the handle is attached.

[D2] *Compliance is determined by applying a force in the intended carrying direction uniformly over a 75 mm length at the centre of the handle. Starting at zero, the applied force shall be gradually increased so that the required test value is attained in 5 – 10 s and then maintained at the test value for 1 min. If more than one handle is provided, the test force shall be determined by the percentage of the product weight sustained by each handle with the product in the intended carrying position. If a product weighing less than 25,0 kg is provided with more than one handle but can be carried by only one handle, each handle shall be capable of withstanding a force based on the total weight of the product.*

4.3.8 Batteries. Modified by the following:

[DC] … shall comply with either (a) IEC 62133 and applicable parts of Annex M of IEC 62368-1, Edition No. 2, or (b) UL 2054 and 4.3.8.

[DC] Battery packs with secondary sealed cells and batteries (other than button) containing alkaline or other non-acid electrolyte and used in STATIONARY EQUIPMENT shall comply with either IEC 62133, UL 2054 or UL 1973.

[DC] Such battery packs used in STATIONARY EQUIPMENT that rely on solid-state circuits and software controls as safeguards shall comply with either a) the requirements in UL 1973 for System Safety Analysis (5.7) and Protective Circuit and Controls (5.8) or b) similar requirements in an appropriate standard for electronic safety-related controls that are suitable for investigation of such protection of secondary cells and batteries.

[DC] Where a battery standard does not contain requirements for electrical insulation used as a safeguard, appropriate insulation requirements from sub-clause 2.10 are applicable based on the WORKING VOLTAGE.

4.3.13.5.1 Lasers (including laser diodes). Modified by the following:

[D1] *Compliance is checked by inspection…* ~~*IEC 60825-1*~~ *Annex NAE.*

4.7.3.4 Materials for components and other parts inside fire enclosures. Modified by the following:

[DC] – wire that complies with the requirements for ″VW-1″ or ″FT-1″ or better, and that is so marked;

5.1 Touch current and protective conductor current. Modified by the following:

[D2] Except for application of 5.1.8.2 and 5.1.8.3, …

[**D2**]**5.1.8.3 Limitation of touch current due to ringing signals. Modified by the following:**

[D2] An EUT that receives ringing voltages on more than one TELECOMMUNICATION NETWORK connection port shall have simulated ringing applied to the network connections.

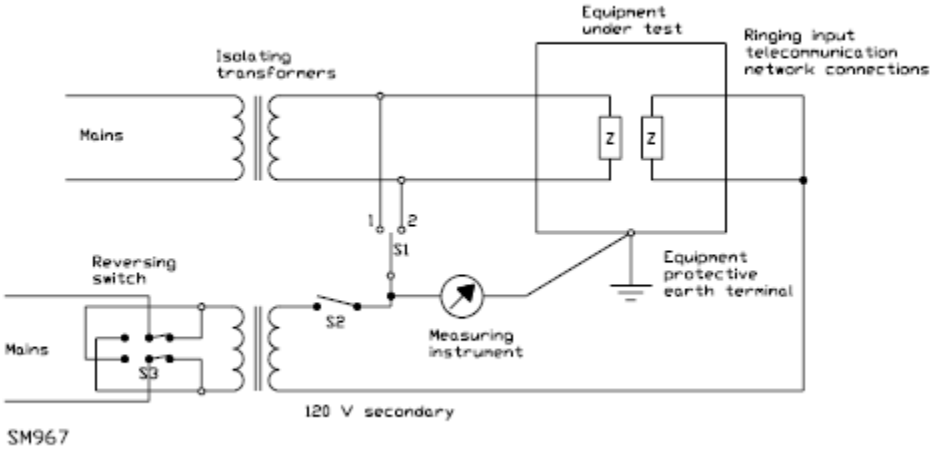
[D2] Simulated ringing shall be applied to 3 % (rounding down) of the ports receiving ringing in excess of three ports.

[D2] Equipment containing input TELECOMMUNICATION NETWORK leads over which ringing voltages are applied to the equipment shall be tested using the circuit of Figure 5C for mains-connected equipment or Figure 5D for other equipment. For any position of the selector switches, the current values shall not exceed the relevant limits specified in Table 5A.

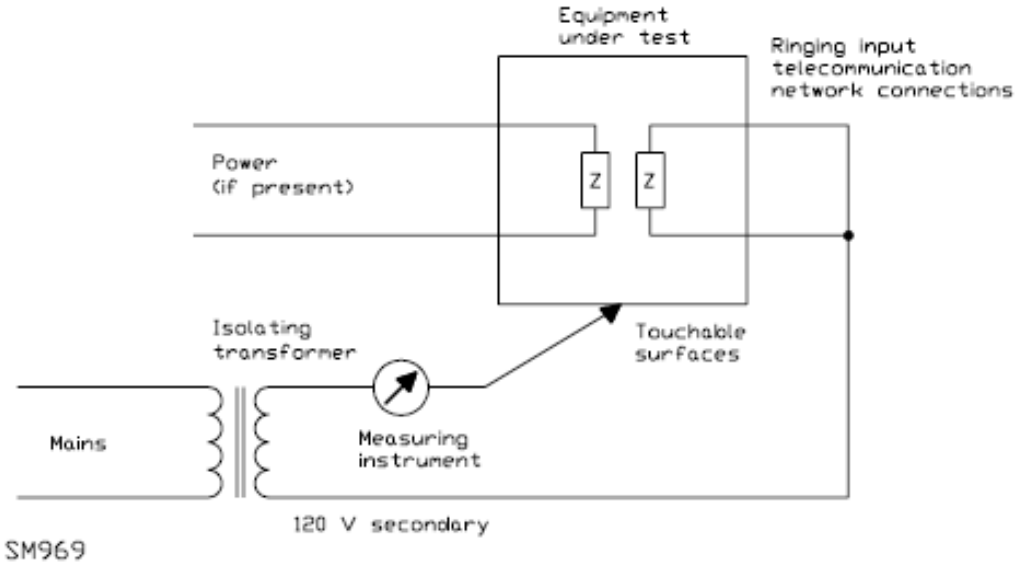
[D2] *Compliance is checked by the following tests which are conducted using the measuring instrument described in Annex D. Simulated ringing at 120 V, 50 to 60 Hz, shall be applied to ringing input TELECOMMUNICATION NETWORK leads, either one lead at a time or connected together. Other TELECOMMUNICATION NETWORK leads shall be left disconnected. Equipment shall be evaluated in each operating state, including ground start. The general test methods of 5.1 shall apply, checking leakage current for all positions of switches S1, S2 and S3.*

[D2] NOTE 1 Conducting the test with the leads connected together generally is a more efficient, though sometimes more onerous, test method. Compliance using either test method is acceptable.

[D2] NOTE 2 This requirement is intended to measure the total touch current of the product, including touch current due to ringing signals, and determine that the total touch current of the product continues to comply with Table 5A. This requirement supplements 5.1.8.2, which considers cumulative touch currents associated with all telecommunication ports in the product, but not ringing signals exclusively.



[D2] Figure 5C – Test circuit for earth leakage current on mains-connected equipment



[D2] Figure 5D – Test circuit for earth leakage current on other than mains-connected equipment

5.3.7 Simulation of faults. Modified by the following:

[D2] *f) Overloading of internal (e.g., card cage) SELV CIRCUIT connectors and printed wiring board connectors, or both, that are accessible to the operator and that deliver power. The connectors shall be connected to a load that draws the maximum available output current. The maximum available output current shall be:*

[D2] *(1) That current which is just below the trip point of any overcurrent or overtemperature protective device. The trip point of an overcurrent protective device shall be considered to be 110 % of its current rating; or*

[D2] *(2) the maximum available output current.*

[D2] *If the circuit is interrupted by the opening of a component, the test shall be repeated twice (three tests total), using new components as necessary.*

5.3.9.1 During the tests. Modified by the following:

[D2] *– if a wire or a printed wiring board trace in the PRIMARY CIRCUIT opens, the gap shall be electrically shorted and the test continued until ultimate results occur. This applies to each occurrence; and*

[D2] *– if a trace in a secondary circuit is designed to intentionally open in a repeatable manner, the test shall be conducted three times to determine if the circuit does open repeatedly; and*

6.3 Protection of the telecommunication wiring system from overheating. Modified by the following:

[D2] *Where a fuse is used to provide current limiting in accordance with 6.3, it shall not be operator-accessible unless it is not readily interchangeable.*

[D2]6.4 Protection against overvoltage from power line crosses. Modified by the following:

[D2] Equipment intended for connection to a TELECOMMUNICATION NETWORK that uses outside cable subject to overvoltage from power line failures shall comply with the construction requirements, test conditions or combination thereof as shown in Figure 6C.

[D2] NOTE 1 In Figure 6C, ″Pass 1, 2, 3, 4 or 5″ means compliance with Test Condition 1, 2, 3, 4 or 5, respectively, of Annex NAC.

[D2] NOTE 2 It is assumed that the following overvoltage conditions can be encountered on TELECOMMUNICATION ETWORKS that connect to outside cable. The overvoltage is the result of a) contact with a multi-earthed neutral distribution power line (4 kV to approximately 50 kV), b) induction from a distribution power line fault to earth, c) earth potential rise from a distribution power line fault current flowing to earth, and d) contact with 120 V power line.

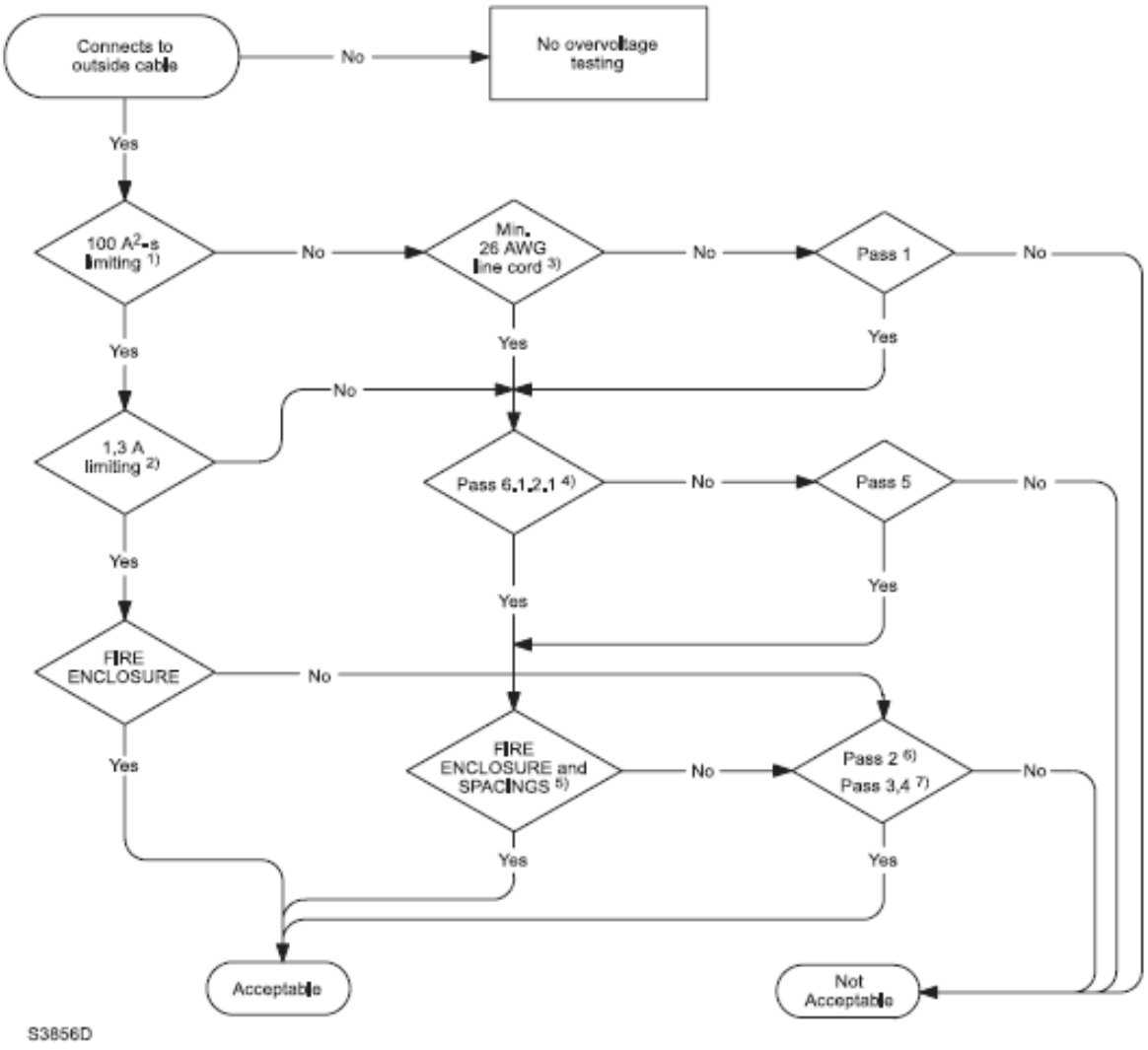
[D2] Maximum longitudinal voltage of 600 V can occur on inside wiring that is protected with 3-mil carbon blocks. Asymmetrical operation of the carbon blocks can result in a metallic voltage of up to 600 V when the longitudinal voltage is high enough to operate one carbon block but not the other (minimum 285 V peak).

[D2] Maximum induced current of 2,2 A, steady state, can result from a high impedance power line fault to earth.
[D2] Maximum 7 A for 5 s can result from induction or from earth potential rise after a power line contact with a multi-earthed neutral conductor.

[D2] An I^2t of 2 400 can result from power line contact with a telephone shielded cable. A combination of 40 A, 1,5 s is considered the worst case. I^2t is used for current limits in adiabatic heating processes.

[D2] A 120 V power line crossed with a telephone line can deliver up to 25 A to the telephone wiring, limited by the wiring impedance.

[D2] *Compliance with the construction requirements is checked by inspection. Compliance with the test conditions is checked by the requirements in Annex NAC.*



[D2] Figure 6C – Overvoltage flowchart

[D2] Conditions applicable to Figure 6C:

[D2] 1) Equipment contains a method for limiting current energy to 100 A^2-s max. for Test Condition 1. A circuit or component that complies with the Standard for Secondary Protectors for Communications Circuits, UL 497A, or CSA C22.2 No. 226, Protectors in Telecommunication Networks, shall be considered to comply with this requirement.

[D2] 2) Equipment contains a method for limiting current to 1,3 A max. steady state (e.g. a fuse rated 1,0 A maximum) that also complies with the Standard for Secondary Protectors for Communications Circuits, UL 497A, or CSA C22.2 No. 226, Protectors in Telecommunication Networks.

[D2] 3) Minimum No. 26 AWG telecommunication line cord, either supplied with the equipment or described in the safety instructions. See Annex NAA.

[D2] 4) The telephone line is adequately isolated from earth for the operating mode being considered at a voltage of 120 V. This may be determined by complying with the test of 6.1.2, Figure 6A, using a minimum voltage of 120 V, or an electric strength test of 120 V. The test is applicable to PLUGGABLE EQUIPMENT TYPE A, PLUGGABLE EQUIPMENT TYPE B and PERMANENTLY CONNECTED EQUIPMENT.

[D2] 5) In addition to the requirements for a FIRE ENCLOSURE, including consideration of HWI (4.7.3.2), both of the following requirements apply for parts in TNV CIRCUITS that might ignite under overvoltage conditions:

[D2] a) the parts shall be separated from internal materials of FLAMMABILITY CLASS V-2 or lower by at least 25 mm of air or a barrier of FLAMMABILITY CLASS V-1 or better. The exceptions of 4.7.3.4 apply, except that 25 mm shall be substituted wherever 13 mm is found.

[D2] b) the parts shall be separated from openings in the top or sides of the ENCLOSURE by at least 25 mm of air or a barrier of FLAMMABILITY CLASS V-1 or better unless the openings comply with one of the following:

[D2] – not exceed 5 mm in any direction; or

[D2] – not exceed 1 mm in width regardless of length.

[D2] 6) Test Condition 2 is not required for equipment containing a method for limiting current to 1,3 A max steady state (e.g., a fuse rated 1,0 A maximum).

[D2] 7) Test Conditions 3 and 4 are not required for equipment whose application (because of system function, design limitations, etc.) is limited to connections to outside cable not exceeding 1 000 m (for example, equipment that connects to ISDN S/T reference points and certain proprietary telephone sets).

Annex M. Modified by the following:
(normative)
[DE] Criteria for telephone ringing and other signals
(see 2.3.1)

M.2 Method A

This method requires that the currents…

[D2] *Continuous ringing signals shall:*

[D2] *• be located in SERVICE ACCESS AREAS;*

[D2] *• be so located and guarded that unintentional contact with such parts is unlikely during service operations, or be provided with a marking to warn SERVICE PERSONNEL of the presence of continuous ringing signals; and*

[D2] *• not become OPERATOR accessible under single fault conditions.*

[D2] M.4 Other telecommunication signals

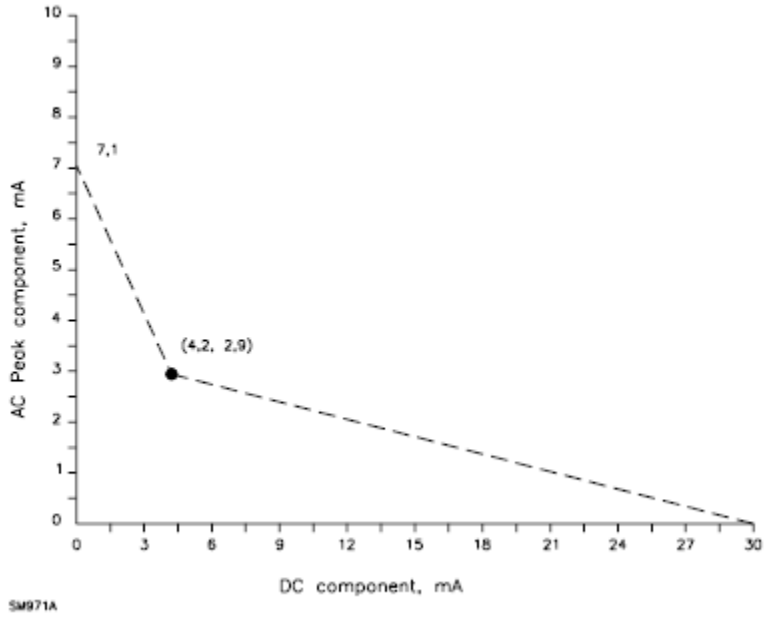
[D2] Telecommunication signaling systems (e.g., some message waiting systems) using voltages or current, or both, greater than those specified in 2.3.1 shall be permitted if they comply with the following:

[D2] NOTE 1 A part may rely on different requirements for different time intervals.

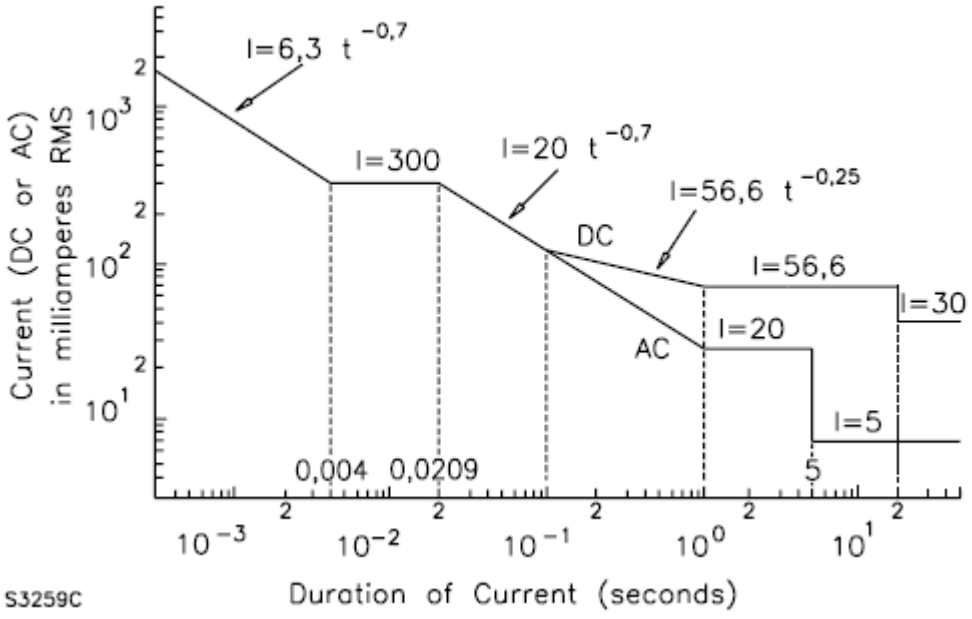
[D2] NOTE 2 These requirements are based on small area contact; parts are not grippable.

[D2] – continuous signal: For a signal of duration greater than 5 s, the current through the measuring instrument shown in Figure D.1 shall be not greater than 7.1 mA peak a.c., or 30 mA d.c., or the limit shown in Figure M.5 for combinations of a.c. and d.c., when measured in accordance with Annex D.

[D2] – intermittent signal: For a signal of duration less than 5 s, the current through the measuring instrument of Figure D.1 shall be not greater than the limit specified in Figure M.6. The signal shall be followed by a quiet interval of at least 1 s before the next intermittent signal. During the quiet interval, either the voltage is less than 56,6 V d.c., or the current measured is less than 0,5 mA.



[D2] Figure M.5 – Maximum a.c. and d.c. current of less than 100 Hz



[D2] Figure M.6 – Maximum current as a function of duration

Annex P
(normative)
Normative references

[DE] ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials

[DE] ASTM E 162, Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

[DE] Code of Federal Regulations (CFR), Title 21, Part 1040, Performance Standards for Light-Emitting Products

[DE] CSA C22.1, Canadian Electrical Code, Part I

[DE] CSA C22.2 No. 0, General Requirements – Canadian Electrical Code, Part II

[DE] CSA C22.2 No. 0.4, Bonding of Electrical Equipment

[DE] CSA C22.2 No. 0.15, Adhesive Labels

[DE] CSA C22.2 No. 31, Switchgear Assemblies

[DE] CSA C22.2 No. 94, Special Purpose Enclosures

[DE] CSA C22.2 No. 94.2-07, Enclosures for Electrical Equipment, Environmental Considerations

[DE] CSA C22.2 No. 226, Protectors in Telecommunication Networks

[DE] CSA C22.2 No. 233, Cords and Cord Sets for Communication Systems

[DE] CSA CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V
[DE] CSA E60825-1, Safety of laser products – Part 1: Equipment classification, requirements and user's guide

[DE] IEEE C2, National Electrical Safety Code

[DE] IEEE 269-2002, Standard Methods for Measuring Transmission Performance of Analog and Digital Telephone Sets, Handsets, and Headsets

[DE] IEEE 487, Recommended Practice for the Protection of Wire-Line Communication Facilities Serving Electric Power Locations

[DE] NFPA 70, National Electrical Code

[DE] NFPA 75, Standard for the Protection of Information Technology Equipment

[DE] REDR C1370, Canadian Radiation Emitting Devices Act

[DE] UL 50, Enclosures for Electrical Equipment

[DE] UL 50E, Enclosures for Electrical Equipment, Environmental Considerations

[DE] UL 497, Protectors for Paired Conductor Communications Circuits

[DE] UL 497A, Secondary Protectors for Communications Circuits

[DE] UL 723, Test for Surface Burning Characteristics of Building Materials

[DE] UL 891, Switchboards

[DE] UL 969, Marking and Labeling Systems

[DE] UL 1863, Communications-Circuit Accessories

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

[DC] **P.1 UL and CSA Component Requirements (mandatory)**

[DC] **Annex P.1**

[DC] NOTE 1 The complete text of Annex P.1 is a DC national difference.

[DC] NOTE 2 Please note that underlining to indicate text added to IEC 60950-1 is not used in this portion of Annex P.

[DC] All IEC component standard requirements in this standard are replaced by the relevant requirements of CSA and UL component standards as listed in this annex.

[DC] Products that are determined to comply with Clauses 1 – 7 and applicable annexes of this standard are considered to comply with UL and CSA requirements, except that some components will require additional evaluation to determine compliance with IEC 60950-1 requirements.

[DC] 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.

[DC] If no standard is listed, requirements are assumed to be those in IEC 60950-1.

[DC] The following components shall comply with the requirements specified below. All IEC standard requirements in this standard are either replaced or modified, as noted, by the relevant requirements of either CSA or UL or both component standards as listed in this annex.

[DC] Annex P.1

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
1.1.2, 4.2, Annex T	*	Enclosures for electrical equipment	UL 50 *Enclosures for Electrical Equipment* UL 50E *Enclosures for Electrical Equipment, Environmental Considerations*	CAN/CSA-C22.2 No. 94 *Special Purpose Enclosures* CSA C22.2 No. 94.2-07 *Enclosures for Electrical Equipment, Environmental Considerations*	
1.1.3	*	Uninterruptible power supplies	UL 1778 *Uninterruptible Power Systems*	CSA C22.2 No. 107.1 *General Use Power Supplies*, or CAN/CSA C22.2 No. 107.3 *Uninterruptible*	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
				Power Supply Equipment	
1.5.2	*	Edison-base lampholders	UL 496 *Lampholders*	CSA C22.2 No. 43 *Lampholders*	
1.5.2	*	Ground-fault circuit-interrupters	UL 943 *Ground-Fault Circuit-Interrupters*	CAN/CSA C22.2 No. 144 *Ground Fault Circuit Interrupters*	
1.5.2		Printed-wiring boards	UL 796 *Printed-Wiring Boards*		
1.5.2		Vehicle battery adapter	UL 2089 *Vehicle Battery Adapters* (input current rating maximum 12 A)	Refer to CSA TIL I-35 for the vehicle adapter connector requirements. A DC to DC converter and its associated wiring are covered in CSA C22.2 No. 60950 1. The input current rating may be increased to 12 A provided that: 1) The fuse or protective device required by TIL I-35, cl 2.2.4.3 shall have a current rating not greater than the ampacity of the interconnecting cord as specified in TIL I-35 cl 2.2.3, and in no case greater than 12A, and 2) The operating instructions for a unit rated greater than 100 VA input shall include the following or in equally definitive wording. The blanks shall be completed with appropriate current and voltage ratings based on the adapter input ratings.	
				"CAUTION - Risk of Fire. Do not replace any vehicle fuse with a rating higher than	

Subclause from this standard	Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
			recommended by the vehicle manufacturer. This product is rated to draw ___amperes from a ____V vehicle outlet. Ensure that the electrical system in your vehicle can supply this product without causing the vehicle fusing to open. This can be determined by making sure the fuse in the vehicle which protects the outlet is rated higher than ___amperes. Information on the vehicle fuse ratings are typically found in the vehicle operator's manual. If a vehicle fuse opens repeatedly, do not keep on replacing it. The cause of the overload must be found. On no account should fuses be patched up with tin foil or wire as this may cause serious damage elsewhere in the electrical circuit or cause fire."	
1.5.2	Electrochemical Capacitor Modules (e.g., energy storage modules consisting of multiple electrochemical capacitors, also sometimes known as "ultracapacitors","electric double layer capacitors", double layer capacitors", or "supercapacitors") These requirements do not apply to electrolytic capacitors	UL 810A *Electrochemical Capacitors*		
1.5.5	Interconnecting cables (non	UL 758 *Appliance*	CAN/CSA C22.2 No.	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
		LPS, 3,05 m or less)	*Wiring Material*	210 *Appliance Wiring Material Products*	
1.5.9		VDRs (varistors or MOVs), rated below 250 V, and surge suppressors (See P.2 (1.5.9))	UL 1449 *Surge Protective Devices*	Certification Notice No. 516 (Where the surge suppressor is relied upon to achieve Overvoltage Category 1, UL 1449 requirements apply)	IEC 61051-2 *Varistors for use in electronic equipment - Part 2: Sectional specification for surge suppression varistors*
2.7	*	Circuit breakers	UL 489 *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures*	CSA C22.2 No. 5 *Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures*	
2.7	*	Fuseholders	UL 4248-1 *Fuseholders - Part 1: General Requirements* UL 4248-4 *Fuseholders - Part 4: Class CC* UL 4248-5 *Fuseholders - Part 5: Class G* UL 4248-8 *Fuseholders - Part 8: Class J* UL 4248-12 *Fuseholders - Part 12: Class R* UL 4248-15 *Fuseholders - Part 15: Class T*	CSA C22.2 No. 39 *Fuseholder Assemblies*	
2.7	*	Fuses (branch circuit applications)	UL 248-1 *Low-Voltage Fuses - Part 1: General Requirements* UL 248-4 *Low-Voltage Fuses - Part 4: Class CC Fuses* UL 248-5 *Class G Fuses* UL 248-8 *Low-Voltage Fuses - Part 8: Class J Fuses* UL 248-10 *Low-Voltage Fuses - Part 10: Class L*	CSA C22.2 No. 248 *Series Low-Voltage Fuses* CSA C22.2 No. 248.1 *Low-Voltage Fuses - Part 1: General Requirements* CSA C22.2 No. 248.4 *Low-Voltage Fuses - Part 4: Class CC Fuses* CSA C22.2 No. 248.5 *Low-Voltage Fuses - Part 5: Class G Fuses* CSA C22.2 No. 248.8	IEC 60127-1 *Miniature fuses - Part 1: definitions for miniature fuses and general requirements for miniature fuse-links.*

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
			Fuses UL 248-12 *Low-Voltage Fuses - Part 12: Class R Fuses* UL 248-15 *Low-Voltage Fuses - Part 15: Class T Fuses*	*Low-Voltage Fuses - Part 8: Class J Fuses* CSA C22.2 No. 248.10 *Low-Voltage Fuses - Part 10: Class L Fuses* CSA C22.2 No. 248.12 *Low-Voltage Fuses - Part 12: Class R Fuses* CSA C22.2 No. 248.15 *Low-Voltage Fuses - Part 15: Class T Fuses*	
2.7	*	Supplementary protectors	UL 1077 *Supplementary Protectors for Use in Electrical Equipment*	CAN/CSA C22.2 No. 235 *Supplementary Protectors*	
2.8.4	*	Solid-state controls	UL 244A *Solid-State Controls for Appliances* Compliance with UL 60730-1 *Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements,* and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.	CSA C22.2 No. 156 *Solid-State Speed Controls*	
2.8.7	*	Limit controls	UL 353 *Limit Controls*	CSA C22.2 No. 24 *Temperature-Indicating and Regulating Equipment*	
2.8.7, 3.4		Switches	UL 20 *General-Use Snap Switches* UL 917 *Clock-Operated Switches* UL 1054 *Special-Use Switches* UL 61058-1 *Switches for Appliances - Part 1: General*	CSA C22.2 No. 55 *Special Use Switches* CSA C22.2 No. 111 *General-Use Snap Switches* CAN/CSA C22.2 No. 177 *Clock-Operated Switches* CAN/CSA C22.2 No. 61058-1 *Switches for*	IEC 61058-1: *Switches for Appliances - Part 1: General Requirements*

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
			Requirements	*Appliances - Part 1: General Requirements*	
2.9.1	*	Insulating tubing	UL 224 *Extruded Insulating Tubing*	CSA C22.2 No. 198.1 *Extruded Insulating Tubing*	
2.9.1	**	Insulating tape	UL 510 *Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape*	CSA C22.2 No. 197 *PVC Insulating Tape* (For other than PVC tape, UL 510 applies)	
2.10.5.4, Annex U	*	Insulated transformer winding wiring (supplements requirements in 2.10.5.4/Annex U)	UL 2353 *Single- and Multi-layer Insulated Winding Wire*	CAN/CSA C22.2 No. 210 *Appliance Wiring Material Products*	
3.1	*	Wires and cables	UL 44 *Thermoset-Insulated Wires and Cables* UL 83 *Thermoplastic-Insulated Wires and Cables* UL 758 *Appliance Wiring Material*	CSA C22.2 No. 35 *Extra-Low-Voltage Control Circuit Cables, Low-Energy Control Cable, and Extra-Low Voltage Control Cable* CSA C22.2 No. 127 *Equipment and Lead Wires* CAN/CSA C22.2 No. 210.2 *Appliance Wiring Material Products*	
3.2.4, 3.2.5, 4.3.6	*	Attachment plugs, receptacles, and connectors	UL 498 *Attachment Plugs and Receptacles* UL 1682 *Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type*	CSA C22.2 No. 42 *General Use Receptacles, Attachment Plugs, and Similar Wiring Devices* CSA C22.2 No. 182.1 *Plugs, Receptacles, and Connectors of the Pin and Sleeve Type* CSA C22.2 No. 182.2 *Industrial Locking Type, Special Use Attachment Plugs, Receptacles, and Connectors* CSA C22.2 No. 182.3 *Special Use Attachment Plugs, Receptacles, and*	IEC 60083: 1997 *Plugs and socket-outlets for domestic and similar general use* IEC 60309: 1988 *Plugs, socket-outlets and couplers for industrial purposes* IEC 60320: 1981 *Appliance couplers for household and similar general purposes*

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
				Connectors	
3.2.5	*	Cord sets and power supply cords	UL 817 *Cord Sets and Power-Supply Cords ("solid green" protective earthing conductor acceptable)*	CSA C22.2 No. 21 *Cord Sets and Power Supply Cords ("solid green" protective earthing conductor acceptable)*	
3.2.5	*	Flexible cords and cables	UL 62 *Flexible Cord and Fixture Wire*	CSA C22.2 No. 49 *Flexible Cords and Cables* CAN/CSA C22.2 No. 96 *Portable Power Cables*	IEC 60227: 1979 *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V* IEC 60245: 1980 *Rubber insulated cables of rated voltages up to and including 450/750 V* IEC 60885-1: 1987 *Electrical test methods for electric cables. Part 1: Electrical tests for cables, cords, and wires for voltages up to and including 450/750 V*
3.2.5, 4.3.6	*	Direct plug-in units	See 4.3.6		
3.3	*	Wire connectors (for field wiring)	UL 486A-486B *Wire Connectors* UL 486E *Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*	CSA C22.2 No. 65 *Wire Connectors*	
3.4		Industrial control equipment	UL 61131-2 *Controllers, Programmable - Part 2: Equipment Requirements* UL 60947-1 *Switchgear and Controlgear,*	CSA C22.2 No. 14 *Industrial Control Equipment* CAN/CSA E61131-2-06 *Programmable controllers - Part 2: Equipment*	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
			Low-Voltage - Part 1: General Rules UL 60947-4-1A *Switchgear and Controlgear, Low-Voltage - Part 4-1: Contactors and Motor-Starters* UL 60947-5-2 *Switchgear and Controlgear, Low-Voltage - Part 5-2: Control Circuit Devices and Switching Elements*	*requirements and tests* CAN/CSA C22.2 No. 60947-1-07 *Low-Voltage Switchgear and Controlgear - Part 1: General rules* CAN/CSA C22.2 No. 60947-4-1-07 *Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters*	
3.4, 2.8.7	*	Switches	See 2.8.7		
4.2,1.1.2, Annex T	*	Enclosures for electrical equipment	See 1.1.2		
4.3.5	*	Connectors used for current interruption [Exception: Connectors in circuits supplied by LPS or in circuits (normal operation) less than 30 Vrms (or 42.4 Vpk/dc) and less than 8.3 A (UL 1977, Type 0; CSA 182.3, Type 0).]	UL 1977 *Component Connectors for Use in Data, Signal, Control and Power Applications (current interruption requirements)*	CSA C22.2 No. 182.3 *Special Use Attachment Plugs, Receptacles, and Connectors (current interruption requirements)*	
4.3.6, 3.2.5	*	Direct plug-in units	UL 1310 *Class 2 Power Units* (Mechanical Assembly Requirements Only)	CAN/CSA C22.2 No. 223 *Power Supplies With Extra-Low-Voltage Class 2 Outputs* (Mechanical Assembly Requirements Only)	
4.3.6, 3.2.5, 3.2.5	*	Attachment plugs, receptacles, and connectors	See 3.2.4		
4.3.8		Secondary (Rechargeable) Battery Packs (used with Transportable Equipment)	UL 2054 *Household and Commercial Batteries*		
4.7.3.1	*	Enclosure materials (large surface areas)	UL 723 *Test for Surface Burning Characteristics of Building Materials*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	
4.7.3.1		Enclosure materials (environmental air space)	UL 2043 *Fire Test for Heat and Visible*		

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
			Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces		
5.3.7	*	Thermal cutoffs	UL 60691 *Thermal-Links - Requirements and Application Guide*	CSA C22.2 No. 209 *Thermal Cut-Offs*	
5.3.7	*	Thermostats	UL 873 *Temperature-Indicating and - Regulating Equipment* Compliance with UL 60730-1 *Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements,* and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.	CSA C22.2 No. 24 *Temperature-Indicating and Regulating Equipment*	
6.4	*	Communication circuit protectors and accessories	UL 497 *Protectors for Paired Conductor Communications Circuits* UL 497A *Secondary Protectors for Communications Circuits* UL 497B *Protectors for Data Communications and Fire Alarm Circuits* UL 1863 *Communications-Circuit Accessories*	CAN/CSA C22.2 No. 182.4 *Plugs, Receptacles, and Connectors for Communication Systems* CAN/CSA C22.2 No. 226 *Protectors in Telecommunication Networks* CAN/CSA C22.2 No. 233 *Cords and Cord Sets for Communication Systems*	
Annex T, 1.1.2, 4.2		Enclosures for electrical equipment	See 1.1.2		
Annex U, 2.10.5.4		Insulated transformer winding wiring	See 2.10.5.4		

Subclause from this standard	Component type	UL standard	CSA standard	IEC publication (shall be replaced by UL and/or CSA Standard)
[DC] * Indicates UL, CSA or both standards having requirements providing equivalent levels of safety within the meaning of this standard. Requirements of either UL or CSA standard may be used.				
[DC] ** Standards are equivalent except under conditions specified in parentheses in the table.				

[DC] P.2 UL and CSA Component Requirements (alternative). Modified by the following:
[DC] Annex P.2

[DC] NOTE 1 The complete text of Annex P.2 is a DC national difference.

[DC] NOTE 2 Please note that underlining to indicate text added to IEC 60950-1 is not used in this portion of Annex P.

[DC] All IEC component standard requirements in this standard are replaced by the relevant requirements of CSA and UL component standards as listed in this annex.

[DC] Products that are determined to comply with Clauses 1 – 7 and applicable annexes of this standard are considered to comply with UL and CSA requirements, except that some components will require additional evaluation to determine compliance with IEC 60950-1 requirements.

[DC] 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.

[DC] If no standard is listed, requirements are assumed to be those in IEC 60950-1.

[DC] In the U.S. and Canada, any of the following components that comply with either the specified UL or CSA standards are considered as an acceptable alternative to the referenced IEC component standard and comply with the requirements of this standard.

[DC] Annex P.2

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
1.2.12.2, 1.2.12.3, 1.2.12.4	†	Plastic materials V-0, V-1, V-2	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	IEC 60695-11-10:1999 *, Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods*
1.2.12.5, 1.2.12.6	†	Plastic materials 5VA, 5VB	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	IEC 60695-11-20:1999 *, Fire hazard testing - Part 11-20: Test flames - 500 W flame test*

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
					methods
1.2.12.7, 1.2.12.8, 1.2.12.9	†	Plastic materials HF-1, HF-2, HBF	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	ISO 9772:1994 , *Cellular plastics - Determination of horizontal burning characteristics of small specimens subjected to a small flame*
1.2.12.10, 1.2.12.11	†	Plastic materials HB40, HB75	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	IEC 60695-11-10:1999 , *Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods*
1.2.12.12, 1.2.12.13, 1.2.12.14	†	Plastic materials VTM-0, VTM-1, VTM-2	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	ISO 9773:1998 , *Plastics - Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source*
1.5.2	†	Battery chargers	UL 1236 *Battery Chargers for Charging Engine-Starter Batteries*	CAN/CSA C22.2 No. 107.2 *Battery Chargers*	
1.5.2		Connectors	UL 1977 *Component Connectors for Use in Data, Signal, Control and Power Applications*	CSA C22.2 No. 182.3 *Special Use Attachment Plugs, Receptacles and Connectors*	
1.5.2		EMI filters	UL 1283 *Electromagnetic Interference Filters*	CSA C22.2 No. 8 *Electromagnetic Interference (EMI) Filters*	
1.5.2		Electric fans	UL 507 *Electric Fans*	CSA C22.2 No. 113 *Fans and Ventilators*	
1.5.2	†	Power supplies	UL 60950-1 *Information Technology Equipment - Safety - Part 1: General Requirements* UL 1310 *Class 2 Power Units*	CAN/CSA C22.2 No. 60950-1 *Information Technology Equipment - Safety - Part 1: General Requirements* First Edition CAN/CSA C22.2 No. 223 *Power Supplies with Extra-Low-Voltage Class 2 Outputs* (Direct	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
				plug-ins, with a mounting tab, are not acceptable)	
1.5.4, 5.3.3		Transformers	UL 5085-1 *Low Voltage Transformers - Part 1: General Requirements* UL 5085-3 *Low Voltage Transformers - Part 3: Class 2 and Class 3 Transformers*	CSA C22.2 No. 66 *Specialty Transformers*	
1.5.5		Interconnecting cables (LPS, 3,05 m or less)	UL 758 *Appliance Wiring Material*	CAN/CSA C22.2 No. 210 *Appliance Wiring Material Products*	
1.5.6, 1.5.7		X and Y capacitors	UL 1414 *Capacitors and Suppressors for Radio- and Television-Type Appliances* (X1, Y1 and Y2, used per conditions in 1.5.6and 1.5.7) UL 60384-14 *Fixed Capacitors for Use in Electronic Equipment - Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*	CSA C22.2 No. 1 *Audio, Video and Similar Electronic Equipment*, or CAN/CSA E384-14 *Fixed Capacitors for User in Electronic Equipment - Part 14: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*	IEC 60384-14:1993 *Fixed capacitors for use in electronic equipment - Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*
1.5.9, Annex Q		VDRs (Varistors or MOVs) rated 250 V or above (see P.1 (1.5.9))	UL 1449 *Surge Protective Devices*	Certification Notice No. 516 (Where the surge suppressor is relied upon to achieve Overvoltage Category 1, UL 1449 requirements apply)	IEC 61051-2 *Varistors for use in electronic equipment - Part 2: Sectional specification for surge suppression varistors*
2.5, 6.3		PTC	UL 1434 *Thermistor-Type Devices* UL 60730-1A *Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements* Compliance with UL 60730-1 *Standard for Automatic Electrical Controls for Household*	Informs Component Acceptance No. CA-18A and associated TIL No. CA-3A *Component Acceptance Requirements for PTC Thermistors for Overcurrent Protection in Electrical and Electronic Equipment*	IEC 60730-1 *Automatic electrical controls for household and similar use. Part 1: general requirements*

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
			and Similar Use, Part 1: General Requirements, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.		
2.5, Annex CC		Overcurrent protectors	SU 2367 *Outline for Solid State Overcurrent Protectors*		
2.7, 2.5		Fuses (supplementary applications)	UL 248-14 *Low-Voltage Fuses - Part 14: Supplemental Fuses* UL 1417 *Special Fuses for Radio- and Television-Type Appliances*	CSA C22.2 No. 248.14 *Low Voltage Fuses - Part 14: Supplemental Fuses*	IEC 60127-1 *Miniature fuses - Part 1: definitions for miniature fuses and general requirements for miniature fuse-links*
2.7		Fusing resistors	UL 1412 *Fusing Resistors and Temperature-Limited Resistors for Radio- and Television-Type Appliances* UL 60730-1A *Automatic Electrical Controls for Household and Similar Use; Part 1: General Requirements* Compliance with UL 60730-1 *Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements,* and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.	CSA C22.2 No. 1 *Audio, Video and Similar Electronic Equipment*	IEC 60730-1 *Automatic electrical controls for household and similar use. Part 1: general requirements*
2.9.1		Insulating materials	UL 746C *Polymeric Materials - Use in Electrical Equipment Evaluations* (Sections 8 and 9) The following materials are considered acceptable for the support of uninsulated live parts: slate, porcelain, phenolic, or cold-molded composition, unfilled polycarbonate, unfilled	CAN/CSA-C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials* The following materials are considered acceptable for the support of uninsulated live parts: slate, porcelain, phenolic, or cold-molded composition, unfilled polycarbonate, unfilled nylon, nylon filled with	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
			nylon, nylon filled with inorganic compounds, melamine, melamine-phenolic, urea formaldehyde, or other material acceptable for the support of parts that are judged to comply with the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations,UL 746C. These materials should withstand the most severe conditions likely to be met in service. - A material need not comply with the requirements in UL 746C if it meets the insulation requirements applicable to the component. - Laminate material in printed wiring boards need not comply with the requirements in UL 746C. - Vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but not as the sole support for uninsulated live parts if shrinkage, current leakage, or warpage can result in a risk of fire, electric shock, injury to persons, or electrical energy - high current levels.	inorganic compounds, melamine, melamine-phenolic, or other material acceptable for the support of parts that are judged to comply with the standard for polymeric materials - Evaluation of Properties of Polymeric Materials, CSA 0.17. These materials should withstand the most severe conditions likely to be met in service. - A material need not comply with the requirements in CSA 0.17 if it meets the insulation requirements applicable to the component. - Laminate material in printed wiring boards need not comply with the requirements in CSA 0.17. - Vulcanized fiber may be used for insulating bushings, washers, separators, and barriers, but not as the sole support for uninsulated live parts if shrinkage, current leakage, or warpage can result in a risk of fire, electric shock, injury to persons, or electrical energy - high current levels.	
2.9.1, 4.5.2	†	Insulating systems	UL 1446 *Systems of Insulating Materials - General*	CAN/CSA C22.2 No. 0 *General Requirements - Canadian Electrical Code, Part II*	IEC 60085 *Electrical insulation - Thermal classification*
2.10.5.4		Optical isolators	UL 1577 *Optical Isolators*	CSA Certification Notice, Component Acceptance Service No. 5A (Announcement of Extension of the	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
				Component Acceptance Service for Optocouplers and Related Devices)	
2.10.5.13		Magnet wire	ANSI/NEMA MW 1000 Magnet Wire (Heavy Build)	ANSI/NEMA MW 1000 Magnet Wire (Heavy Build)	IEC 60317 Specifications for particular types of winding wires (Grade 2)
2.10.6.2, Annex R	†	Conformal coatings	UL 746C Polymeric Materials - Use in Electrical Equipment Evaluations	CSA Electrical Bulletin 1402C	
3.2.3		Outlet boxes	UL 514A *Metallic Outlet Boxes*; or UL 514B *Conduit, Tubing and Cable Fittings*; or UL 514C *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*	CAN/CSA C22.2 No. 18 *Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware*; or CAN/CSA C22.2 No. 85 *Rigid PVC Boxes and Fittings*	
3.3	†	Terminal blocks	UL 1059 *Terminal Blocks*	CSA C22.2 No. 158 *Terminal Blocks*	
4.2.8	*	Cathode ray tubes	UL 61965 *Mechanical Safety for Cathode Ray Tubes*	CAN/CSA C22.2 No. 60065 *Audio, Video and Similar Electronic Apparatus - Safety Requirements*, Clause 18 CAN/CSA E61965 *Mechanical Safety of Cathode Ray Tubes*	
4.3.4		Wire connectors	UL 486A-486B *Wire Connectors* UL 486C *Splicing Wire Connectors* UL 486E *Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*	CSA C22.2 No. 65 *Wire Connectors*	
4.3.12		Flammability of liquids	UL 340 *Tests for Comparative Flammability of Liquids*		
4.3.13.3		Materials subjected to UV exposure	UL 746C *Polymeric Materials - Use in Electrical Equipment Evaluations* Sections 25 (UV Exposure) and 57 (UL Light Exposure	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
			Test)		
4.5.2, 2.9.1	†	Insulating systems	See 2.9.1		
4.6.5		Adhesives	UL 746C *Polymeric Materials - Use in Electrical Equipment Evaluations*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	
4.7	†	Polymeric materials	UL 746A *Polymeric Materials - Short Term Property Evaluations*; or UL 746B *Polymeric Materials - Long Term Property Evaluations*; or UL 746C *Polymeric Materials - Use in Electrical Equipment Evaluations*; or UL 746D *Polymeric Materials - Fabricated Parts*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	
4.7.3	†	Flammability of plastic materials	UL 94 *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	
4.7.3.1	†	Glow wire test	UL 746A *Polymeric Materials - Short Term Property Evaluations*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials*	IEC 60695-1-1 *Fire Hazard Testing - Part 1-1: Guidance for Assessing the Fire Hazard of Electrotechnical Products - General Guidelines*
4.7.3.5		Air filter units	UL 900 *Air Filter Units*		
4.7.3.6		High-voltage components	UL 1413 *High-Voltage Components for Television-Type Appliances*	CSA C22.2 No. 1 *Audio, Video and Similar Electronic Equipment*	
5.3.2	†	Motors	UL 1004-1 *Rotating Electrical Machines - General Requirements* UL 1004-2 *Impedance Protected Motors* UL 1004-3 *Thermally Protected Motors* UL 2111 *Overheating Protection for Motors*	CSA C22.2 No. 77 *Motors with Inherent Overheating Protection* or CSA C22.2 No. 100 *Motors and Generators*	
5.3.3, 1.5.4		Transformers	See 1.5.4		

Subclause from this standard		Component type	UL standard	CSA standard	IEC publication (may be replaced by UL or CSA Standard)
6.3, 2.5		PTC	See 2.5		
A.2	†	Small plastic materials flame tests	UL 1694 *Tests for Flammability of Small Polymeric Component Materials*	CAN/CSA C22.2 No. 0.17 *Evaluation of Properties of Polymeric Materials, Appendix C*	IEC 60695-2-2 *Fire Hazard Testing - Part 2: Test Methods - Section 2: Needle Flame Test*
Annex B	†	Motor protection	See 5.3.2	See 5.3.2	
Annex R, 2.10.6.2	†	Conformal coatings	See 2.10.6		
Annex Q, 1.5.9		VDRs (Varistors or MOVs) rated 250 V or above	See 1.5.9		
[DC] † Indicates CSA or UL standard having requirements that meet or exceed the relevant IEC requirements					

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Annex EE
(normative)
Household and home/office document/media shredders

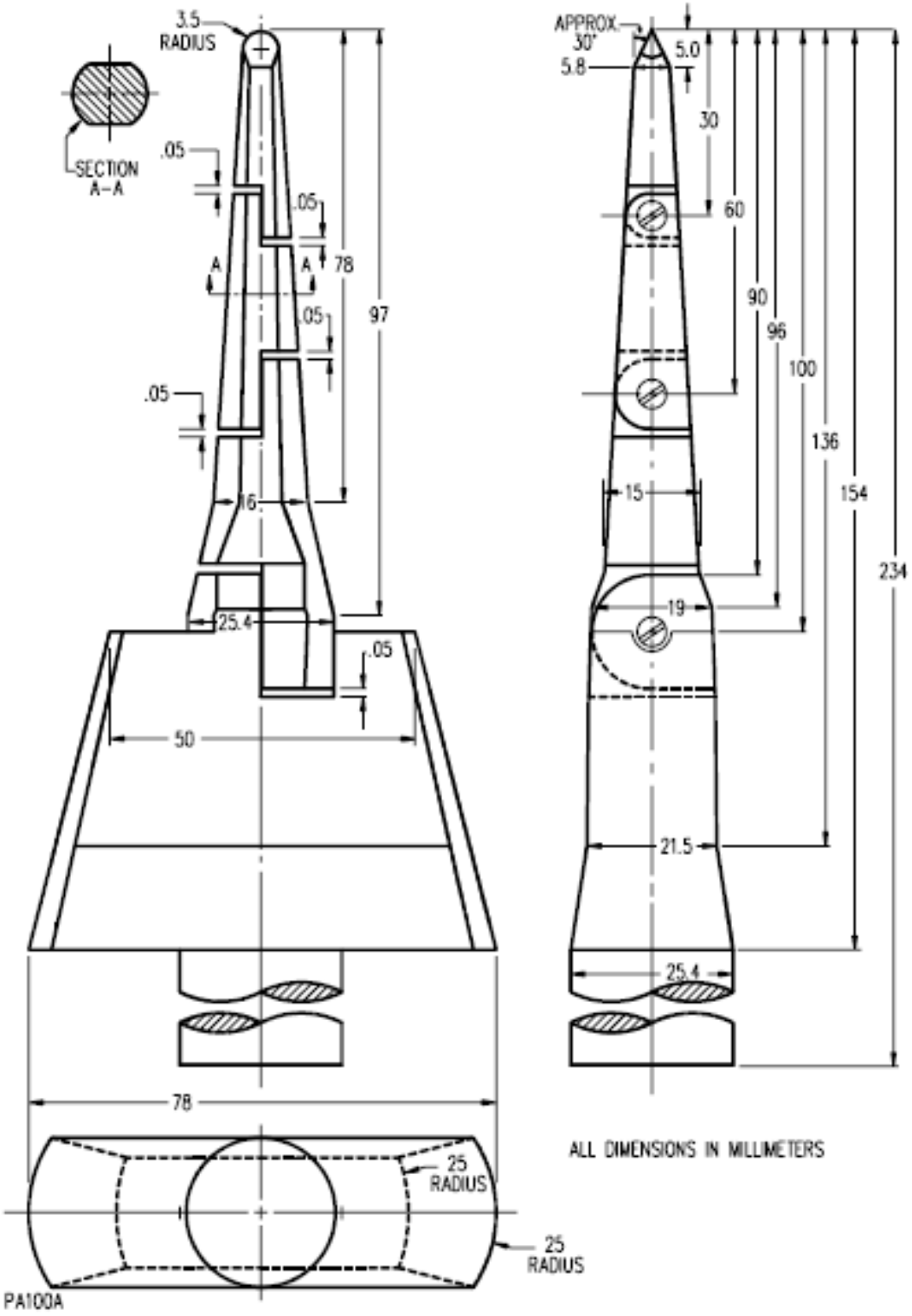
EE.3 Inadvertent reactivation. Modified by the following:

[D2] With the HOUSEHOLD AND HOME/OFFICE DOCUMENT/MEDIA SHREDDER … ~~test finger of Figure 2A~~ articulated accessibility probe of Figure EE.3.

[D2] *Compliance is …* ~~*test finger of Figure 2A*~~ *articulated accessibility probe of Figure EE.3.*

EE.5 Protection against hazardous moving parts. Modified by the following:

[D2] *The* ~~*test finger of Figure 2A*~~ *articulated accessibility probe of Figure EE.3 shall be…*



[D2] Figure EE .3 - Articulated accessibility probe.

Bibliography. Modified by the following:

[DE] IEC TR 62102, Electrical safety – Classification of interfaces for equipment to be connected to information and communications technology networks

[DE] ITU-T Recommendation P.360, Efficiency of devices for preventing the occurrence of excessive acoustic pressure by telephone receivers and assessment of daily noise exposure of telephone users

[D2] Annex NAA. Modified by the following:
[D2] (normative)
[D2] Markings and instructions

[D2] This annex identifies the markings and instructions required for Canada and the U.S. Excluding the words ″ WARNING″ and ″ CAUTION,″ wording equivalent to that provided in this annex may be used.

[D2] French translations of required markings are considered informative. It is the responsibility of the manufacturer to provide bilingual markings, where applicable, in accordance with local jurisdictional requirements.

[D2] NOTE 1 In Canada, there are two official languages, English and French. This annex lists acceptable French translations of the markings specified in this standard.

[D2] NOTE 2 Underlining to indicate text added to IEC 60950-1 is not used in this annex.

[D2] NOTE 3 The complete text of Annex NAA is a national difference. The national difference types are noted in the margin or in the last column of the table.

[D2] Other markings may be required.

Annex NAA

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
1.1.1	Equipment intended for use exclusively outside of a computer room need not be subjected to computer room-based regulatory requirements if the equipment is marked, or provided with installation instructions, indicating that the equipment is not intended for use in a computer room as defined in the Standard for the Protection of Information Technology Equipment, ANSI/NFPA 75.	Not for use in a computer room as defined in the Standard for the Protection of Information Technology Equipment, ANSI/NFPA 75.	Ne peut être utilisé dans une salle d'ordinateurs telle que définie dans la norme ANSI/NFPA 75 Standard for Protection of Information Technology Equipment	D1

Annex NAA Continued

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
1.5.5	Each detachable external interconnecting cable (with terminations), 3,05 m or less in length and furnished as part of the equipment, shall be marked or similarly identified in the installation instructions with the name, trademark or trade name of the organization that is responsible for the equipment and the organization's identifying number or equivalent designation for the cable. The marking may be applied on the cable at any location. This marking need not comply with the requirements in the Standard for Marking and Labeling Systems ,UL 969, or Adhesive Labels, CSA C22.2 No. 0.15. This requirement does not apply to interconnecting cable types which are specified in the National Electrical Code or the Canadian Electrical Code.			D2
1.5.5	The output connectors for other than limited-power and TNV CIRCUITS shall be marked or otherwise described in installation instructions to identify the type of circuit, the intended cable type or the relevant circuit characteristics.	" DP-1" or " DP-2"	"DP-1" or "DP-2"	D2
1.7	In an operator access area, there shall be indicated on or near each lampholder the maximum wattage, or lamp type number, or model designation.			D2
1.7.1	See Table NAA.1 for guidance on information that may be provided to allow for the proper selection of a power supply.			D2

[D2] Table NAA.1 (informative)
[D2] Guidance to allow for proper selection of power supplies

1. The following information may be provided:	2. One of the following classification levels may be provided:	3. One of the following classifications may be provided:
a) Rated output voltage(s); b) Rated output current(s); c) Rated output frequency or frequency range or symbol for d.c.; d) Total maximum output power if it is less than the sum of the powers of the individual outputs; e) Required rating and type of the overcurrent protection to be provided in the end product, if not provided as an integral part of the power supply; and f) Output short-circuit current(s).	a) LEVEL 0: Classification Level 0 (L0) for power supplies that require special additional features or that depend on the host equipment to meet the applicable requirements; b) LEVEL 1: Classification Level 1 (L1) for power supplies with output circuits that are either not suitable for, or have not been investigated for SELV CIRCUITS; c) LEVEL 2: Reserved for future use;	a) Method 1: Classification M1 for power supplies using method 1 for isolation of SELV or TNV CIRCUITS from the PRIMARY CIRCUIT or HAZARDOUS VOLTAGE circuits; b) Method 2: Classification M2 for power supplies using method 2 for isolation of SELV or TNV CIRCUITS from the PRIMARY CIRCUIT or HAZARDOUS VOLTAGE circuits; c) Method 3: Classification M3 for power supplies using method 3 for isolation of SELV CIRCUITS from the PRIMARY CIRCUIT or HAZARDOUS VOLTAGE circuits;
	d) LEVEL 3: Classification Level 3 (L3) for power supplies with output circuits that all meet the requirements for SELV CIRCUITS and that, under any condition of output overloading, do not exceed 240 VA (i.e., the outputs are SELV CIRCUITS and at non-HAZARDOUS ENERGY LEVELS);	d) Method 4: Classification M4 to indicate a multiple output power supply having SELV or TNV CIRCUITS isolated from the PRIMARY CIRCUIT or HAZARDOUS VOLTAGE circuits in any combination of methods 1, 2, and 3. NOTE As an example, an output (of a power supply) designated as "L3M1" indicates the particular output:
	e) LEVEL 4: Classification Level 4 (L4) for power supplies with outputs suitable for direct connection to the TELECOMMUNICATION NETWORK;	- is a SELV CIRCUIT; - does not exceed 240 VA under any condition of overloading; and - is isolated from the PRIMARY CIRCUIT by DOUBLE or REINFORCED INSULATION.
	NOTE 1 - The output is suitable for direct connection to the TELECOMMUNICATION NETWORK if the output current is limited to 1,3 A by inherent impedance or by an overcurrent protective device rated no more than 1 A (see 6.3).	
	f) LEVEL 5: Classification Level 5 (L5) for power supplies having output	

1. The following information may be provided:	2. One of the following classification levels may be provided:	3. One of the following classifications may be provided:
	circuits that meet the requirements for SELV CIRCUITS;	
	g) LEVEL 6: Classification Level 6 (L6) to indicate a multiple output power supply having output circuits in any combination of Levels 1, 3, 4, and 5. NOTE 2 - Additional markings are allowed, provided they do not give rise to misunderstanding. NOTE 3 - Conditions of acceptability, if any, should be provided in the installation instructions.	

Annex NAA

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
1.7.4	See 1.7.4	See 1.7.4	VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RÉSEAU	DE
1.7.6	A marking shall be located adjacent to the fuse rating marking provided in operator-serviceable areas to identify the need for using the indicated fuse. The marking shall be located so that it is obvious as to which fuse or fuseholder the marking applies. A single marking is acceptable for a group of fuses.	CAUTION: For continued protection against risk of fire, replace only with same type and rating of fuse.	ATTENTION: Pour ne pas compromettre la protection contre les risques d'incendie, remplacer par un fusible de même type et de mêmes caractéristiques nominales.	D2
1.7.7	Connectors and field-wiring terminals involving external Class 2 or Class 3 circuits shall be provided with a marking indicating the minimum class of the wiring that can be used. The marking shall be located adjacent to the terminals and shall be visible during wiring.	"Class 2" or "Class 2 Output"	"Classe 2" or "Sortie Classe 2"	D1
1.7.13	See 1.7.13	See 1.7.13	ATTENTION Il y a danger	DE

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
			d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.	
2.7.6	See 2.7.6	See 2.7.6	ATTENTION. Double pôle/fusible sur le neutre.	DE
3.2.1.2	Equipment where the d.c. supply circuit is connected to the earthing conductor: Equipment that has the earthed conductor of a d.c. supply circuit connected to the earthing conductor at the equipment shall be provided with a permanent marking located near and in plain view of the field wiring terminals and worded as indicated. Alternatively, the wording can be replaced by the  symbol on the product if the specified wording appears in the installation instructions.	CAUTION: This equipment has a connection between the earthed conductor of the d.c. supply circuit and the earthing conductor. See installation instructions.	Cet appareil comporte une connexion entre le conducteur relié à la terre du circuit d'alimentation c.c. et son conducteur de terre.	D2
3.2.1.2	Equipment with provisions to connect the earthed conductor of a d.c. supply circuit: Equipment that has provisions to connect the earthed conductor of a d.c. supply circuit to the earthing conductor at the equipment shall be provided with a permanent marking located near and in plain view of the field wiring terminals and worded as indicated. Alternatively, the wording can be replaced by the  symbol on the product if the specified	CAUTION: This equipment is designed to permit the connection of the earthed conductor of the d.c. supply circuit to the earthing conductor at the equipment. See installation instructions.	Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil.	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	wording appears in the installation instructions.			
3.2.1.2	Equipment where the d.c. supply circuit is connected to the earthing conductor: If equipment has the earthed conductor of a d.c. supply circuit connected to the earthing conductor at the equipment, the equipment shall be provided with a permanent marking located near and in plain view of the field wiring terminals and worded as indicated. Alternatively, the wording can be replaced by the  symbol on the product if the specified wording appears in the installation instructions.	This equipment has a connection between the earthed conductor of the d.c. supply circuit and the earthing conductor. All of the following installation conditions must be met: - This equipment shall be connected directly to the d.c. supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the d.c. supply system earthing electrode conductor is connected. - This equipment shall be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same d.c. supply circuit and the earthing conductor, and also the point of earthing of the d.c. system. The d.c. system shall not be earthed elsewhere. - The d.c. supply source shall be located within the same premises as this equipment. - Switching or disconnecting devices shall not be in the earthed circuit conductor between the d.c. source and the point of the connection of the earthing electrode conductor.	Ce matériel doit être raccordé directement au conducteur de la prise de terre du circuit d'alimentation c.c. ou à une tresse de mise à la masse reliée à une barre omnibus de terre laquelle est raccordée à l'électrode de terre du circuit d'alimentation c.c. Les appareils dont les conducteurs de terre respectifs sont raccordés au conducteur de terre du même circuit d'alimentation c.c. doivent être installés à proximité les uns des autres (p.ex., dans des armoires adjacentes) et à proximité de la prise de terre du circuit d'alimentation c.c. Le circuit d'alimentation c.c. ne doit comporter aucune autre prise de terre. La source d'alimentation du circuit c.c. doit être située dans la même pièce que le matériel. Il ne doit y avoir aucun dispositif de commutation ou de sectionnement entre le point de raccordement au conducteur de la source d'alimentation c.c. et le point de raccordement à la prise de terre.	D2
3.2.1.2	Equipment with provisions to connect the earthed conductor of a d.c. supply circuit: Equipment which has provisions to connect the earthed conductor of a d.c. supply circuit to the earthing conductor at the equipment	This equipment is designed to permit the connection of the earthed conductor of the d.c. supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions	Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil. Pour ce raccordement, toutes les	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	shall be provided with a permanent marking located near and in plain view of the field wiring terminals and worded as indicated. Alternatively, the wording can be replaced by the  symbol on the product if the specified wording appears in the installation instructions.	must be met: - This equipment shall be connected directly to the d.c. supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the d.c. supply system earthing electrode conductor is connected. - This equipment shall be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same d.c. supply circuit and the earthing conductor, and also the point of earthing of the d.c. system. The d.c. system shall not be earthed elsewhere. - The d.c. supply source shall be located within the same premises as this equipment. - Switching or disconnecting devices shall not be in the earthed circuit conductor between the d.c. source and the point of connection of the earthing electrode conductor.	conditions suivantes doivent être respectées: - Ce matériel doit être raccordé directement au conducteur de la prise de terre du circuit d'alimentation c.c. ou à une tresse de mise à la masse reliée à une barre omnibus de terre laquelle est raccordée à l'électrode de terre du circuit d'alimentation c.c. - Les appareils dont les conducteurs de terre respectifs sont raccordés au conducteur de terre du même circuit d'alimentation c.c. doivent être installés à proximité les uns des autres (p.ex., dans des armoires adjacentes) et à proximité de la prise de terre du circuit d'alimentation c.c. Le circuit d'alimentation c.c. ne doit comporter aucune autre prise de terre. - La source d'alimentation du circuit c.c. doit être située dans la même pièce que le matériel. - Il ne doit y avoir aucun dispositif de commutation ou de sectionnement entre le point de raccordement au conducteur de la source d'alimentation c.c. et le point de raccordement à la prise de terre.	
3.2.3	If the wires in a terminal box or compartment intended for power-supply connection of equipment can attain a temperature higher than 60 °C during the normal-temperature test, the unit shall be marked as indicated in this annex. The marking shall be provided at or near the point at which the supply	For supply connections, use wires suitable for at least _____°C.	Utiliser des fils convenant à une température de _____ °C pour les connexions d'alimentation.	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	connections are to be made. The temperature to be used in the marking shall be 75 °C if the temperature attained in the terminal box or compartment is 61 - 75 °C, or 90 °C if the temperature attained in the terminal box or compartment is 75 - 90 °C. Refer to Annex NAE for details regarding the regulatory requirements for supply connections.			
3.3.6	Equipment incorporating field wiring terminals intended to be connected to aluminum conductors shall be so identified for the connection of aluminum conductors. This marking shall be independent of all other markings on the terminal connectors and shall be visible after installation. The terminal for the connection of an equipment protective earthing (grounding) conductor shall not be identified for the connection of an aluminum conductor.	"Use Aluminum Conductors Only" or "Use Aluminum or Copper-Clad Aluminum Conductors Only" if the terminal is intended only for connection to aluminum wire. "Use Copper or Aluminum Conductors" or "Use Copper, Copper-Clad Aluminum, or Aluminum Conductors"if the terminal is intended for connection to both copper and aluminum wire.	"Utiliser seulement des conducteurs en aluminium " or "Utiliser seulement des conducteurs en aluminium cuivré " if the terminal is intended only for connection to aluminum wire. "Utiliser seulement des conducteurs en cuivre ou en aluminium " or "Utiliser des conducteurs en cuivre, en aluminium ou en aluminium cuivré " if the terminal is intended for connection to both copper and aluminum wire.	D1
4.2.9	A compartment that houses a high-pressure lamp as mentioned in 4.2.9 shall be marked where readily visible during any approach to enter the compartment to indicate the risk of explosion.	CAUTION: High-pressure lamp may explode if improperly handled. Refer to lamp replacement instructions.	ATTENTION: Les lampes à haute pression peuvent exploser si elles sont mal utilisées. Confier l'entretien à une personne qualifiée.	D2
4.3.12	Equipment that uses replenishable liquids as indicated in 4.3.12 shall be marked where it will be clearly visible to persons replenishing the liquid with the generic type or the trade name of the liquid to be used.	CAUTION: For continued protection against possible fire, use only: (type of liquid used, for example: alcohol, kerosene and the like) base liquid classed ____ (for example 30 - 40) or lower with respect to fire hazard, or [manufacturer's specific material (trade name) which has been determined to be acceptable for the	ATTENTION: Pour assurer la protection contre les risques d'incendie, utiliser seulement (type of liquid used, for example: alcohol, kerosene and the like) classé _____ (for example 30 - 40) ou moins en ce qui concerne les risques d'incendie, ou [manufacturer's specific material (trade name) which has been	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
		purpose].	determined to be acceptable for the purpose].	
4.3.13.2	Equipment which produces x-radiation and does not comply with 4.3.13 under all conditions of servicing shall be marked where readily visible during servicing to indicate the presence of radiation. Service conditions include the removal of shields, windows, cages and covers, with or without the chassis removed from its enclosure.	CAUTION: Servicing this unit with circuits energized may involve exposure to x-radiation. Refer to service manual for radiation protection procedure.	ATTENTION: L'entretien de cet appareil alors que les circuits sont sous tension peut entraîner l'exposition à des rayons X. Voir le guide d'entretien pour les précautions à prendre.	D2
4.7.3.1	Equipment evaluated for installation in space used for environmental air as described in Section 300-22(C) of the National Electrical Code, ANSI/NFPA 70, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1 shall be marked or provided with installation instructions indicating suitability for installation in such locations. Equipment that is not evaluated for installation in areas covered by Section 300-22(C) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1 shall not be provided with this marking, nor shall its installation instructions describe such installation.	Suitable for use in environmental air space in accordance with Section 300-22(C) of the National Electrical Code, and Sections 2-128, 12-010(3) and 12-100 of the Canadian Electrical Code, Part 1, CSA C22.1.	Peut être utilisé dans des gaines transportant de l'air traité, conformément à la section 300-22(C) du National Electrical Code et aux articles 2-128, 12-010(3) et 12-100 du Code Canadien de l'électricité, Première partie, CSA C22.1.	D1
5.1.7	See 5.1.7	See 5.1.7	**COURANT DE FUITE ÉLÉVE** Raccordement à la terre indispensable avant le raccordement au réseau	DE
5.1.8.2, 5.1.8.3	For pluggable equipment, if leakage current due to ringing voltage exceeds 3,5	HIGH LEAKAGE CURRENT Connect permanent earthing	COURANT DE FUITE ÉLEVÉ Raccordement à la terre indispensable avant	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	mA, a label bearing the warning indicated in this annex, or similar wording, shall be affixed adjacent to telecommunication ports.	conductor before connecting telephone lines.	le raccordement au réseau.	
5.1.8.2, 5.1.8.3	For ringing voltage leakage current in excess of 3.5 mA: Pluggable equipment shall be marked with the complete earthing installation instructions, or with a reference to the earthing installation instructions. Installation instructions furnished with the product shall include prominent mention of the text provided in this annex.	1. A supplementary equipment earthing conductor is to be installed between the product or system and earth, that is, in addition to the equipment earthing conductor in the power supply cord. 2. The supplementary equipment earthing conductor may be not smaller in size than the unearthed branch-circuit supply conductors. The supplementary equipment earthing conductor is to be connected to the product at the terminal provided, and connected to earth in a manner that will retain the earth connection when the power supply cord is unplugged. The connection to earth of the supplementary earthing conductor shall be in compliance with the appropriate rules for terminating bonding jumpers in Part V of Article 250 of the National Electrical Code, ANSI/NFPA 70, and Section 10 of Part I of the Canadian Electrical Code, Part I, CSA C22.1. Termination of the supplementary equipment earthing conductor may be made to building steel, to a metal electrical raceway system, or to any earthed item that is permanently and reliably connected to the electrical service equipment earthed.	1. Un conducteur de terre additionnel doit être installé entre l'appareil ou le réseau et la terre. Ce conducteur de terre s'ajoute à celui du cordon d'alimentation de l'appareil. 2. La section du conducteur de terre additional ne doit pas être inférieure à celle des conducteurs de dérivation non mis à cette fin et raccordé à la terre de façon que la continuité des masses soit maintenue lorsque le cordon d'alimentation est débranché. La connexion à la terre du conducteur de terre additionnel doit être conforme aux exigences pertinentes visant le raccordement à des tresses de mise à la masse indiquées à la partie K de l'article 250 du NEC (norm ANSI/NFPA 70) et à la section du CCE, Première partie. Le conducteur de terre additionnel peut être raccordé à la structure d'acier du bâtiment, à un réseau de canalisation électrique méttallique ou à tout autre point raccordé de façon permanente et sûre à la prise de terre du réseau. 3. Les conducteurs de terre nus, recouverts ou isolés sont acceptables. Le revêtement des conducteurs recouverts ou isolés doit être vert ou vert à rayures jaunes.	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
		3. Bare, covered or insulated earthing conductors are acceptable. A covered or insulated earthing conductor shall have a continuous outer finish that is either green, or green with one or more yellow stripes.		
6	The indicated instructions are appropriate for telephones connected to a telecommunication network. In addition, item 3 is appropriate for all telephones, whether wired or wireless. The instructions shall be in the form of a separate booklet or sheet, or shall be part of the instruction manual separated in format from the other instructions and appearing before any operating instructions. Symbols, graphics and illustrations, if used, shall be adequately defined. The instructions shall start with the words, "IMPORTANT SAFETY INSTRUCTIONS" or equivalent, emphasized and clearly distinguishable from the rest of the text.	**IMPORTANT SAFETY INSTRUCTIONS** When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following: 1. Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement or near a swimming pool. 2. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning. 3. Do not use the telephone to report a gas leak in the vicinity of the leak.	**IMPORTANTES MESURES DE SÉCURITÉ** Certaines mesures de sécurité doivent être prises pendant l'utilisation de matérial téléphonique afin de réduire les risques d'incendie, de choc électrique et de blessures. En voici quelquesunes: 1. Ne pas utiliser l'appareil près de l'eau, p.ex., près d'une baignoire, d'un lavabo, d'un évier de cuisine, d'un bac à laver, dans un sous-sol humide ou près d'une piscine. 2. Éviter d'utiliser le téléphone (sauf s'il s'agit d'un appareil sans fil) pendant un orage électrique. Ceci peut présenter un risque de choc électrique causé par la foudre. 3. Ne pas utiliser l'appareil téléphonique pour signaler une fuite de gaz s'il est situé près de la fuite.	D2
		SAVE THESE INSTRUCTIONS	CONSERVER CES INSTRUCTIONS	
6	Telecommunication-type connectors and terminals, when not used for connection to a telecommunication network, shall be provided with a marking identifying the specific function or circuit characteristics the connector or terminal is used for.			D2
	Examples of			

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	telecommunication connectors are RJ and CA series modular jacks in the U.S. and Canada, respectively, 50 pin ribbon connectors, and insulation piercing terminals.			
6.3	Equipment intended to be remotely powered over telecommunication wiring systems shall be marked as indicated in this annex adjacent to the receptacle or connection.	"Telephone Power" and the symbol  or the words "See instruction manual." The instruction manual shall include the following: a) the current limitations and maximum overcurrent protection for telecommunication circuits; b) reference to the specific power supply or current limiting device provided with the product; c) detailed instructions showing the proper method of installation and connections to the telecommunication wiring system.	"Alimentation du système téléphonique" and the symbol  or the words "Voir le manuel d'instructions"	D2
6.4	Where No. 26 AWG line cord is required by Figure 6C, the telecommunication line cord shall either be provided with the equipment or shall be described in the safety instructions.	"CAUTION - To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord."	"ATTENTION - Pour réduire les risques d'incendie, utiliser uniquement des conducteurs de télécommunications 26 AWG au de section supérleure."	D2
Annex NAC	Equipment intended for use with a generic secondary protector shall be marked as indicated in this annex. The instructions shall include prominent mention of the type of protection or protective device that is required, along with specific information regarding the location of and installation procedures for the protector.	For use only on telephone wiring containing secondary protection. See instruction manual.	Utiliser seulement avec un réseau téléphonique comprenant un dispositif de protection secondaire. Voir le manuel d'instructions.	D2
Annex NAC	Equipment intended for use with a specific primary or	For use only on telephone wiring protected by a	Utiliser seulement avec un réseau téléphonique	D2

Subclause reference from IEC 60950-1	Requirement	Example of English text for marking/instruction	Example of French text for marking/instruction	
	secondary protector shall be marked as indicated in this annex. The instructions shall include prominent mention of the manufacturer and type of protective device that is required, along with specific information regarding the location of and installation procedures for the operator.	(manufacturer and type of protector) protector. See instruction manual.	comprenant un dispositif de protection (manufacturer and type of protector). Voir le manuel d'instructions.	

[D2] Annex NAB. Addition of Annex NAB to the Standard:
(Informative)
D.C. powered equipment and centralized d.c. power systems
(see 1.6.1.2)

NOTE 1 Underlining to indicate text added to IEC 60950-1 is not used in this annex.

NOTE 2 The complete text of Annex NAB is a D2 national difference.

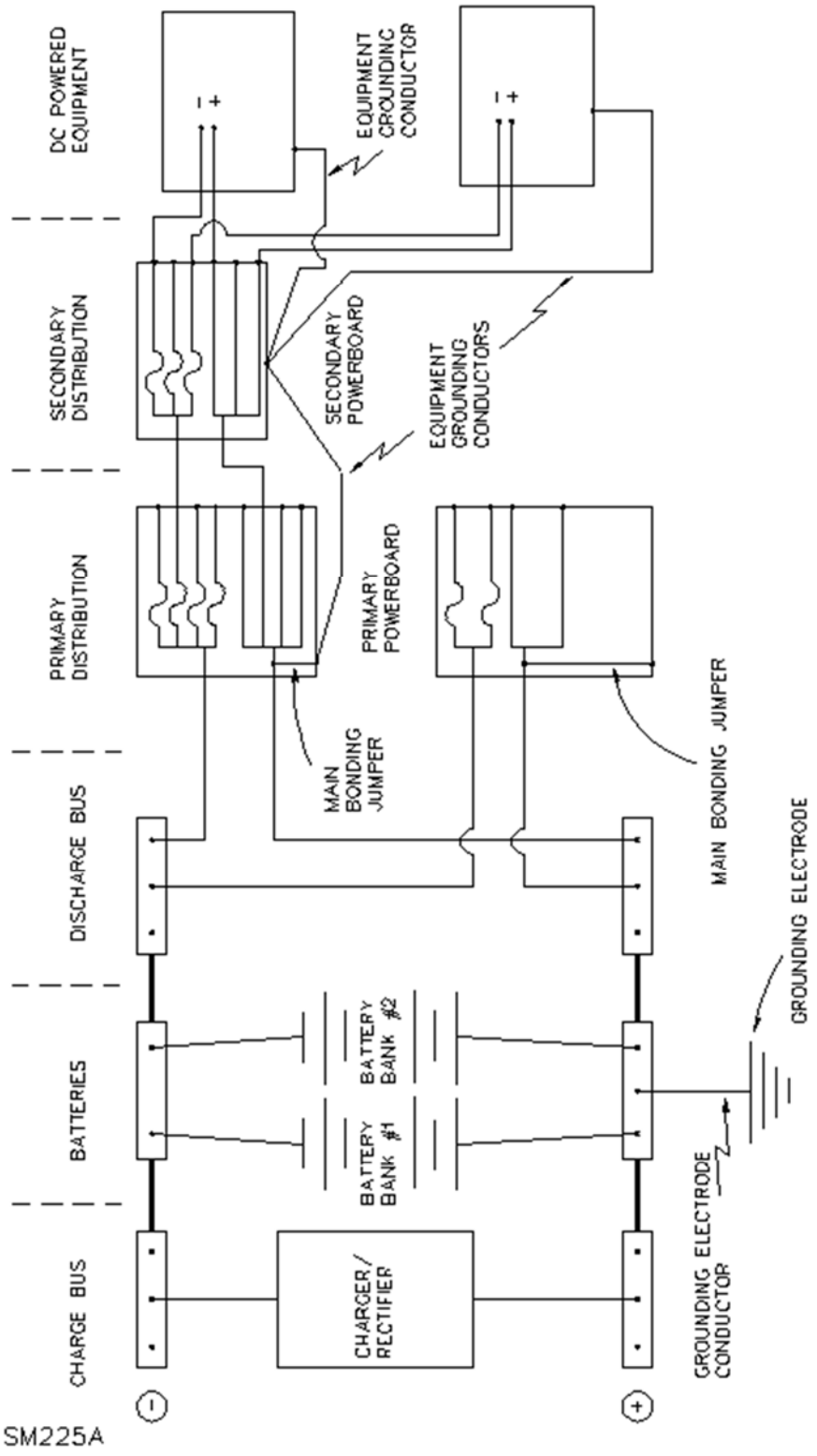
NAB.1 System descriptions

A centralized d.c. power distribution system is a power distribution system consisting of open batteries, charger/rectifier circuits and primary and secondary distribution equipment that is intended to provide power to equipment loads. Systems rated not less than 48 V have one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. Systems rated less than 48 V may have one point directly earthed.

Two types of systems are recognized according to the arrangement of earthed and protective earth (earthing) conductors, as follows:

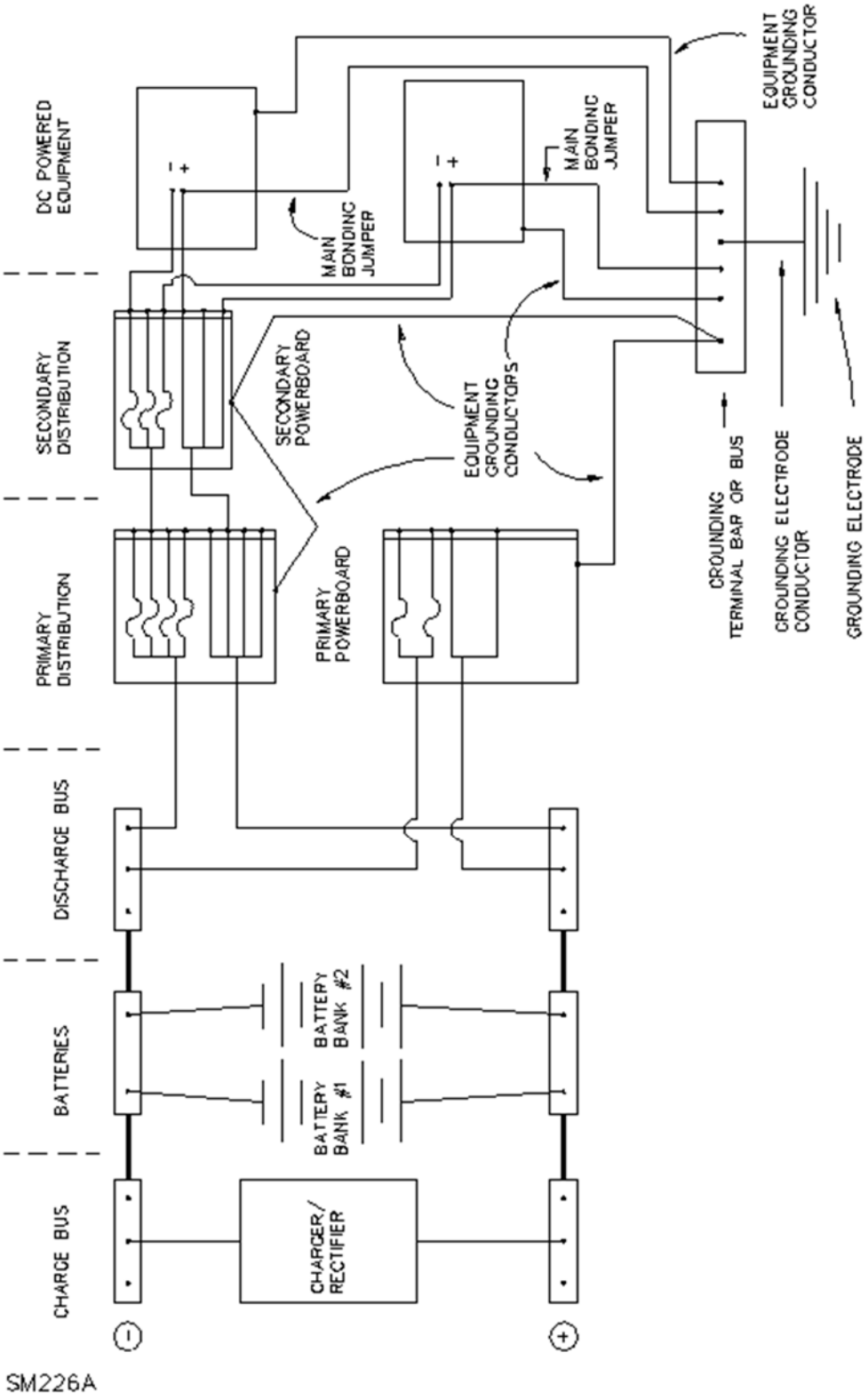
- source earthed d.c. power systems, in which the connection to the earthing electrode is located at the source and separate earthed and protective earth conductors are provided throughout the system. See Figure NAB.1.

- d.c. power system earthed at the equipment location, in which the connection to the earthing electrode is located in the area where the load equipment is to be installed, typically known as the "earthing window." See Figure NAB.2.



For the purpose of applying this figure, grounded and grounding are equivalent to earthed and earthing, respectively.

Figure NAB.1 - Typical centralized d.c. power system - plant and distribution source-grounded d.c. power system



For the purpose of applying this figure, grounded and grounding are equivalent to earthed and earthing, respectively.

Figure NAB.2 - Typical centralized d.c. power system - plant and distribution d.c. power system grounded at the equipment location

[D2] Annex NAC
(normative)
Power line croses
(see 6.4)

NOTE 1 Underlining to indicate text added to IEC 60950-1 is not used in this annex.

NOTE 2 The complete text of Annex NAC is a D2 national difference.

NAC.1 Equipment evaluation

Equipment shall be evaluated while in each operating state that affects compliance (usually, on-hook and off-hook).

Equipment that functions as either terminal or series equipment shall be evaluated for both functions.

NAC.2 Test set-up

NAC.2.1 Equipment

Equipment shall be mounted as intended for its use. Tests may be conducted on either the equipment as an assembly, on individual subassemblies, or on a partial assembly containing those components that can be exposed to an overvoltage condition. Two single plies of cheesecloth shall be wrapped tightly around the assembly, subassembly or partial assembly.

NOTE 1 Bleached cotton cheesecloth, running 28 - 30 m/kg and having what is known as a "count of 32 X 28 inch" - that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads by 11 threads), is considered suitable for this purpose.

NOTE 2 Cheesecloth meeting the requirements of CSA C22.2 No. 0 is considered suitable for this purpose.

Functional circuitry shall be used for each test. Circuitry that is damaged during testing may be either repaired or replaced for subsequent tests. After any of the specified tests, equipment may be returned to ambient temperature before performing any additional tests. Alternatively, separate samples may be used for each test.

NAC.2.2 Wiring connections

The following requirements apply:

a) Except where a wiring simulator is required, equipment that has a removable telecommunication line cord shall be connected to the test circuit with a line cord having 0,4 mm (No. 26 AWG) or larger copper wire conductors and not more than 1 total resistance. However, equipment supplied with a line cord having 0,4 mm (No. 26 AWG) copper conductors, and having installation instructions for equivalent replacement cords, shall be evaluated with the line cord provided.

b) Equipment that has a permanently attached telecommunication line cord (one that requires use of a tool to remove) or a permanently attached handset cord that can be subjected to overvoltage conditions, and for which these cords have not been approved as component parts, shall have the cord or cords prepared for testing as described in the Standard for Communications-Circuit Accessories, UL 1863, and CSA C22.2 No. 233, Cords and Cord Sets for Communication Systems.

c) For equipment intended to be field-wired to the telecommunications network, a 300 mm length of 0,4 mm (No. 26 AWG) solid copper wire shall be used to connect the equipment to the test circuit.

NAC.2.3 Wiring simulator

A wiring simulator shall be used in test conditions 1 and 5 where

- a minimum 26 AWG telecommunications line cord is not provided; or

- minimum 26 AWG wiring is not specified for field-wired telecommunications equipment.

The wiring simulator shall be

- a 50 mm length of 0,2 mm (No. 32 AWG) bare or enameled solid copper wire;

- a fuse having a time-current characteristic comparable to a 0,2 mm wire [Bussman Mfg. Co. Type MDL-2 A fuse or equivalent]; or

- for test condition 1 only, a current probe consisting of a 300 mm length of at least 0,5 mm (No. 24 AWG) copper wire to determine the I^2t imposed on the connecting wiring.

Compliance is determined by the 50 mm length of wire or the fuse not interrupting current during the test, or by the current probe measurement indicating an I^2t less than $100A^2$-s.

NAC.3 Test conditions

NAC.3.1 General conditions

Test voltages shall be applied to a representative pair or pairs of the equipment's leads that connect to outside cable as indicated (M indicates differential mode, L indicates common mode and F indicates 4-wire test mode):

- Terminal equipment with an earthing connection shall be subjected to common mode (longitudinal) L-type overvoltage test conditions using the test circuit described in Figure NAC.1.

- Terminal equipment shall be subjected to differential mode (metallic) M-type overvoltage test conditions using the test circuit described in Figure NAC.2; if the equipment also has an earthing connection, either tip shall be earthed or ring shall be earthed during testing, whichever is more severe.

- Terminal equipment which connects to a 2-pair (4-wire) TELECOMMUNICATION NETWORK shall be subjected to pair-to-pair F-type overvoltage test conditions using the test circuit described in Figure NAC.3. Four-wire testing is not required provided any of the following conditions are satisfied:

• the equipment circuitry limits the current in each line to an I^2t less than $100A^2$-s and analysis indicates that the test voltages would not cause excessive power dissipation in the affected components; or

• analysis indicates that all circuit elements that would be stressed by the 4-wire test voltages are evaluated in the differential mode or common mode test; or

• a dielectric barrier at the test voltage is provided between the wire pairs.

- Series equipment shall be subjected to:

• all common mode, differential mode and 4-wire tests without terminal equipment being connected; and

• differential mode tests M-2, M-3 and M-4 with terminal equipment connections short-circuited.

PLUGGABLE EQUIPMENT TYPE A that is not installed by SERVICE PERSONNEL shall be evaluated with and without the power-supply cord earthing lead connected to earth if that earthing can affect compliance.

The open circuit voltage at 50 or 60 Hz, and short-circuit current (set before the test voltage is applied) available from the voltage source, are given in the following test requirements.

NAC.3.2 Special conditions

Telecommunication equipment often is used with a primary or secondary protector. A primary protector is a voltage limiting device. A secondary protector is a current limiting device. A secondary protector may, but is not required to, provide voltage limiting acceptable for protecting telephone equipment.

NAC.3.2.1 Primary protectors

On equipment installed by SERVICE PERSONNEL and intended for use only with a specified primary protector that complies with the Standard for Protectors for Paired Conductor Communications Circuits, UL 497, and CSA C22.2 No. 226, Protectors in Telecommunication Networks, the voltage may be adjusted based on the 3-sigma breakdown voltage over life for the protector. Since the test voltage is based on the maximum voltage that will not break down the protector, these tests are performed without the actual protector in place.

NOTE Primary protectors are generally under the exclusive control of the service providers, not the equipment manufacturer. Therefore, unless the equipment is intended to be installed by a service provider and it can be ensured that the manufacturer's recommendation for a specific primary protector will be followed, or the primary protector is provided as part of the equipment construction, equipment should be evaluated without a primary protector in the test circuit.

NAC.3.2.2 Secondary protectors

Equipment installed by SERVICE PERSONNEL and intended for use only with a secondary protector that complies with the Standard for Secondary Protectors for Communication Circuits, UL 497A, and CSA C22.2 No. 226, or both, shall be evaluated either together with the protector(s) or to the let-through voltage and current characteristics of the protector(s). A secondary protector simulator shall be used when the secondary protector does not have a specified current limit.

A secondary protector simulator, intended to simulate the maximum permissible I^2t allowed by a generic secondary protector, shall be used in Test Conditions 1 and 5. The secondary protector simulator shall consist of the test fuse used in the Standard for Secondary Protectors for Communication Circuits, UL

497A, and CSA C22.2 No. 226, Protectors in Telecommunication Equipment, to indicate proper operation of a secondary protector. Test Conditions 2, 3 and 4 shall be evaluated without use of a secondary protector simulator.

NOTE Although the secondary protector simulator may be the same device as the wiring simulator, it serves a different purpose. When the secondary protector simulator is specified for use in the test circuit, it is allowed to interrupt the test current.

NAC.3.3 Tests

Tests M-1, L-1 and F-1 These tests simulate contact between a power system primary and a telecommunications cable.

Test Condition 1: 600 V, 40 A, applied for 1,5 s.

NOTE 1 The L-1 test may be conducted on one lead at a time.

Tests M-2, L-2 and F-2 These tests simulate short-term induction as a result of a power system primary fault to a multi-earth neutral.

Test Condition 2: 600 V, 7 A, applied for 5 s.

Tests M-3, L-3 and F-3 These tests simulate long duration induction as a result of a power system fault to earth.

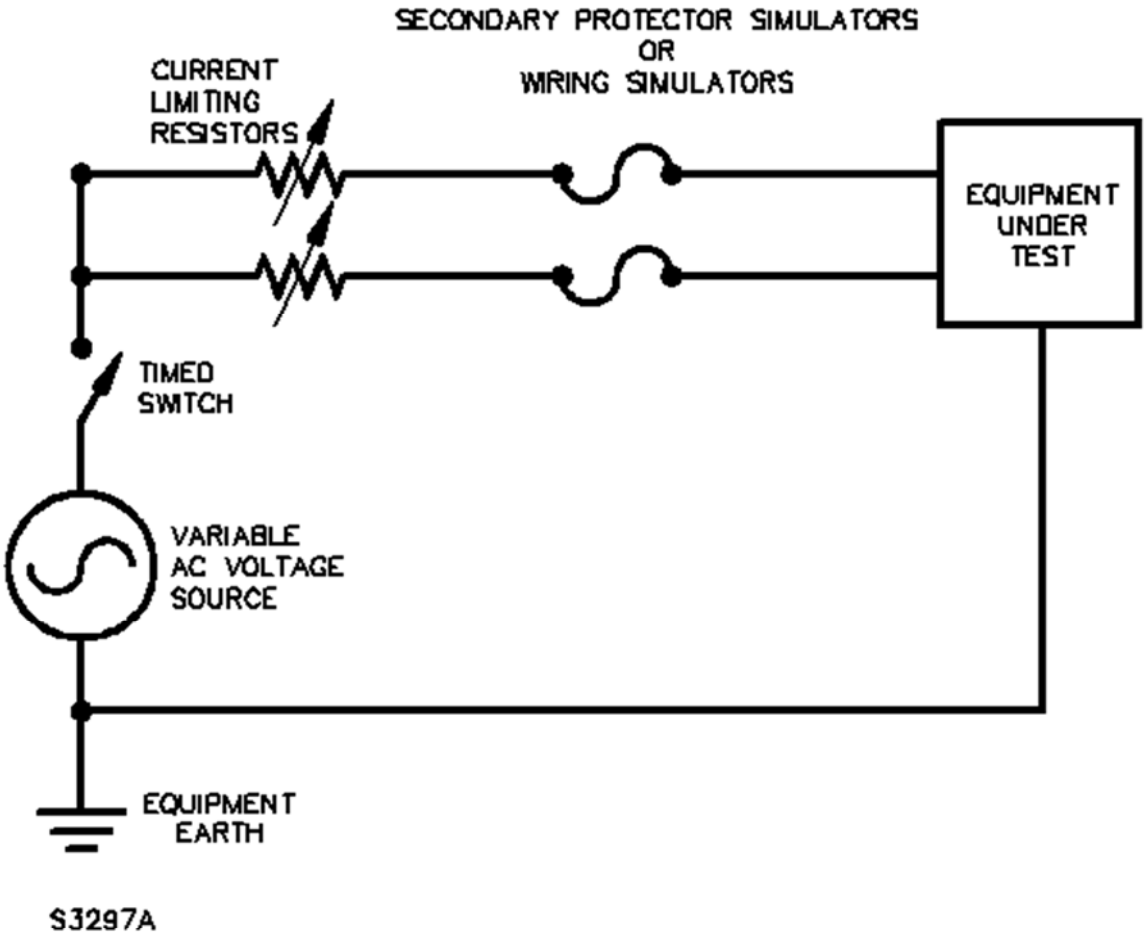


Figure NAC.1 - Circuit for common mode (longitudinal) overvoltage tests

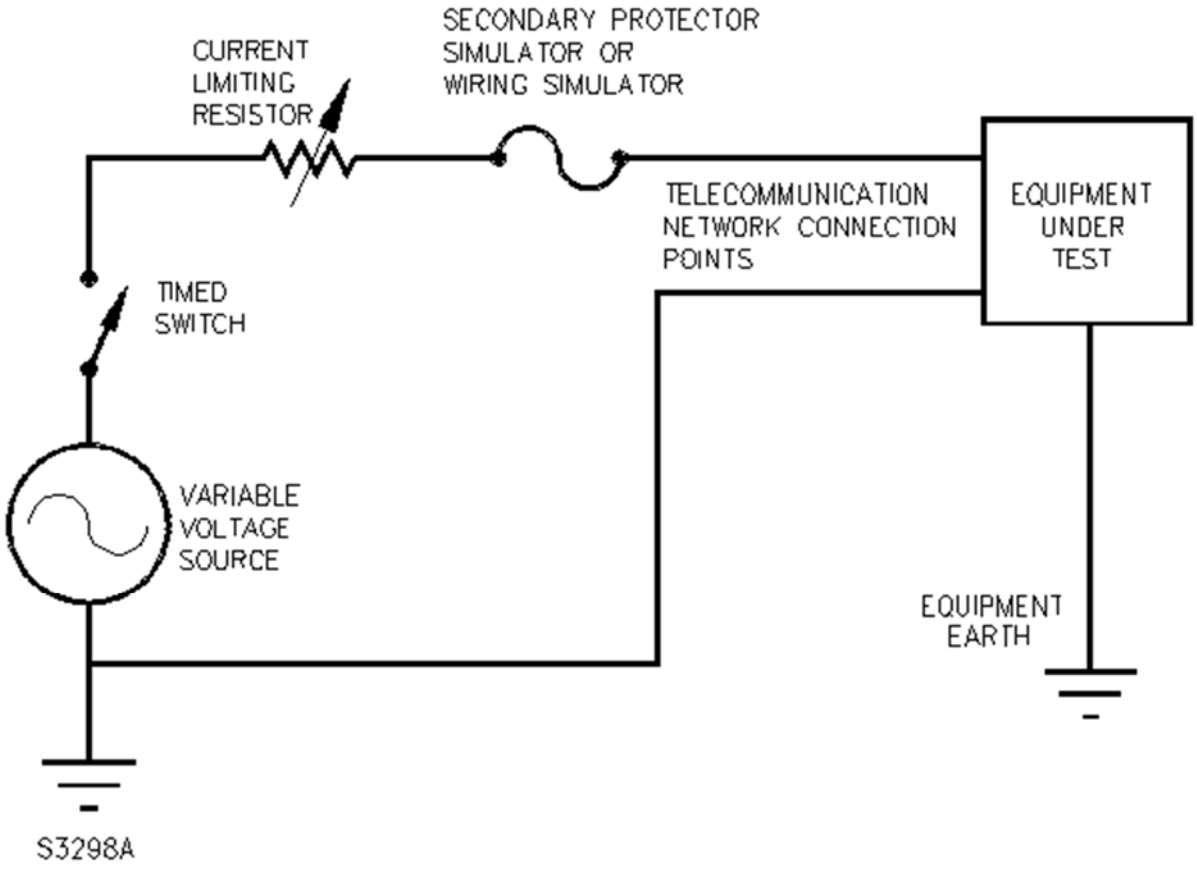


Figure NAC.2 - Circuit for differential mode (metallic) overvoltage tests

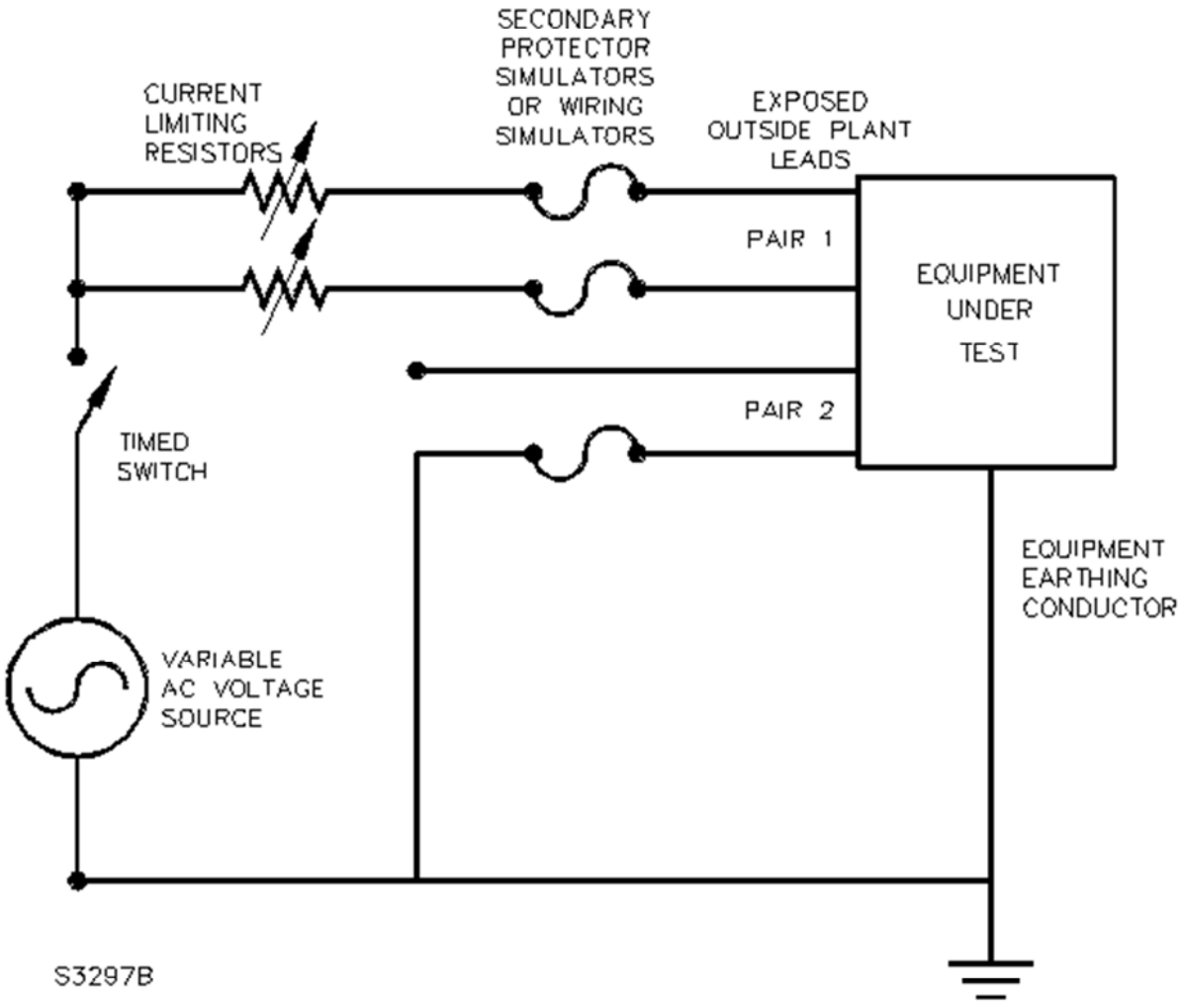


Figure NAC.3 - Circuit for 4-wire overvoltage tests

Test Condition 3: 600 V, 2,2 A, applied per Test Duration.

Test Condition 3A: If an open circuit condition occurs during Test Condition 3, an additional test shall be conducted at 600 V, at a current no greater than 2,2 A, whose value does not result in an open circuit condition and is intended to produce maximum heating, applied per Test Duration.

NOTE 2 Where a fuse causes the open circuit in Test Condition 3, as an alternative to testing the equipment with its fuse in place, a short-circuit current value of up to 135 percent of the fuse rating, with the fuse bypassed, may be used.

Tests M-4, L-4 and F-4 If a voltage limiter rated by the manufacturer to conduct at 285 V peak or more operates during Test Condition 3 or 3A, the following test shall be conducted.

Test Condition 4: A voltage whose peak value is below the conduction voltage, at a current no greater than 2,2 A, whose value does not result in an open circuit condition and is intended to produce maximum heating, applied per Test Duration.

NOTE 3 Where a fuse causes the open-circuit in Test Condition 3, as an alternative to testing the equipment with its fuse in place, a short-circuit current value of 135 percent of the fuse rating, with the fuse bypassed, may be used.

NOTE 4 A voltage limiting device that does not have a breakdown characteristic (such as a metal oxide varistor) is considered to be conducting when the current through it exceeds 5 mA.

Test L-5 This test simulates a contact between a power mains cable and a telecommunication cable.

Test Condition 5: 120 V, 25 A, applied per Test Duration.

Test Duration

Test Conditions 3, 4 and 5 are to be conducted for 30 minutes or until an open circuit occurs through the action of a current limiting device.

NOTE 5 An unacceptable condition will typically manifest itself within 30 minutes; hence, the tests are normally limited to 30 minutes. If at the end of 30 minutes it appears possible that a risk of fire, electric shock or injury to persons will result eventually, the test should be continued until ultimate results are obtained - maximum 7 hours.

NAC.4 Compliance

In addition to the compliance criteria specified for the wire simulator and current probe, compliance is checked by all of the following:

a) There shall be no ignition or charring of the cheesecloth indicator. Charring is deemed to have occurred when threads have been reduced to char by a glowing or flaming condition.

b) After the completion of each overvoltage test, the equipment under test shall continue to comply with the requirements in 6.2.

NOTE In many cases, it will be obvious from the results of the tests that compliance with one or more of these clauses has not been affected by the applied potentials. Where there is doubt or where continued compliance cannot be determined, the appropriate tests in these clauses might need to be repeated.

[D2] Annex NAD
(normative)
Acoustic tests

NOTE 1 Underlining to indicate text added to IEC 60950-1 is not used in this annex.

NOTE 2 The complete text of Annex NAD is a D2 national difference.

NAD.1 General

Manufacturers of information technology equipment having acoustic outputs at communication receivers and similar devices used for voice telecommunication, regardless of transmission medium (e.g., TELECOMMUNICATION NETWORK, CABLE DISTRIBUTION NETWORK, wireless network), shall demonstrate that the equipment complies with the appropriate acoustics requirements related to short duration impulses and long duration disturbances as described in NAD.3 and NAD.4.

The compliance tests described in this Annex require simulation of the TELECOMMUNICATION NETWORK or CABLE DISTRIBUTION SYSTEM, or other transmission medium (e.g., wireless) to perform the following functions:

- generation of test signals that produce acoustic output at the communication receiver; and

- provision of d.c. power superimposed on the above signals, as applicable.

Compliance is checked by inspection, by evaluation of the data provided by the manufacturer, and if necessary, by testing in accordance with the specified parts of this Annex. When IEEE Std 269 (Method 1 of NAD.3 and NAD.4) permits the use of alternate ear simulators, test fixtures, or methods of test, the choice is specified by the manufacturer. It is not required to test using more than one ear simulator.

NAD.1.2 Definitions

NAD.1.2.13.20 DIFFUSE FIELD: A sound field with a high number of reflections that, at any given point in the diffuse field, sound arrives from all angles in a uniform manner.

NAD.2 Acoustic pressure limiting

These requirements apply to equipment that is intended to be connected directly or indirectly to a TELECOMMUNICATION NETWORK or CABLE DISTRIBUTION SYSTEM or other transmission medium, and that contains an earpiece or receiver that is held against or in the ear. The effect on human hearing of impulsive noise or of disturbances that are less than 0,5 s in duration shall be evaluated under NAD.3. The effect of longer disturbances, such as those that might be produced during tone-type dialing, shall be evaluated under NAD.4.

For equipment not intended to be connected to a PSTN (such as connected behind a PABX or connected to a digital TELECOMMUNICATION NETWORK), a test voltage may be applied to the equipment under

test that simulates the effect of the PABX interface or the digital TELECOMMUNICATION NETWORK interface between the equipment under test and the PSTN.

NOTE 1 These requirements are based on ITU-T Recommendation P.360, which assumes a 2 s exposure for long-duration disturbances and no more than one incident per day. Authorities might deem it appropriate to use lower limits for specific cases, for instance for the headsets used by operators.

NOTE 2 A PABX or digital TELECOMMUNICATION NETWORK termination can block network voltages, in which case no test voltage is applied. However, signals that can be generated by the system should be considered.

NOTE 3 Where the actual measurement can be made at the drum reference point (DRP), such as for insert type earphones, measurements may be corrected to the ear reference point (ERP) in accordance with IEEE Std 269 Annex C.

NOTE 4 Special attention is directed to Annex B, Alternative ear simulators, mouth simulator, and test fixture, and its Table B.1, Ear simulator usage, of IEEE Std 269. Annex B of IEEE Std 269 permits specialized ear simulators to be used as alternates if the applicable performance specification requires or allows it and the associated application requirements are met. For example, the Type 1 ear simulator may be used for large, supra-aural or supra-concha, hard-cap, conically symmetrical receivers, which naturally seal to the simulator rim, in the band of 100 - 4000 Hz. While IEEE Std 269 recommends that these receivers "should" also be tested in a realistic unsealed condition using the Type 3.3 or Type 3.4 ear simulator as specified in IEEE Std 269 Annex B, it is not normative to do so.

NOTE 5 The alternative methods allowed in NAD.3.2 and NAD.4.2 are considered to provide equivalent assessment for "safety" of ITE due to acoustic pressure. However since the original purpose of IEEE Std 269 is to provide standard methods for measuring "transmission performance" of analog and digital telephone sets, handsets and headsets, the actual measurements per either option might not provide equivalent "transmission performance" results.

NAD.3 Short-duration impulses

The peak sound pressure level (SPL) of short duration impulses (< 0.5 s) from an earpiece or receiver of a communication handset or headset shall not exceed an equivalent diffuse field SPL of 140 dB; relative to: 20 µPa.

Compliance is checked by the measurement methods described in NAD.3.1 (recommended method) or NAD.3.2 (alternate method, if appropriate). The methods utilize artificial ears for testing. Artificial ears measure SPL at eardrum reference point (DRP) or ear reference point (ERP) depends on the type of the artificial ear. If either the DRP or ERP measured SPLs are below the 140 dB limit, compliance can be assumed.

NOTE 1 Compliance can be assumed because an equivalent diffuse field SPL is always lower than a measured DRP or ERP SPL due to the characteristics of the human ear.

If either the DRP or ERP measured SPLs exceed the 140 dB limit, the measured SPL shall be translated to the equivalent diffuse field and compared to the limit again. Appropriate correction factors in Table NAD.1 or Table NAD.2 shall be used for the translation, e.g. SPL(diffuse field) = SPL(DRP) + S_{DDff}

(correction factor for DRP to diffuse field) or SPL(diffuse field) = SPL(ERP) + S_{EDff} (correction factor for ERP to diffuse field).

It is recommended to apply the corrections with a real time (minimum phase) filter.

NOTE 2 The correction outputs from the filter should be as close as possible to the appropriate graph in Figure NAD.1.

The test setup is illustrated in Figure NAD.2.

Alternatively, although not recommended, the DRP or ERP translations to the diffuse field may be accomplished mathematically using a software algorithm to process digitally sampled and stored waveforms. If this method is used, the method shall accurately emulate the preferred real time filter method.

NOTE 3 A given amplitude response can in theory be produced by an infinite set of filters, each of which creates a different phase response. A phase response that is a non-linear function of frequency smears the response in time. The filter that produces the amplitude response with the least time-smearing is the minimum phase filter of the set. Most simple equalizers are minimum phase filters.

NOTE 4 For equalizers (e.g. programmable digital equalizer) with broader frequency bandwidth than the given correction factors' frequency bandwidth in Tables NAD.1 and NAD.2, the setting of the equalizer at outside of the correction factors' bandwidth should be 12 dB per 1/3 Octave attenuation. For example, if the highest frequency for the ERP to Diffuse Field correction factor is 8 kHz (0.9 dB), the setting at the next 1/3 frequency, 10 kHz, should be -11.1 dB.

Table NAD.1 - Correction factors to convert DRP SPL to diffuse field SPL

Frequency, Hz	S_{DDff}	Frequency, Hz	S_{DDff}
100	0.0	1250	-5.5
125	0.0	1600	-7.5
160	-0.0	2000	-11.0
200	-0.0	2500	-14.0
250	-0.0	3150	-14.5
315	-0.5	4000	-13.5
400	-1.0	5000	-11.5
500	-1.5	6300	-10.0
630	-2.5	8000	-11.0
800	-3.5	10 000	-11.0
1000	-4.0		
Note: Table NAD.1 is modified from Table B.2 of IEEE Standard 1652-2008, The Application of Free Field Acoustic Reference to Telephony Measurements; [IEEE Std. 1652 © 2009 IEEE].			

NOTE 5

S_{DDff} The correction from DRP to Diffuse Field

$S_{DDff} = 20 \log_{10}(P_{Dff}/P_D)$

Where: P_{Dff} is SPL at diffuse field

P_D is SPL at DRP

Table NAD.2 - Correction factors to convert ERP SPL to diffuse field SPL

Frequency, Hz	S_{EDff}	Frequency, Hz	S_{EDff}
100	0.0	1000	-2.5
125	0.0	1250	-3.0
160	0.0	1600	-3.5
200	-0.0	2000	-4.5
250	-0.0	2500	-4.5
315	-0.5	3150	-4.0
400	-0.5	4000	-7.0
500	-1.0	5000	-8.5
630	-1.5	6300	-7.0
800	-2.0	8000	0.5
Note: Table NAD.2 is modified from Table B.2 of IEEE Standard 1652-2008, The Application of Free Field Acoustic Reference to Telephony Measurements; [IEEE Std. 1652 © 2009 IEEE].			

NOTE 6

S_{EDff} The correction from ERP to Diffuse Field

$S_{EDff} = 20 \log_{10}(P_{Dff}/P_E)$

Where: P_{Dff} is SPL at diffuse field

P_E is SPL at ERP

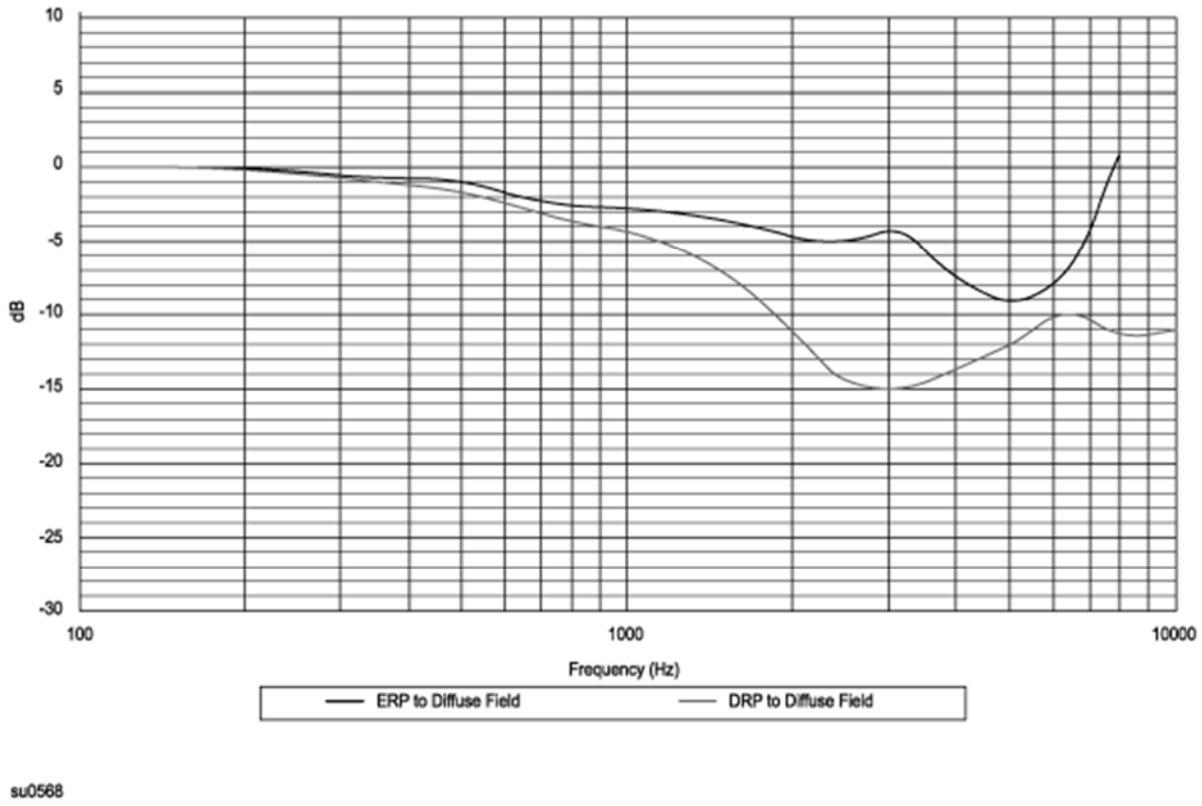


Figure NAD.1 - Corrections to Convert DRP and ERP Sound Pressures to Diffuse Field Sound Pressure

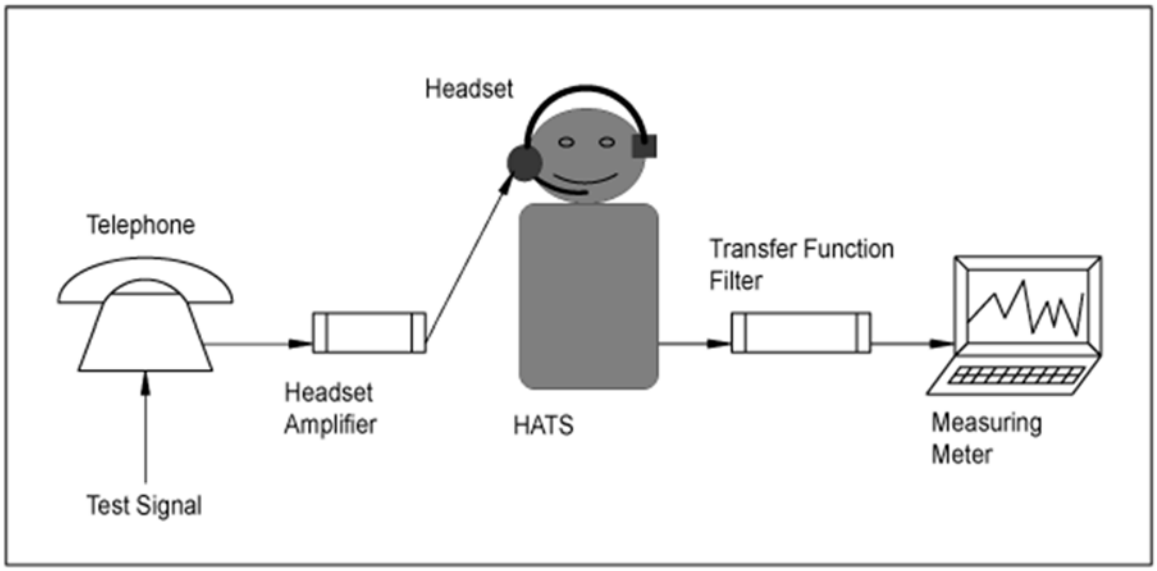


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Figure NAD.2 - Test setup

NAD.3.1 Method 1 (recommended method)

Measurements are made following the methods described in IEEE Std 269, Clause 4, for test equipment and positioning, Clause 6.10 for analog communication sets, and Clause 7.13 for digital communication sets.

NAD.3.2 Method 2 (alternate method)

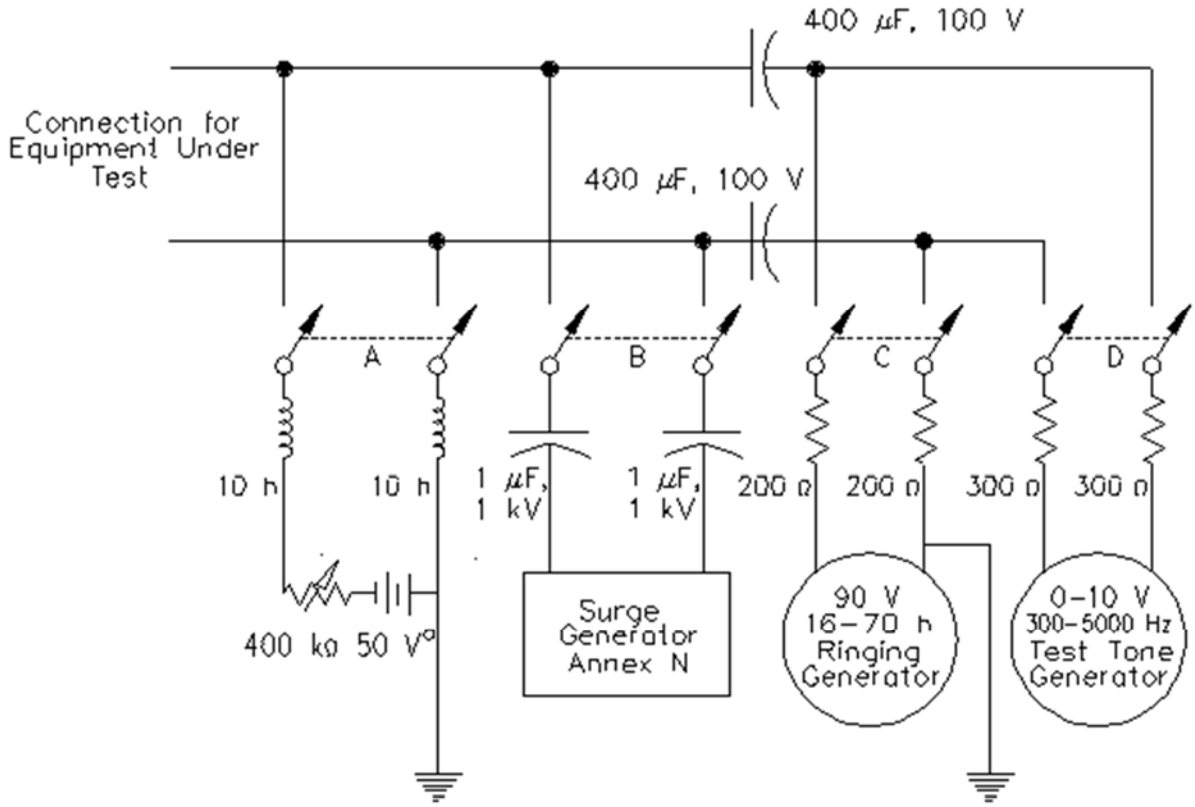
A handset or headset that is of a design compatible with the artificial ear of IEC 60318 shall be placed under normal operating conditions in position for the exchange of calls (such as talking state with the handset raised), and fixed to an artificial ear conforming to the requirements of IEC 60318. The earpiece shall be naturally sealed to the knife-edge of the artificial ear. If any holes in the earpiece fall outside the knife-edge of the artificial ear the earpiece is not qualified for this Method 2 test. Other types of handset and headset should use Method 1.

Response for insert type earphones shall be measured with an in-ear coupler as indicated in the American National Standard for Occluded Ear Simulator, ANSI/ASA S3.25-1989, extended by an ear canal simulator consisting of a cylinder 8 mm long and 7,5 mm in diameter. The tip of the earphone shall be inserted until tangent with plane X-X' shown in Figure 1 of ANSI/ASA S3.25-1989.

The artificial ear shall be electrically connected to a precision sound level meter conforming with IEC 60651 or IEC 61672-1:2002, with an unweighted peak-hold response and capable of measuring impulses having a duration less than 50 µs.

The equipment under test shall be connected to a network simulator and impulse generator as shown in Figure NAD.3, by closing switches A and B. An equivalent network simulator may be used.

One positive and one negative polarity impulse shall be applied to the equipment under test with Uc = 1 kV. For analog equipment, the impulses shall be applied to the receive circuit. For digital equipment, the impulses shall be applied to both the transmit and receive circuits.



[a] This can be replaced with a constant current generator capable of delivering 50 V/50 mA.

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NOTE Surge generator is 10/700 µs as described in Annex N.

Figure NAD.3 - Example of a line simulator for a two-wire analogue telephone

NAD.4 Long-duration disturbances

The maximum steady-state, long-duration disturbances (0.5 s) A-weighted sound pressure level (SPL) from an earpiece or receiver of a communications handset or headset shall not exceed 125 dBA for handset and 118 dBA for headset at ERP (ear reference point).

NOTE 1 Typical signals considered are alerting (ringing) signals during the on-hook operating condition; and tone-type dialing, network signals and other similar signals generated within the device that can cause excessive acoustic output during the off-hook operating condition.

Compliance is checked by the measurement methods specified in NAD.4.1 (recommended method) or NAD.4.2 (alternate method, if appropriate). The methods utilize artificial ears for testing. Artificial ears measure SPL at DRP (eardrum reference point) or ERP (ear reference point) depends on the type of the artificial ear. If the DRP measured SPL is below the above limits (125 dBA for handset and 118 dBA for headset), compliance can be assumed.

NOTE 2 Compliance can be assumed because a measured ERP SPL is always lower than a measured DRP SPL due to the characteristics of the human ear.

If the DRP measured SPL exceed the above limits, the DRP measured SPL shall be translated to an equivalent ERP SPL and compared to the limits again. The correction factors in Table NAD.3 shall be used for the translation, e.g. SPL(ERP) = SPL(DRP) + S_{DE}(correction factor for DRP to ERP).

It is recommended to apply the corrections with a real time (minimum phase) filter.

NOTE 3 The correction outputs from the filter should be as close as to the graph in Figure NAD.4.

The test setup is illustrated in Figure NAD.2

Alternatively, although not recommended, the DRP to ERP filter translation may be accomplished mathematically. If this method is used, the method shall accurately emulate the preferred real time filter method.

NOTE 4 A given amplitude response can in theory be produced by an infinite set of filters, each of which creates a different phase response. A phase response that is a non-linear function of frequency smears the response in time. The filter that produces the amplitude response with the least time-smearing is the minimum phase filter of the set. Most simple equalizers are minimum phase filters.

NOTE 5 For equalizers (e.g. programmable digital equalizer) with broader frequency bandwidth than the given correction factors' frequency bandwidth in Table NAD.3, the setting of the equalizer at outside of

the correction factors' bandwidth should be 12 dB per 1/3 Octave attenuation. For example, if the highest frequency for the DRP to ERP factor is 10 kHz (-14.4 dB), the setting at the next 1/3 frequency, 12.5 kHz, should be -26.4 dB.

Table NAD.3 - Correction factors to convert DRP SPL to ERP SPL

Frequency, Hz	S_{DE}	Frequency, Hz	S_{DE}
100	0.0	1250	-2.5
125	0.0	1600	-4.0
160	0.0	2000	-6.5
200	0.0	2500	-9.0
250	-0.0	3150	-10.0
315	-0.0	4000	-6.5
400	-0.5	5000	-3.0
500	-0.5	6300	-3.0
630	-0.5	8000	-16.0
800	-1.0	10 000	-14.0
1000	-1.5		

NOTE 6

S_{DE} The correction from ERP to DRP

$S_{DE} = 20 \log_{10}(P_E/P_D)$

Where: P_E is SPL at ERP

P_D is SPL at DRP

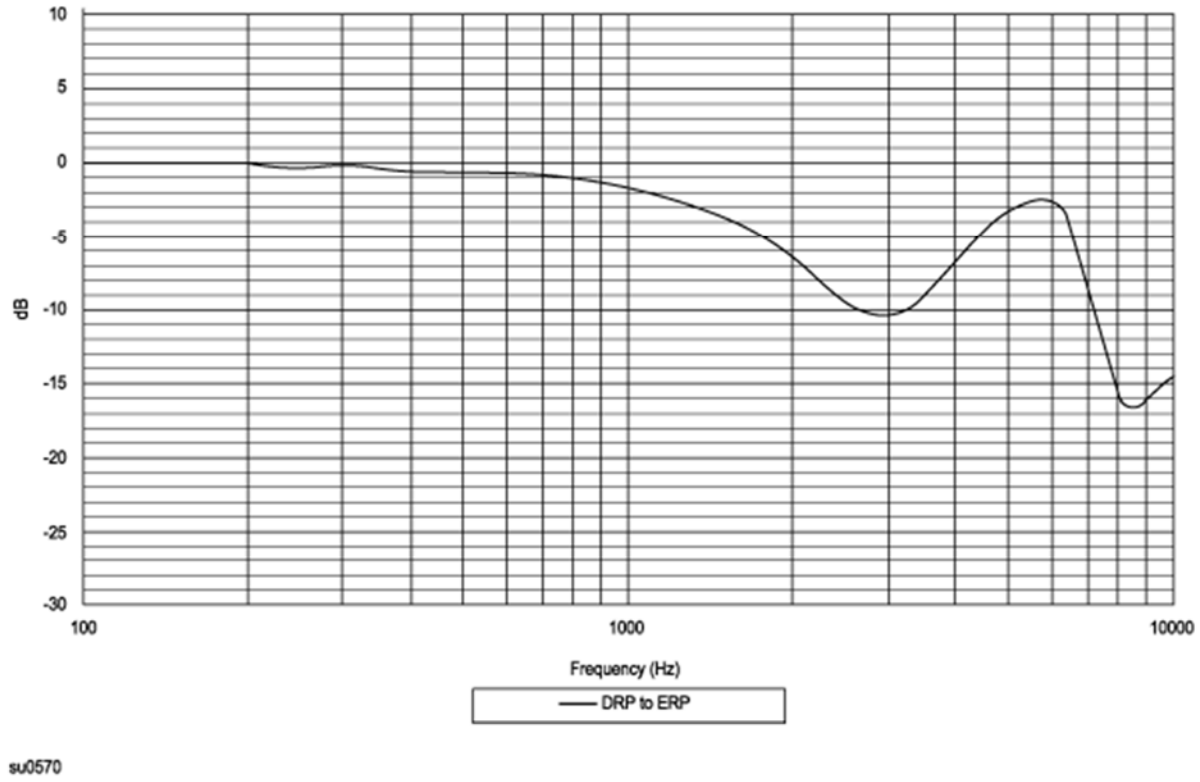

Figure NAD.4 - Corrections to Convert DRP Sound Pressures to ERP Sound Pressure

NAD.4.1 Method 1 (recommended method)

Measurements shall be made following the methods described in IEEE Std 269, Clause 4, for test equipment and positioning, Clause 6.10 for analog communication sets, and Clause 7.13 for digital communication sets.

NAD.4.2 Method 2 (alternate method)

A handset or headset that is of a design compatible with the artificial ear of IEC 60318 shall be placed under normal operating conditions in position for the exchange of calls (such as talking state or ringing state with the handset raised), and fixed to an artificial ear conforming to the requirements of IEC 60318. The earpiece shall be naturally sealed to the knife-edge of the artificial ear. If any holes in the earpiece fall outside the knife-edge of the artificial ear the earpiece is not qualified for this Method 2 test. Other types of handset and headset should use Method 1.

Response for insert type earphones shall be measured with an in-ear coupler as indicated in the American National Standard for Occluded Ear Simulator, ANSI/ASA S3.25-1989, extended by an ear canal simulator consisting of a cylinder 8 mm long and 7,5 mm in diameter. The tip of the earphone shall be inserted until tangent with plane X-X' shown in Figure 1 of , ANSI/ASA S3.25-1989.

The artificial ear shall be electrically connected to a precision sound level meter conforming with IEC 60651 or IEC 61672-1:2002, with A-weighted slow response.

NAD.4.2.1 Off-hook signal source

An off-hook signal source as described below shall be applied to the receive circuit of the equipment under test. The amplitude and frequency is adjusted to produce the maximum acoustic output from the earpiece.

The equipment under test shall be connected to a network simulator and test tone generator as shown in Figure NAD.3, by closing switches A and D. An equivalent network simulator may be used.

The analog signal generator in the simulator circuit produces a sine-wave signal. For the equipment under test with a digital interface, a digital sequence representing minimum to maximum transition square wave at frequencies between 300 Hz and 5 000 Hz may be used.

NAD.4.2.2 On-hook signal source

An on-hook signal source as described below shall be applied to the receive circuit of the equipment under test that contains an alerting device in the handset. The ringing frequency shall be adjusted to produce the maximum acoustic output from the earpiece.

The equipment under test shall be connected to a network simulator and ringing generator as shown in Figure NAD.3, by closing switches A and C. An equivalent network simulator may be used. A signal generator in the simulator circuit produces a sine-wave signal. For equipment under test with a digital interface, a digital sequence that will activate the alerting device at its maximum acoustic output may be used.

[D1] Annex NAE. Modified by the following:
(informative)
U.S. and Canadian regulatory requirements

This annex provides examples of and references for regulatory requirements that apply to equipment. Applicability of these requirements is dependent on the construction of the equipment and its intended installation and use.

This annex is not intended to provide a complete list of all of the applicable requirements, only to serve as a reference for requirements that most commonly apply to this type of equipment. For complete requirements, the National Electrical Code, ANSI/NFPA 70-2008, the Canadian Electrical Code, Part I, CSA C22.1-09 or other referenced documents must be consulted.

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.

NOTE 1 Underlining to indicate text added to IEC 60950-1 is not used in this annex.

NOTE 2 The complete text of Annex NAE is a D1 national difference.

[D1] Annex NAE

Clause No.	Topic/summary	NEC	CEC
1.1.1 (1.5.5)	**Cables used in ITE (computer) rooms** See 1.5.5 (1.1.1).	645.5	4-010(2)(i), 12-020 60-316
1.1.2	**Additional requirements**	90.2(B)(5) ANSI/IEEE 487	Section 0
	Special installation methods are required for equipment connected to wire-line communication facilities serving high voltage electric power stations operating at greater than 1 kV. These requirements do not cover the equipment used in the design of such installations. Special system design requirements, such as those covered by ANSI/IEEE 487, Recommended Practice for the Protection of Wire-Line Communication Facilities Serving Electric Power Locations, shall be followed to reduce the risks associated with wire-line communication facilities serving such power stations.		
1.1.2, Annex T	**Outdoor use equipment**	110.11, 110.20, Table 110.20	22-102 2-400 2-402
	Equipment intended for use		

Clause No.	Topic/summary	NEC	CEC
	outdoors shall be evaluated in accordance with the Standard for Enclosures for Electrical Equipment, UL 50, or the Standard for Enclosures for Electrical Equipment, Environmental Considerations, UL 50E, or Special Purpose Enclosures, CAN/CSA C22.2 No. 94, or CSA C22.2 No. 94.2-07 *Enclosures for Electrical Equipment, Environmental Considerations* and shall be marked with a suitable outdoor use enclosure designation compatible with the National Electrical Code, ANSI/NFPA 70, or the Canadian Electrical Code.		
1.1.3 (1.5.5)	**Building wiring** See 1.5.5 (1.1.3).		2-128, Annex B 2-132, Sections 4, 8, 10, 12 and 60
1.2	**GFCI protection** Receptacles, rated 125-volt, single phase, 15- or 20-ampere accessible to either Users or Service Personnel shall be provided with GFCI Protection for Personnel if the equipment containing the receptacles is installed outdoors.	210.8(B)	24-116 26-700
1.5.5 (1.1.3) (3.5)	**Building wiring**	110.8	Section 12
	Wires and cables installed as part of building wiring systems (premises wiring, facility wiring, etc.) shall comply with the applicable provisions in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, and, except for cables run completely within an ITE (computer) room, are not within the scope of this standard. For example:		
	Conductors for general	Article 300, 310	Section 4

Clause No.	Topic/summary	NEC	CEC
	wiring		
	Cables extending beyond an ITE (computer) room	645.6	
	Class 1, 2 and 3 circuits	Article 725	Section 16
	Optical fiber cables	Article 770	Section 56
	Communication circuits	Article 800	Section 60
1.5.5 (1.1.3) (3.5)	**Building wiring and cable used in ducts, plenums and other air-handling space**		12-010
	Building wiring and cable used in ducts, plenums and other air-handling space are subject to special requirements and are not within the scope of this standard.		
	General requirements	300.22	Section 12-010
	Class 2 and 3 circuits	725	Section 16
	Optical fiber cables	770	Section 56
	Communication circuits	800	Section 60
1.5.5 (1.1.1) (3.5)	**Cables used in ITE (computer) rooms**	645.5	12-020 4-010(2)(i) 60-316
	Cables installed within an ITE (computer) room are within the scope of this standard and shall also comply with the applicable provisions of the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1.		
1.5.5	**External interconnecting cables**	645.5(C) 645.5(D) NFPA 75	12-020
	Type DP or equivalent cable is required for cabling under raised floors in ITE (computer) rooms. Type DP-1 or DP-1P cable is suitable for use in any external circuit operating at 600 volts or less. Type DP-2 or DP-2P cable is suitable for use in any external circuit operating at 300 volts or less.		60-306 60-318

Clause No.	Topic/summary	NEC	CEC
	Generally, for ITE (computer) room applications, it is assumed that any cable over 3,05 m in length, coiled or uncoiled, can be used under raised floors.		
	Cables extending beyond the ITE (computer) room are subject to the applicable requirements in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, for building wiring.	300, 645.6	
	For installations other than ITE (computer) rooms, cables are subject to the applicable requirements in the National Electrical Code, ANSI/NFPA 70, except cables not exceeding 3,05 m may consist of appliance wiring material and may be evaluated as part of equipment. Special constructions may warrant additional considerations.		
	For circuits supplied by limited power sources, Article 725 of the National Electrical Code, ANSI/NFPA 70, permits the use of CL2 or permitted cable substitutions. See Table NAE.1.	725	
	For cabling less than 3,05 m, which are types not specified in the National Electrical Code or Canadian Electrical Code, each detachable external interconnecting cable (with terminations) furnished as part of the equipment shall be marked or similarly identified in the installation instructions with the name, trademark or trade name of the organization that is responsible for the equipment and with the		

Clause No.	Topic/summary	NEC	CEC
	organization's identifying number or equivalent designation for the cable, or the cable must be evaluated separately from the equipment.		
	This marking is required to allow authorities having jurisdiction to identify external interconnecting cables that are evaluated as a part of the system and that are not separately evaluated.		
	Telephone line cords, extension cords and the like shall comply with the requirements of the Standard for Communications-Circuit Accessories,UL 1863, and Cords and Cord Sets for Communication Systems, CSA C22.2 No. 233.	800.113	60-102
1.6 (3.2)	**Connection to a.c. or d.c. mains supplies**		
	See 3.2.		
1.6.1.2 (3.2.1.2)	**Connections to a d.c. power system (d.c. branch circuit)**		
	Connections to the d.c. power system shall meet the requirements for connection to branch circuits. (See connections to primary power, 3.2.)	480.3	80-002
1.6.1.2 (2.6.1)	**Earthing (grounding) of d.c. powered equipment**	480.3, 250	See 2.5.1 10-102 10-104 10-202 10-404 10-810
	Equipment intended to be connected to a nominal 48 V d.c. (or higher) power supply source, or systems rated less than 48 V d.c. that have one point directly earthed (grounded), shall have provision for the earthing (grounding) of all exposed dead metal parts that might		

Clause No.	Topic/summary	NEC	CEC
	become energized from the power supply source or from circuits involving a risk of electric shock.		
1.6.1.2 (1.7.11)	**Overcurrent and earth (ground) fault protection for d.c. powered equipment** See 2.7.1.	480.3	
1.6.1.2(1.7.7.3, 3.2.1.2)	**Polarity marking for d.c. powered equipment field wiring terminals**	200.10, 200.11	2-100(1)(m)
	Terminals and leads provided for permanent connection to the supply shall be marked to indicate polarity if reverse polarity can result in a hazard.		Individual CSA Part II Standards
1.7.1	**Rated voltage marking**	100, 110.4, 110.21, 220.5 and	2-100, 2-10
	Based on nominal rating conventions, the following marking schemes shall be used:	ANSI C84.1	CSA CAN3-C235
	The voltage rating for equipment with more than one phase supply conductor and an earthed neutral supply conductor shall indicate the phase-to-earth **RATED VOLTAGE** and the phase-to-phase **RATED VOLTAGE**, separated by a solidus (/), and shall give an indication of the number of phases of the supply. In order to differentiate this marking from multiple voltage ratings, the number of supply wires, including the neutral, shall also be provided.		
	For example:		
	120/240 V, 3-wire means the voltage is supplied by two phase wires and one neutral wire with 120 V between each phase conductor and the neutral and 240 V between the phase conductors.		
	120/208 V, 3-phase 4-wire		

Clause No.	Topic/summary	NEC	CEC
	means the voltage is supplied by a three-phase power system and one neutral wire with 120 V between each phase conductor and the neutral and 208 V between phases.		
	For cord connected equipment, the **RATED VOLTAGE**, specified shall not exceed the rating of the attachment plug.		
	A voltage rating that exceeds the attachment plug cap rating may be acceptable if it does not exceed the extreme operating conditions in Table 2 of Preferred Voltage Levels for AC Systems, 0 to 50,000 V, CSA CAN3-C235, and if it is part of a range that extends into "Normal Operating Conditions". The voltage rating shall not be lower than that specified for "Normal Operating Conditions" in Table 2 of CSA CAN3-C235 unless it is part of a range that extends into "Normal Operating Conditions." For example, a marking of 100 V would not be allowed, but 100 - 118 V would be acceptable. A marking of 127 V would not be allowed, but 100 - 127 V would be acceptable.		
	See also 1.7.7.		
1.7.7 (2.5)	**Markings for Class 2 terminals**	725.124	16-204
	Wiring terminals intended to supply Class 2 outputs in accordance with Article 725 of the National Electrical Code, ANSI/NFPA 70, or Section 16 of the Canadian Electrical Code, Part 1, CSA C22.1, shall be marked with the voltage rating and "Class 2" or the equivalent. The marking shall be located		

Clause No.	Topic/summary	NEC	CEC
	adjacent to the terminals and shall be visible during wiring.		
1.7.7.1 (2.6.4.2) (3.3)	**Identification of the protective earthing terminal (terminal for the connection of the equipment grounding conductor or bonding conductor) for permanently connected equipment** The terminal for the connection of the equipment earthing conductor (grounding conductor or bonding conductor) shall be identified by (1) a green-colored, not readily removable terminal screw with a hexagonal head; (2) a green-colored, hexagonal, not readily removable terminal nut; or (3) a green-colored pressure wire connector. If the terminal is not visible, the conductor entrance hole shall be marked with the word "green" or "ground," the letters "G" or "GR" or the grounding symbol (IEC 60417) or otherwise identified by a distinctive green color. The term "Protective Earth" or its abbreviation "PE" are not commonly used in Canada or the U.S. Therefore, "G," "GND," " GROUND," or the grounding symbol should be used in conjunction with these terms.	250.126	CSA C22.2 No. 0.4 [Clause 3.5.1.2(c)]
1.7.7.2 (3.3.1)	See 3.3.1		
1.7.7.3 (3.2.1.2) (1.6.1.2)	**Polarity marking for d.c. powered equipment field wiring terminals**		2-100(1)(m)
	See 1.6.1.2 (1.7.7.3) (3.2.1.2).		
2.5 (1.7.7)	**Markings for Class 2 terminals**		16-204 (supply marking)
	See 1.7.7 (2.5).		

Clause No.	Topic/summary		NEC	CEC
2.5	**Overcurrent protection for Class 2 limiting**		725.121,Chapter 9,Tables 11(A) and 11(B)	16-206
	Where overcurrent protection is required for Class 2 and Class 3 limiting in accordance with the National Electrical Code, ANSI/NFPA 70, the overcurrent device shall not be interchangeable with devices of higher ratings. A marking is not sufficient regardless of the location of the device.			
	Where a limited power source is used to provide current limiting to external wiring in accordance with the National Electrical Code, ANSI/NFPA 70, a fuse, if used, shall not be operator-accessible unless it is not interchangeable.			
2.6	**Provisions for protective earthing**		Article 100	Section 0
	The terms "protective earth," "protective earthing" and "earthing" are not commonly used in Canada or the U.S. For connections to the grounding system, the following terms should be applied, as defined in the Canadian Electrical Code(CEC), Part I, CSA C22.1, and/or the National Electrical Code (NEC), ANSI/NFPA 70. These terms appear in parentheses, where appropriate:			
	Bonding Conductor (CEC)	Grounding Conductor (CEC, NEC)		
	Grounded (CEC, NEC)	Grounding Conductor, Equipment (NEC)		
	Grounded Conductor	Grounding Electrode		

Clause No.	Topic/summary		NEC	CEC
	(NEC)	Conductor (NEC)		
	Grounding (CEC)	Grounding System (CEC)		
2.6 (2.7)	**Output receptacle circuit earthing (grounding)**		250.30, 250.66, Table 250.66, 645.15	10-906
	Equipment having output receptacles for alternating current power connections that are generated from an internally derived source (i.e., provided with transformer isolation internal to the equipment, which provides isolation of the output circuit from the mains supply) shall have the earthed (grounded) circuit conductor bonded to the protective earthing (grounding) terminal via a "system bonding jumper" considering the maximum fault current of the circuit.			
	For cord-connected equipment, the size of the bonding jumper shall not be less than the current-carrying conductors of the derived output circuit. For permanently connected equipment, the bonding jumper shall not be less than 8 AWG per NEC Table 250.66.			
2.6.1 (1.6.1.2)	**Earthing (grounding) of d.c. powered equipment**<			
	See 1.6.1.2 (2.6.1).			
2.6.3.3	**Size of protective bonding conductors**			
	For **PLUGGABLE EQUIPMENT TYPE A**, and if neither a) or b) of 2.6.3.3 is applicable, the current rating of the circuit shall be taken as 20 A since the Pluggable Equipment Type A configurations described in 1.2.5.1 are protected by		210.20, 210.23,	10-106 26-710(b)

Clause No.	Topic/summary	NEC	CEC
	maximum 20 ampere branch circuit overcurrent protection.		
2.6.4 (2.6.5.7) (3.1.8)	See 2.6.5.7		
2.6.4.2 (1.7.7.1) (3.3)	**Identification of the protective earthing terminal (terminal for the connection of the equipment grounding conductor or bonding conductor) for permanently connected equipment**		CSA C22.2 No. 0.4 [Clause 3.5.1.2(c)]
	See 1.7.7.1 (2.6.4.2) (3.3).		
2.6.4.2 (3.3.4)	**Range of earthing conductor (equipment grounding conductor or bonding conductor) sizes to be accepted by field wiring terminals**	250.122 Table 250.122	10-814 Table 16
	Terminals shall be suitable for the wire gauges commonly used in the U.S. and Canada. It is required that current-carrying conductors be rated 125 percent of the equipment rating; therefore, once the equipment rating exceeds 80 percent of the capacity of the wiring in the branch circuit, the next higher capacity wire gauge shall be used. Refer to the appropriate article in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part 1, CSA C22.1, for ampacity Tables.		
2.6.5.7 (2.6.4) (3.1.8)	**Screws for protective bonding** Sheet metal (spaced thread) screws shall not be used to connect protective earthing (grounding) and bonding conductors or connection devices to enclosures.	250.8	
2.7	**Branch circuit protection for receptacles**	210.20, 210.23, 240.10 406	14-012 14-114 14-600

Clause No.	Topic/summary	NEC	CEC
	Standard supply outlets and receptacles shall be protected by an overcurrent device in either the equipment or the branch circuit, rated or set at not more than the rating of the outlet or receptacle. The overcurrent device shall be of a type that is suitable for branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, unless it is supplied by a secondary circuit.		
	Standard supply outlets and receptacles are considered an extension of the branch circuit. Equipment that can plug into these receptacles is evaluated based on the branch circuit protection normally associated with the type of receptacle. For example, to comply with both U.S. and Canadian Electrical Code requirements, a 15 A, 125 V receptacle is assumed to have branch circuit protection rated 15 A. For NEMA 5-15R receptacles not located in the operator access area of the equipment, and when additional evaluation of the end system shows no hazards in accordance with this standard, a maximum of 20 A branch circuit protection may be used.		
2.7	**Multiple panelboards**	645.17	
	For ITE (computer) room applications, power distribution units may have multiple panelboards within a single cabinet/enclosure.		
2.7	**Overcurrent protection for appliances**	422.11	14-104 Table 13

Clause No.	Topic/summary	NEC	CEC
	This clause contains requirements for sizing branch circuits for appliances. If special overcurrent devices separate from the equipment are required, data for selection of these devices shall be marked on the appliance.nbsp;	422.60	
2.7 (1.6.1.2)	**Overcurrent and earth fault protection for d.c. powered equipment** Overcurrent and earth fault protection in accordance with 2.7 shall be provided either in the equipment or as part of the building installation. If the protection is provided as part of the building installation, the type and rating shall be provided in the installation instructions.	480.3	
	If a protective device interrupts the grounded conductor, it shall also interrupt the supply conductor.	240.22	14-016
2.7	**Overcurrent protection for distribution transformers**	450.3(B) Table 450.3(B)	26-254 26-256
	Special overcurrent protection is required for individual transformers that distribute power to other units over branch circuit wiring. Typically, these requirements apply to transformers rated not less than 10 kVA, with an output of not less than 100 V.		
2.7	**Overcurrent protection for panelboards**	408.36	14-606
	This clause contains additional requirements for equipment provided with panelboards.		
3.1.1	**Overcurrent protection of wiring**	240.21(B)(1), 240.21(B)(2), 310.15	4-004 4-014 14-100
	Section 310-15 of the		

Clause No.	Topic/summary	NEC	CEC
	National Electrical Code, ANSI/NFPA 70, and Section 4 of the Canadian Electrical Code, Part I, CSA C22.1, give guidance on the ampacities of conductors.		
	Any overcurrent device is suitable for use with a conductor that meets the following conditions:		
	- The length of the conductor does not exceed 3 m.		
	- The conductor is located completely within the enclosure of the equipment.		
	- The ampacity of the conductor is not less than the rating of the overcurrent protective device at the termination of the conductor.		
	An overcurrent device rated not more than 3 times the ampacity of the conductors is suitable if all of the following conditions are met:		
	- The length of the conductor does not exceed 7,5 m.		
	- The conductor is protected from mechanical damage by being enclosed in an approved enclosure, raceway or by other approved means.		
	- The conductor terminates at its load end in one or more overcurrent protective devices.		
	- The ampacity of the conductor is not less than the sum of the ratings of the overcurrent protective devices supplied by the conductor.		
	For solid bus bars, the		

Clause No.	Topic/summary		NEC	CEC
	following meets this requirement:			
	Material	Overcurrent protection		
		Low enough to limit the current density in the bus bar to:		
	Copper	4,65 A/mm^2 of bus bar cross-section		
	Electrical-conductor (EC) grade of aluminum (conductivity is 61 percent of IACS	3,10 A/mm^2 of bus bar cross-section		
	Aluminum having a conductivity of 55 percent of IACS	2,75 A/mm^2 of bus bar cross-section		
3.1.8 (2.6.4) (2.6.5.7)	See 2.6.5.7			
3.2 (1.6)	**Connection to a.c. or d.c. mains supplies** Wiring methods used for the connection of the equipment to the AC or DC **MAINS SUPPLY** shall be in accordance with the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1.		110.8	Section 12
3.2.1	**Methods of connection**			
	Flexible cords and plugs are permitted for portable and **STATIONARY EQUIPMENT** and for fixed equipment where the fastening means and mechanical connections of the equipment are designed to permit removal for maintenance and repair.		400.7, 400.8	4-010

Clause No.	Topic/summary	NEC	CEC
	(Equipment such as automated teller machines (ATMs) and similar bank equipment, which are typically installed in banks, financial institutions, supermarkets, etc., are examples of such fixed equipment where flexible cords and plugs are permitted.)		
	Flexible cords must be provided with an attachment plug for connection to the branch circuit.	400.7(B)	CSA C22.2 No. 0
	The attachment plug configuration shall be one that is rated not less than 125 percent of the current rating of the equipment (e.g., the maximum rating of equipment that has a NEMA 5-15P plug is 12 A).	210.19(A)(1), 210.23(A)(1), 422.10(A), 422.10(E), 645.5(A)	8-104, 26-722, 8-302(3) 26-1000
	CLASS II EQUIPMENT provided with 15- or 20-A standard supply outlets, Edison-base lampholders or a single pole disconnect device shall be provided with a polarized-type attachment plug.	422.40	CSA C22.2 No. 42
3.2.1.2	**Special earthing (grounding) conditions for d.c. powered equipment**	250, Parts VI and VII, 480.3	10-102, 10-104, 10-202, 10-404, and 10-810
	Equipment that has the earthed terminal (terminal for the grounded conductor) of the power source connected to the frame of the unit is required to have special provisions for earthing (grounding), along with markings and instructions. See Annex NAA.		
	If the equipment provides the means for connecting the supply to the earthing electrode conductor (grounding conductor or grounding electrode	250, Parts III and V, 480.3	

Clause No.	Topic/summary	NEC	CEC
	conductor), there shall be no switches or overcurrent protective devices located between the point of connection to the supply and the point of connection to the earthing (grounding) electrode.		
3.2.1.2 (1.7.7.3) (1.6.1.2)	**Polarity marking for d.c. powered equipment field wiring terminals**		
	See 1.6.1.2 (1.7.7.3) (3.2.1.2).		
3.2.3	**Connection of wiring systems (e.g., conduit, raceways, etc.)**	300, including 300.10, 300.11, 300.12	12-914, 12-918, 12-916
	Equipment shall have provision for connecting and securing a field wiring system.		
	For certain locations, such as some restricted access locations using low-voltage d.c. systems, open wiring systems may be permitted. Equipment intended solely for installation in such locations need not be provided with a provision for connecting and securing a field wiring system. However, a method of securing wiring or instructions shall be provided to ensure the installed wiring is adequately protected from abuse.		
3.2.3	**Permanently connected equipment**		
3.2.3	**Sizes of cables and conduits**	300.1(C), Annex C, Chapter 9, Table 4	Section 4 Section 12 Tables 6 - 10
	Trade sizes of different size conduits and the number type and ampacity of cables allowed to be used with different sized conduits are covered in the national codes. Tables NAE.2 and NAE.3 are provided for		

Clause No.	Topic/summary	NEC	CEC
	reference.		
3.2.3	**Terminals and leads for field wiring connections**	110.14, 300.14,	12-3000(5) CSA C22.2 No. 0 30-404
	Equipment shall be provided with either terminals or leads for connection of field-installed wiring. Leads shall not be smaller than No. 18 AWG (0,82 mm^2) and not less than 150 mm in length.		
3.2.5	**Cord-connected equipment** The length of a power supply cord shall not exceed 4,5 m.	400.8, 645.5(B)	4-010
	The minimum length of a power supply cord shall be 1,5 m unless it is intended for a special installation, such as dedicated equipment intended to be mounted near a receptacle. Exception: For equipment provided with an external power supply, the minimum length of the power supply cord shall be 0,5 m, provided that the total length of the conductive path from the receptacle to the equipment is 1,5 m or greater. The minimum 1,5 m length includes the 0,5 m power supply cord, the axial length of the power supply, and the output conductors, measured from the face of the attachment plug cap to the output connector face. The minimum 0,5 m length of a detachable power supply cord is measured from the face of the attachment plug cap to the cord connector face. The minimum 0,5 m length of a non-detachable power supply cord is measured from the face of the attachment plug cap to the point on the flexible cord where it enters the power	210	Individual CSA Part II Standards

Clause No.	Topic/summary	NEC	CEC
	supply enclosure, including any strain relief means outside the enclosure.		
	Power supply cords shall have conductors with cross-sectional areas sufficient for the rated current of the equipment. Conductors shall be sized based on the requirements in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1.	400.5, 400.12, Table 400.5(A)	4-014, Table 11, 4-012
	Power supply cords and cord sets shall incorporate flexible cords suitable for the particular application or shall be of a type at least as serviceable for the particular application. Table NAE.4 lists common applications and associated suitable cord types. Table NAE.5 specifies the allowable ampacity for flexible cords and cables.	400.3, 400.4	4-010(1), Table 11
		Table 400.4	Table 12
3.2.9	**Wire bending space at field wiring terminals**	312.6	C22.2 No. 0.12
	There shall be adequate room in a wiring compartment to properly make the field connections.		
	Not applicable to wiring compartments for non-detachable power supply cords.		
3.2.9	**Volume of field wiring compartments**	314.16	12-3032 and Table 22 CSA C22.2 No. 0.12
	Wiring compartments shall be of sufficient size to provide free space for all conductors enclosed in the box.		
	Not applicable to wiring compartments for non-detachable power supply cords.		

Clause No.	Topic/summary	NEC	CEC
	For certain locations, such as some restricted access locations using low-voltage d.c. systems, open wiring systems may be permitted. Equipment intended solely for installation in such locations need not be provided with a field wiring compartment. However, adequate free space shall be provided for all conductors, and all conductors shall be protected against accidental contact.		
3.3 (1.7.7.1) (2.6.4.2)	**Identification of the protective earthing terminal (terminal for the connection of the equipment grounding conductor or bonding conductor) for permanently connected equipment**	250.126	
	See 1.7.7.1 (2.6.4.2) (3.3).		
3.3 (4.5.2)	**Temperature markings for field wiring compartments**	110.14(C), 310.10	12-100(c) Individual CSA Part II Standards
	If the wires in a terminal box or compartment intended for power supply connection of equipment can attain a temperature higher than 60 °C during normal operation, the unit shall be marked near the point at which the supply connections are made with the minimum temperature rating of the conductors that must be used.		
3.3	**Wiring terminals for field wiring connections**		CSA C22.2 No. 0
3.3	**Wiring terminals for the connection of external conductors**	300.1 725	CSA C22.1
	Field wiring terminals provided for interconnection of units by conductors not		

Clause No.	Topic/summary	NEC	CEC
	supplied by a limited power source, or a Class 2 circuit defined in the National Electrical Code, ANSI/NFPA 70, or the Canadian Electrical Code, CSA C22.1, also shall comply with the applicable requirements in 3.3.		
	Interconnection of units by conductors supplied by a limited power source, or a Class 2 circuit defined in the National Electrical Code, ANSI/NFPA 70, or the Canadian Electrical Code, CSA C22.1, may have field wiring connections other than specified in 3.3, such as wire-wrap and crimp-on types, if the limited power source and Class 2 circuits are separated from all other circuits by barriers, routing or fixing.		
3.3.1 (1.7.7.2)	**Identification of terminals for connection of an earthed (grounded) conductor (neutral)**	200.9	26-002 CSA C22.2 No. 0.4
	Terminals for the connection of the earthed (grounded) circuit conductor (neutral) are required to be identified by a distinctive white marking or other equally effective means.		
3.3.3	**Wire-binding screws**	110.14(A)	12-116
	A wire-binding screw may be employed at a wiring terminal intended for connection of a No. 10 AWG (5,3 mm^2) or smaller conductor wire. Upturned lugs, a cupped washer or the equivalent shall be provided to hold the wire in position.		
3.3.4	**Range of conductor sizes to be accepted by field-wiring terminals**	210.19(A), 210.20,	4-004 Tables 1, 5c and 12
	Terminals shall be suitable	Article 310, ampacity Tables	

Clause No.	Topic/summary	NEC	CEC
	for the wire gauges commonly used in the U.S. and Canada. It is required that current-carrying conductors be rated 125 percent of the equipment rating. Therefore, once the equipment rating exceeds 80 percent of the capacity of the wiring in the branch circuit, the next higher capacity wire gauge shall be used. Refer to the appropriate article in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, for ampacity Tables. For purposes of application of Table 310.16, no Correction Factors shall be used for terminal sizing considerations, unless requested by the manufacturer and documented. A wiring terminal that will not receive a conductor size one size larger than the minimum determined per Table 310.16 shall be marked to restrict its use to the smaller conductor size.		
3.3.4 (2.6.4.2)	**Range of earthing conductor (equipment grounding conductor or bonding conductor) sizes to be accepted by field wiring terminals**	250.122(A), Table 250.122	10-814 Table 16
3.3.6	**Conductor material markings for field wiring terminals intended for aluminum conductors** Equipment with supply field-wiring terminals intended to be connected to aluminum conductors shall be so identified for the connection of aluminum conductors. This marking shall be independent of all other markings on the terminal	110.14	12-118

Clause No.	Topic/summary	NEC	CEC
	connectors and shall be visible after installation. The terminal for the connection of an equipment protective earthing (grounding) conductor shall not be identified for the connection of an aluminum conductor.		
3.3.6	**Terminals for field wiring** Field-wiring connections shall be made through the use of suitable pressure connectors (including set-screw type), solder lugs, or splices to flexible leads.	110.14	12-116 12-118
3.4.2	**Motor control devices**	430.81(B)	28-500(3)
	For equipment with a primary motor, a motor control device is required, unless (a) - (d) are true: a) the equipment is cord connected; b) the equipment voltage rating is 125 V or less; c) the equipment current rating is 12 A or less; and d) the motor is rated 1/3 hp or less (250 W or less, or locked rotor current of 43 A or less).		
	Although a motor control device is required, the motor control device need not have a 3 mm contact gap if the equipment is provided with a separate suitable disconnect device (such as the plug on a power supply cord).		
3.4.8	**Orientation of switches and circuit breakers**	240.81	14-300 14-502
	Vertically mounted disconnect switches and circuit breakers shall be mounted such that the up position of the handle is the		

Clause No.	Topic/summary	NEC	CEC
	"on" position.		
3.4.11	**Backup battery power sources**	645.11	
	For ITE (computer) room applications, batteries integral to equipment shall incorporate a means for battery disconnect and a means for connection to the remote emergency power off circuit that disconnects the battery power source, except for battery circuits for which (1) the product of the open circuit voltage times the rating of the overcurrent protective device does not exceed 750 VA or (2) any resistive load cannot draw more than 750 VA for more than five minutes after the mains power is disconnected. If connection to the remote emergency power off circuit is required, batteries shall be disconnected within five minutes of activating the remote emergency power off circuit.		
3.5.1	**Interconnection of equipment - general requirements**	300.3(C)(1) 725.136	12-3030, 16-012, 16-114, 16-212
	Interconnecting cables containing more than one type of circuit may be subjected to additional restrictions per the National Electrical Code,NFPA 70, and the Canadian Electrical Code, Part I. In particular, restrictions are placed on cables that contain both conductors with Class 2, Class 3 (for U.S. only) or limited power source circuits and conductors with power, Class 1 and other circuits specified in the Code. Such constructions may require additional consideration.		
4.3.12	**Maximum quantity of**	NFPA 30	

Clause No.	Topic/summary	NEC	CEC
	flammable liquid stored in equipment		
	The maximum quantity of flammable liquid stored in equipment shall comply with Table NAE.6		
4.3.13.5.1	**Requirements for equipment incorporating lasers**	Code of Federal Regulations, 21 CFR 1040	Canadian Radiation Emitting Devices Act, REDR C1370 or CAN/CSA-E60825-1, Safety of laser products - Part 1: Equipment classification, requirements and user's guide
	Requirements for lasers are contained in the applicable national codes and regulations. Compliance of laser products with the Code of Federal Regulations (CFR), Title 21, Part 1040,and the Canadian Radiation Emitting Devices Act, REDR C1370, shall be determined by: a) determining the Class of laser (as defined in the CFR) from the manufacturer's required documentation, such as the Center for Devices and Radiological Health (CDRH) report, markings and labels, or similar documentation; b) verifying that the manufacturer' s markings and labels having the information specified in the CFR are affixed on the laser product (as defined in the CFR); c) determining that the corresponding construction features, such as protective housing, interlocks, and		

Clause No.	Topic/summary	NEC	CEC
	similar features, are provided in accordance with the CFR; and d) determining that the resulting construction complies with the construction requirements of this standard.		
4.5.2 (3.3)	**Temperature markings for field-wiring compartments**		Individual CSA Part II Standards
	See 3.3 (4.5.2).		
4.7	**Automated information storage equipment**	NFPA 75 (8.1.4)	
	For ITE (computer) room applications, automated information storage equipment, which is enclosed storage and retrieval equipment that moves recorded media between storage and electronic computer equipment, that is intended to contain more than 0,76 m^3 of combustible media shall have provision for either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.		
4.7.3.1	**Equipment for use in environmental air space**		
	Equipment intended for use in environmental air space, other than air ducts or plenums, is required to be provided with a metal enclosure or with a non-metallic enclosure having adequate fire-resistance and low smoke-producing characteristics. Determination of low-smoke-producing characteristics is made in accordance with the Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-	300.22(C)	12-010

Clause No.	Topic/summary	NEC	CEC
	Handling Spaces, UL 2043.		
	Equipment is not permitted to be installed in air ducts or plenums used for environmental air.	300.22(B)	12-010
4.7.3.1	**Flammability requirements for large surfaces**	NFPA 75 (7.1.4)	
	For ITE (computer) room applications, an external surface of combustible material having an exposed area of greater than 0,9 m^2 (10 sq ft) or a single dimension greater than 1,80 m (6 ft) shall have a flame spread rating of 50 or less when tested in accordance with either:		
	- the Standard for Tests for Surface Burning Characteristics of Building Materials, UL 723, or ASTM E 84; or,		
	- the radiant panel furnace method in ASTM E 162. The flame spread rating as determined by this method is the average value based on tests of six samples representative of the wall thickness used, with no single sample rating greater than 75.		
	The limits mentioned refer to the exposed surface area of a single unbroken section. If two sides of a single piece are exposed, only the larger side is to be considered in computing the area.		
	A material with a flame spread rating higher than 50 may be used as the exterior finish or covering on any portion of the enclosure, guard or cabinet if the flame spread rating of the combination of the base material and finish or covering complies with the flame spread requirements.		

Clause No.	Topic/summary	NEC	CEC
	For equipment not intended for use in ITE (computer) rooms, materials with a flame spread rating of 200 or less may be used.		
7	**Connection to cable distribution systems**		Section 54
	Equipment and accessories associated with the cable distribution system may need to be subjected to applicable parts of Chapter 8 of the NEC and Section 54 of the CEC.		
	Radio and Television Equipment	810	
	Equipment connected to cable distribution systems used for connection to antennas and dishes shall be installed in accordance with the applicable provisions of Article 810. These provisions may include:		
	Grounding	810.15, 810.21,	
	Antenna Discharge Units	810.20, 810.57	
	Community Antenna Television and Radio Distribution Systems	820	
	Equipment connected to cable distribution systems employed in CATV systems shall be installed in accordance with the applicable provisions of Article 820. These provisions may include:		
	Protection	820.93	
	Cable Grounding	820.100	
	Listing, Marking, and Installation of Coaxial Cable	820.113	
	Installation of Cables and Equipment	820.133	
	Network-Powered Broadband Communication Systems	830	

Clause No.	Topic/summary	NEC	CEC
	Equipment connected to cable distribution systems that are part of a broadband communication system shall be installed in accordance with the applicable provisions of Article 830. These provisions may include:		
	Output Circuits	830.3(D)	
	Network-Powered Broadband Communication Equipment and Cables	830.179	
	Primary Electrical Protection	830.90	
	Cable, Network Interface Unit, and Primary Protector Grounding	830.100	
	Premises-Powered Broadband Communication Systems	840 (pending)	
	Where an Optical Network Terminal (ONT) is served by a nonconductive optical fiber cable, and circuits that terminate at the ONT are completely contained within the building (i.e., do not exit the building), the shield of the coaxial cable shall be grounded.		
Annex H	**Ionizing radiation**	21 Code of Federal Regulations (CFR), Part 1020 Section 1020.10	Canadian Radiation Emitting Devices Act, REDR C1370
	In addition to measurement of ionizing radiation during normal operation in accordance with Annex H, measurements are made with the equipment operating under the following abnormal operating conditions, as applicable:		
	- a maximum supply voltage of 130 V if the equipment has a nominal voltage rating between		

Clause No.	Topic/summary	NEC	CEC
	110 V and 120 V;		
	- a maximum supply voltage of 110 % of the equipment nominal if the nominal is not between 110 V and 120 V;		
	- under conditions identical to those which result from that component or circuit malfunction which maximizes x-radiation while maintaining the equipment operative for normal use.		

[D1] Table NAE.1
[D1] Circuit and cable types permitted by the National Electrical Code, NFPA 70
[D1] (see 1.5.5)

Circuit type	Cable type [a]
Class 2 or Limited Power	CL2
Class 3	CL3
TNV	CM
Optical	OFC, OFN
CATV	CATV

[a] Substitution tables in the National Electrical Code, NFPA 70, apply.

[D1] Table NAE.2
[D1] Conduit sizes and fill (3.2.3)

Type	Minimum size, metric designator (inch)	Maximum size, metric designator (inch)	NEC	CEC
Intermediate metal conduit (IMC)	16 (1/2)	103 (4)	342.20 342.22, Chapter 9, Table 1	- -
Electrical metallic tubing (EMT)	16 (1/2)	103 (4)	358.20, 358.22 Chapter 9, Table 1	12-1400 12-1408, Tables 6 and 8
Flexible metallic tubing (FMT)	16 (1/2)	21 (3/4)	360.20, 360.22 Chapter 9, Table 1	- -
Flexible metal conduit (FMC)	16 (1/2)	103 (4)	348.20, 348.22 Chapter 9, Table 1	12-1004 12-1004, 12-1014, Tables 6 and 8
Liquid-tight flexible metal conduit (LFMC)	16 (1/2)	103 (4)	350.20, 350.22 Chapter 9, Table 1	12-1300 Table 8, 12-1304
Liquid-tight flexible non-metallic conduit (LFNC)	16 (1/2)	103 (4)	356.20, 356.22 Chapter 9, Table 1	12-1300 12-1014, Tables 6 and 8
Rigid metal conduit (RMC)	16 (1/2)	155 (6)	344.20, 344.22, Chapter 9, Table 1	12-1004 12-1014, Tables 6 and 8
Rigid non-metallic conduit (PVC)	16 (1/2)	155 (6)	352.20, 352.22 Chapter 9, Table 1	12-1100 12-1150 12-1200 12-1014, Tables 6 and 8

[D1] Table NAE.3
[D1] Throat diameter of inlet hole (3.2.3)

Trade size of conduit	Throat diameter of hole, mm (in)			
(metric designator)	Minimum		Maximum	
3/8 (12)	11.28	(0.444)	12.52	(0.493)
1/2 (16)	14.22	(0.560)	15.80	(0.622)
3/4 (21)	18.85	(0.742)	20.93	(0.824)
1 (27)	23.98	(0.944)	26.64	(1.049)
1-1/4 (35)	31.55	(1.242)	35.05	(1.380)
1-1/2 (41)	36.80	(1.449)	40.89	(1.610)
2 (53)	47.24	(1.860)	52.50	(2.067)
2-1/2 (63)	56.44	(2.222)	62.71	(2.469)
3 (78)	70.13	(2.761)	77.92	(3.068)
3-1/2 (91)	81.10	(3.193)	90.12	(3.548)
4 (103)	92.02	(3.623)	102.26	(4.026)
5 (129)	115.37	(4.542)	128.19	(5.047)
6 (155)	138.63	(5.458)	154.05	(6.065)

[D1] Table NAE.4
[D1] Power supply cords (3.2.5)

Type of appliance	Type of cord
Table-model equipment (for use on a table, desk, counter and the like)	SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO SP-2, SPE-2, SPT-2, NISP-2, NISPE-2, NISPT-2 SP-3, SPE-3, SPT-3
Table-model equipment (for use on a table, desk, counter and the like) that is subject to being moved frequently	SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO SP-2, SPE-2, SPT-2, NISP-2, NISPE-2, NISPT-2
Hand-held equipment	TS, TST [a] SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO[b]
Wall-mounted or floor-mounted equipment	SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO[c] SP-2, SPE-2, SPT-2, NISP-2, NISPE-2, NISPT-2 [c] SP-3, SPE-3, SPT-3 [c] SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO S, SE, SO, SOO, ST, STO, STOO
[a] A tinsel cord is acceptable if all of the following conditions are met:	
	1. The cord is not longer than 2,5 m.
	2. The cord is attached to the equipment directly or by means of a plug which is intended for that purpose.
	3. The equipment rating does not exceed 50 W.
	4. The nature of the appliance will necessitate the use of an extremely flexible cord.
[b] Type SV and similar cords are acceptable if each conductor is made up of 0,01 mm^2 strands.	
[c] Types SP-2, SP-3, SV and similar cords may be provided if the cord is not longer than 2,4 m.	

[D1] Table NAE.5
[D1] Allowable ampacity for flexible cords and cables
[D1] (Based on ambient temperature of 30 °C)
[D1] (Extracted from the NEC)

Size, AWG	Thermoplastic types	Thermoset types		Types
	TPT, TST	C, E, EO, PD, S, SJ, SJO, SJOW, SJOO, SJOOW, SO, SOW, SOO, SOOW, SP-1, SP-2, SP-3, SRD, SV, SVO, SVOO		HPD, HPN, HSJ, HSJO, HSJOO
		Thermoplastic types		
		ET, ETLB, ETP, ETT, SE, SEW, SEO, SEOW, SEOOW, SJE, SJEW, SJEO, SJEOW, SJEOOW, SJT, SJTW, SJTO, SJTOW, SJTOO, SJTOOW, SPE-1, SPE-2, SPE-3, SPT-1, SPT-1W, SPT-2, SPT-2W, SPT-3, ST, SRDE, SRDT, STO, STOW, STOO, STOOW, SVE, SVEO, SVT, SVTO, SVTOO		
		A [+]	B [+]	
27 [*]	0,5	-	-	-
20	-	5 [**]	7 [***]	-
18	-	7	10	10
17	-	9	12	13
16	-	10	13	15
15	-	12	16	17
14	-	15	18	20
12	-	20	25	30
10	-	25	30	35
8	-	35	40	-
6	-	45	55	-
4	-	60	70	-
2	-	80	95	-

[+] The allowable currents under subheading A apply to 3-conductor cords and other multi-conductor cords connected to utilization equipment so that only 3 conductors are current-carrying. The allowable currents under subheading B apply to 2-conductor cords and other multi-conductor cords connected to utilization equipment so that only 2 conductors are current-carrying.

[*] Tinsel cord.

[**] Elevator cables only.

[***] 7 amperes for elevator cables only; 2 amperes for other types.

[D1] Table NAE.6
[D1] Maximum quantity of combustible/flammable liquid stored in equipment
[D1] (4.3.12)

Liquid			Closed storage container	
NFPA 30 Class	**Flash point, °C**	**Boiling point, °C**	**Material**	**Size, liters**
Class IA	Below 22,8	Below 37,8	Shall not be used	
Class IB	Below 22,8	Above 37,8	Glass	1
			Metal or polyethylene	20
Class IC and II	At or above 22,8 and below 60	-	Glass	5
			Metal or polyethylene	20
Class III	At or above 60	-	Glass	20
			Metal or polyethylene	20
1) FLAMMABLE LIQUIDS with flash points below 22,8 °C and boiling points below 37,8 °C may not be used or stored within equipment covered by the scope of this standard.				
2) Individual reservoirs in equipment shall not be larger than the corresponding sizes for closed storage containers in this table.				