

**CERTIFICATION IMPACT ANALYSIS:
UL/IEC 60950-1, SECOND EDITION -
Safety of Information Technology Equipment**

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This analysis is intended to identify and analyze the impact of *notable* differences between the latest versions of the UL and IEC Standards for Safety of Information Technology Equipment (ITE) and their predecessors. In particular, IEC 60950-1 Second Edition and UL 60950-1 Second Edition are being analyzed and compared to their predecessors, IEC 60950-1 First Edition and UL 60950-1 First Edition, respectively.

This analysis will permit persons already familiar with IEC 60950-1 and UL 60950-1 to become familiar with the impact on ITE of the latest IEC and UL ITE Safety Standards. Other select observations are included that may be of interest to the reader. This analysis may be updated periodically as additional information on the application of the new Standards becomes known.

See informative Annex BB (Changes in Second Edition) of IEC 60950-1 for additional information on changes associated with IEC 60950-1, Second Edition.

Background

IEC 60950-1 is the International Standard for Safety of Information Technology Equipment. It encompasses under its scope information technology equipment, communications equipment, office appliances and multi-media equipment for use in the home, office, business, school, computer room (data center) and similar locations.

The latest version of IEC 60950-1, its Second Edition, was published in December 2005. It supersedes its predecessor, IEC 60950-1, First Edition, originally published in 2001.

IEC 60950-1 was developed by IEC Technical Committee (TC) 108 (previously TC74), MT2: Safety and Energy Efficiency of Information Technology Equipment. IEC TC 108 MT2 also developed/maintains IEC 60950-21, Information technology equipment – Safety – Part 21: Remote power feeding; IEC 60950-22, Safety of Information Technology Equipment – Part 22: Equipment Installed Outdoors; IEC 60950-23, Safety of Information Technology Equipment – Part 23: Large Data Storage Equipment; IEC 60990, Methods of Measurement of Touch Current and Protective Conductor Current; IEC TR 62102, Electrical Safety - Classification of Interfaces for Equipment to be Connected to Information Technology and Communications Technology Networks; and IEC 62151, Safety of Equipment Electrically Connected to a Telecommunication Network.

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In the U.S. and Canada the ITE Bi-National Standard (BNS), formally designated CSA C22.2 No. 60950-1/UL 60950-1, Second Edition, is based on the Second Edition of IEC 60950-1, and like its predecessors includes U.S./Canadian National Differences to address National requirements not in the base IEC document. This Standard was published on March 27, 2007.

The technical content of the BNS is developed and maintained by the Technical Harmonization Committee (THC), Maintenance Team 2 (MT2), which consists of representation from UL, CSA, and the key U.S. and Canadian IT and communications equipment industry groups.

The Effective Dates for formal implementation of UL 60950-x Standards are outlined on the UL website –

<http://www.ul.com/global/eng/pages/offerings/industries/hightech/informationtechnology/dates/> .

Note - Subsequent to the Second Edition of IEC 60950-1, a First Amendment to the Second Edition has been issued as of December 2009. A separate Certification Impact Analysis will be issued to cover Amendment No. 1.

Summary of key changes associated with Revision set dated May 21, 2010

Below are the key updates to this Analysis associated with the latest revision. (Additional editorial changes/updates also were incorporated into the document.)

- **5.1.2.3:** Revised analysis of application of simultaneous multiple connections to an A.C. Mains Supply.

Notes to this Analysis:

- Unless otherwise noted, all Sub-clause/Annex references are to IEC 60950-1, Second Edition.
- Discussion of changes and differences associated with IEC 60950-1, Second Edition is in plain text.
- Discussion of changes and differences associated with the Bi-National Standard, CSA C22.2 No. 60950-1/UL 60950-1, Second Edition is in **bold**.

Explanation of Impact Statements:

Statement	Impact
None	Virtually no impact on the present certification practice of most ITE due to the change.
Minor*	Limited impact on the present certification practice of some, or all ITE due to the change.
Considerable*	Potentially considerable impact on the present certification practice for some, or all ITE due to the change, as indicated.

For new/revised requirements that are **more onerous** than existing requirements, the Impact Statement (Minor, Considerable) will be followed by a (+). For new/revised requirements that are **less onerous** than existing requirements, the Impact Statement (Minor, Considerable) will be followed by a (-). No symbol next to a Minor statement indicates that although there could be impact, it is indeterminate whether it will be slightly more or less.

Clause 0 (Principles of Safety)		
Sub-clause	Discussion	Impact
0.1 General Principles of Safety	New statement added to General Principles of Safety that dimensioning of insulation spacings should take into account possible reductions of spacings by manufacturing tolerances, or deformation by handling, manufacturing, transport and normal use.	None. Principle of Safety. The principle already is incorporated into the level of requirements in this minimum safety standard or is assumed to have been considered by manufacturer based on quality manufacturing processes typically associated with the Industry.

Clause 1 (General)		
Sub-clause	Discussion	Impact
1.1.1 Equipment Covered by this Standard	<p>For the first time the Standard explicitly covers under its scope ITE components and subassemblies, such as component switch mode power supplies. Scope states that such components and subassemblies may not comply with "every aspect of the standard, provided that the complete information technology equipment, incorporating such components and subassemblies, does comply."</p> <p>This same consideration is inherent to UL's Recognized Component Conditions of Acceptability.</p>	<p>None. Scope. Generally reflects present practice since ITE components and subassemblies have been investigated to IEC 60950-based standards and their predecessors for many years.</p> <p>However, this addition provides justification for allowing more ITE components to be provided with an IECEE CB Report/Certificate associated with IEC 60950-1.</p>
	<p>The previous requirements for Acoustic Pressure Limiting have been revised and relocated. Now, instead of being located in 6.5, they are located in Annex NAD, Acoustic Tests. A reference to the requirements has been added into 1.1.1, which also states that the requirements apply to 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, etc.).</p>	<p>Minor (+). Potentially, there could be some impact on manufacturers of ITE with acoustic outputs and intended for connection to transmission mediums other than telecommunication (like cable and wireless) since the Standard was not explicit before for transmission media other than telecommunication networks.</p> <p>However, industry practice generally has been to design ITE with acoustic outputs associated with voice communication to the appropriate acoustic requirements, even if</p>

Clause 1 (General)		
Sub-clause	Discussion	Impact
	<p>There have been some other modifications of the actual requirements (mainly reintroducing legacy test methods), although the acoustic limits remain the same. See Annex NAD for more discussion.</p> <p>[Note – For Europe, the Second Edition of EN 60950-1 in its 1.3.Z1 (Exposure to excessive sound pressure) now requires ITE to be designed and constructed as to present no danger under normal or fault conditions with regards to protection against exposure to excessive sound pressures from headphones or earphones. It references EN 50332-1 and -1, Sound System Equipment: Headphones and earphones associated with portable audio equipment. The full implementation/impact of this requirement is unknown at this time, i.e., range of applicability to ITE.]</p>	<p>these other transmission mediums are used, so the true impact likely will be relatively minor. See Annex NAD.</p>
1.2.2.1 Normal Load	<p>Reworked definition of "Normal Load" emphasizing that the definition is used for testing purposes, and if conditions of actual use can be reasonably expected to exceed those recommended by the manufacturer, the more severe conditions are applicable.</p>	<p>None. Definition. Clarification, and generally consistent with present practice.</p>

Clause 1 (General)		
Sub-clause	Discussion	Impact
	Also, clarifies definition with respect to ITE intended for non-continuous operation. Associated revisions related to non-continuous operation also made to 1.2.2.2, 1.2.2.3, 1.7.3, 4.5.2 and 5.3.8.	None. Definition. Revisions made in other areas of the Standard with respect to ITE intended for non-continuous operation (1.2.2.2, 1.2.2.3, 1.7.3, 4.5.2, 5.3.8) and to align with the revised definition result in a similar level of requirements, but should simplify application.
1.2.2.2 Rated Operating Time	Clarifies that the Rated Operating Time is the "maximum operating time assigned to the equipment by the manufacturer."	None. Definition. Clarification, and generally consistent with present practice.
1.2.2.3 Rated Resting Time	New term/definition for "Rating Resting Time" to complement the existing definition of "Rated Operating Time" and to correlate with revised definition of Normal Load, 1.2.2.1.	None. Definition. Clarification, and generally consistent with present practice.
1.2.5.3 Pluggable Equipment	New higher level term/definition above Pluggable Equipment Type A and Pluggable Equipment Type B.	None. Definition. Editorial.
1.2.8.3 Mains Supply	New higher-level term/definition above AC Mains Supply and DC Mains Supply.	None. Definition. Editorial.
1.2.9.7 RMS Working Voltage	New term/definition for "RMS Working Voltage" to complement existing definitions of Working Voltage and Peak Working Voltage.	None. Definition. Clarification, and generally consistent with present practice.
1.2.10.4 Solid Insulation	New term/ definition for "Solid Insulation," defined as "material that provides electrical insulation between two opposite surfaces, not along an outer surface."	None. Definition. Clarification, and generally consistent with present practice.
1.2.13.15 Cheesecloth	New term/definition for "Cheesecloth."	None. Definition. Consistent with present practice.
1.2.13.16 Wrapping Tissue	New term/definition for "Wrapping Tissue."	None. Definition. Consistent with present practice.

Clause 1 (General)		
Sub-clause	Discussion	Impact
1.2.13.17 Protective Current Rating	New term/definition for "Protective Current Rating," which is defined as "the rating of an overcurrent protective device that is known or assumed to be in place to protect a circuit." See 2.6.3.3 for associated requirements.	None. Definition. Consistent with present practice.
1.4.14 Simulated Faults and Abnormal Conditions	New clarification added that "The failure of Functional Insulation is simulated only when required by 5.3.4 c)." Note - For the First Amendment to IEC 60950-1 2 nd Edition, revisions have been made to 2.8, Safety Interlocks, to clarify the requirements for such fault testing in safety interlock circuits.	Minor (-). Clarification. Attempts to limit the amount of short circuit testing between trace-trace on printed circuits boards associated with Functional Insulation and concentrate on component faults, unless the Functional insulation does not comply with 5.3.4 a) or b). <u>However</u> , this change and its reference to 5.3.4 c) points out a current deficiency in the Standard. Basic/Double/Reinforced insulation are only associated with risk of electric shock, and 5.3.4 c) only mentions risk of fire and risk of electric shock, but other circuits involving 'insulation' could result in a hazard if compromised (e.g., within a safety interlock system circuit (e.g., printed circuit board) protecting against 'mechanical' hazards, 'radiation' hazards, etc.).
1.5.6 Capacitors Bridging Insulation	Complete rework of 1.5.6 to clarify its intent and practical application, including addition of a table that summarizes IEC 60384-14 capacitor ratings and an informative table that provides examples of the	None. Clarification, and generally reflects present practice. When using X & Y capacitors in ITE, revised 1.5.6 should reduce time needed to determine appropriate X & Y

Clause 1 (General)		
Sub-clause	Discussion	Impact
	<p>application of capacitors.</p> <p>The First Amendment to IEC 60950-1 2nd Edition, includes revisions correcting some minor errors in the Tables.</p>	capacitors for the application.
1.5.7 Resistors Bridging Insulation	<p>Complete rework of 1.5.7 to clarify its intent and practical application to resistors bridging Functional, Basic, Supplementary, Double, or Reinforced Insulation.</p> <p>Single resistors are required to pass a new resistor test, and a group of resistors is required to comply with either the specified Clearance and Creepage Distance requirements or the new resistor test.</p> <p>The new resistor testing consists of the damp heat test per IEC 60068-2-78, followed by impulse testing per Annex N, Table N.1, depending on the type of circuit involved.</p>	<p>Minor (+), if a group of resistors is used, and the Clearances and Creepage Distances are assessed as if each resistor was short-circuited in turn. Generally consistent with present practice.</p> <p>Considerable (+), when the new resistor test is required/ chosen since it is a new test.</p>
1.5.9 Surge Suppressors	<p>New sub-clause on Surge Suppressors.</p> <p>For surge suppression devices used in Primary Circuits, these devices are required to be a Voltage Dependent Resistor (VDR) type, like a MOV/Varistor and to be subjected to new requirements in Annex Q, Voltage Dependent Resistors.</p> <p>Also, defines specific requirements when VDR is bridging Functional, Basic, Supplementary, Double, or Reinforced Insulation.</p>	Considerable (+). For the first time the Standard explicitly addresses the general use of surge suppressors, which likely will have some impact as different practices by different manufacturers, and NCBs will now be driven to be more closely aligned.

Clause 1 (General)		
Sub-clause	Discussion	Impact
	<p>An 'interrupting means' (e.g., fuse) is required in series with VDR to protect against overvoltage, thermal overload, or burning/bursting in the event of a short-circuit.</p> <p>There are no new requirements for such devices used in Secondary Circuits.</p> <p>Note- A Gas Discharge Tube (GDT) is not included in the definition of a VDR. However, the First Amendment to IEC 60950-1 2nd Edition, clarifies that VDRs & GDTs may be used in series when bridging Basic insulation only.</p> <p>It is noted that 1.5.9 continues to need additional work to clarify the intended application of some of the requirements discussed above.</p>	
1.5.9.2 Protection of VDRs	<p>Specifies an "interrupting means" is required in series with VDR to protect against overvoltage, thermal overload, or burning/bursting in the event of a short-circuit.</p> <p>It is not clear yet was it the intent of IEC TC108 to allow a single device, or require multiple devices to meet this requirement.</p>	<p>Considerable (+). When VDRs were used in ITE in the past, typically there was not review/analysis of the types of protective devices used to protect the VDRs in case of overvoltage, thermal overload or burning/bursting.</p> <p>This new requirement should help promote consistency, although there likely will be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>

Clause 1 (General)		
Sub-clause	Discussion	Impact
1.7.2.3 Overcurrent Protective Devices	New sub-clause provides User Instruction requirements associated with overcurrent protective devices. Aligned with second paragraph of 2.7.1.	None. Clarification, and generally reflects present practice because of existing requirement in 2.7.1.
1.7.3 Short Duty Cycles	Revised sub-clause reworks requirements for ITE not intended for continuous operation, and adds new term/definition "Rated Resting Time" to complement existing term/definition "Rated Operating Time."	None. Clarification, and generally reflects present practice. A very small percentage of ITE investigated to IEC 60950-1 is affected by this sub-clause because most ITE is intended for continuous operation. See comments on 1.2.2.1, 1.2.2.2 and 1.2.2.3.
1.7.11 Durability	Adds alternative solvent that may be used for Durability testing, which is a type that is easier to identify and locate in North America and some other regions. This was an important change since during factory and test lab audits it was becoming increasingly difficult to prove to auditors the solvent used for durability testing was that specified in the First Edition of IEC 60950-1.	Minor (-). Provides practical solution to previous material sourcing difficulties.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
2.1.1.1 Access to Energized Parts	Connectors with configurations that comply with IEC 60309, IEC 60320, and IEC 60906-1 & -2 have been added as being exempt from test finger accessibility requirement.	Minor (-). Relaxation, and generally reflects present practice.
2.1.1.7 Discharge of Capacitors in Equipment	<p>New compliance requirement instructs that when taking voltage decay measurements, "the result is referred to an instrument having an input impedance consisting of a resistance of 100 M ohms \pm 5 M Ω in parallel with an input capacitance of 20 pF \pm 5pf."</p> <p>It appears the wording "the result is referred to..." is intended to allow for measurements with other specifications than indicated, as long as the results are accurately adjusted accordingly.</p> <p>Note - The First Amendment to IEC 60950-1 2nd Edition, allows the input capacitance to be "25 pF or less."</p>	<p>Minor. Positive development because there has been significant inconsistency making voltage decay measurements due to lack of direction in the Standard.</p> <p>This new requirement should help promote consistency, although there likely will be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>
2.1.1.8 Energy Hazards – d.c. Mains Supplies	As a parallel requirement to existing requirements in 2.1.1.7 for ITE connected to a.c. mains supplies, ITE connected to a d.c. mains supply also is required to have at its point of disconnection energy levels that are not considered a Hazardous Energy Level, or if hazardous, a Hazardous Energy Level that is removed within 2 seconds of disconnection.	<p>Minor (+). This is a new requirement for ITE intended to be connected to a d.c. mains supply.</p> <p>However, it is expected that most manufacturers are already designing their d.c. mains-connected ITE to consider a similar level of requirements based on general safety principles. Also, most NCBs probably have either directly or</p>

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	Requirements for applications that involve both internal capacitors and internal batteries are specified.	indirectly assessed such equipment to a similar level of requirements due to concerns with 'backfeed'.
2.1.1.9 Audio Amplifiers in ITE	New requirement allows accessibility of audio amplifiers in ITE to comply with either the existing 2.1.1.1 or, as an alternative, the accessibility requirements in 9.1.1 IEC 60065.	Minor (-). Generally reflects present practice, and can be considered a relaxation in a sense since the accessibility requirements for audio amplifiers in IEC 60065 are somewhat less onerous than 2.1.1.
2.1.2 Protection in Service Access Area	Requirements now clarify, the Capacitance Discharge requirements of 2.1.1.7 also apply to Permanently Connected Equipment, and the time constant to be used is 10 seconds. For DC applications of permanently connected equipment, 2.1.1.8 applies.	Considerable (+). The Capacitance Discharge requirements per 2.1.1.7 or 2.1.1.8, as applicable, have not been consistently applied to Permanently Connected Equipment in the past. However, since the time constant allowed is 10 seconds, it is expected that most constructions will comply.
2.2.3 Voltages Under Fault Conditions	New requirement that is a clarification on the application of SELV circuit requirements and voltage limits for power supplies and similar constructions that involve repetitive pulses (e.g., hiccup mode). Helps clarify and now discount a more onerous position sometimes taken in the past that any "repetitive" voltage peak above 42.4 Vp or 60 Vd.c. is a hazardous voltage.	Minor (-). Considered a relaxation for most constructions that involve this circuit/performance characteristic. Generally reflects present practice due to the awareness of most NCBs with this pending change for several years.
2.3.2 Separation of TNV Circuits From Other Circuits and from Accessible Parts	Complete rewrite and rework of separation requirements for TNV circuits from other circuits and accessible parts.	Minor (-). Most of the changes are clarifications, and generally reflect present practice. Some of the

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	<p>The key takeaway is that it provides more practical "separation" options that apply to modern designs involving telecommunication circuits, including ITE that is not earthed and ITE without isolation between SELV and TNV circuits (e.g., using SLIC chips).</p> <p>Sub-clause 2.3.2.4, Protection by Other Constructions, is particularly important.</p>	<p>revisions can be viewed as a relaxation of the technical and strict application of the published requirements in the earlier versions of 2.3.2, which were not feasible to apply to modern ITE with TNV circuits. Most NCBs have been aware of this pending change for several years and have allowed similar provisions.</p>
2.5 Limited Power Sources	<p>Sub-clause was reworked to make intended application of the requirements clearer. Noteworthy is the change in classification of LPS protection schemes from "inherently" or "not inherently" limited, to "without an overcurrent protection device" and "with an overcurrent protection device."</p> <p>Previous five (5) example constructions (e.g., output inherently limited in compliance with table 2B) have been reduced to four (4), which should help simplify the LPS determination.</p> <p>For sources without an overcurrent protective device (Table 2B), all max VA limits are now 100 VA, i.e., output voltages equal or less than 20 V no longer have a VA limit of 5xUoc.</p> <p>For such sources (Table 2B), the requirements also now clarify that measurements of</p>	<p>Minor (+). Generally reflects present practice. Some of the revisions can be viewed as minor relaxation of the technical and strict application of the previous requirements.</p> <p>Regarding the Isc & S measurements, for measurements of circuits protected by electronic circuits or PTC devices, since the previous measurement typically was made at 60 s, there could be some constructions not designed to the new criteria. Thus the impact may be Considerable (+). However, since NEC Article 725 and Table 11, and UL 1310 Class 2 measurements for these circuits already are a 5 s measurement, the impact is not expected to be problematic to most manufacturers.</p>

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	<p>Isc & S are made after 5 s if protection is by an electronic circuit or PTC, and 60 s in all other cases.</p> <p>Note - The First Amendment to IEC 60950-1 2nd Ed, contains additional requirements addressing Integrated Circuits (ICs) used as a power-limiting function in an LPS. New Annex CC includes requirements for ICs in order for them not to be subjected to single faults of their power limiting function. The performance requirements are based on existing requirements being applied by some NCBs, including UL's component certifications under QVGS2, Protectors, Low-Voltage Solid-State Overcurrent - Component.</p>	
2.6.3.3 Size of Protective Bonding Conductors	Rework of sub-clause to clarify its intended application. New Note 1 clarifies in the U.S./Canada the Protective Current Rating of a circuit associated with Pluggable Equipment Type A is 20A.	None. Clarification. Reflects present practice.
2.6.3.4 Resistance of Earthing Conductors and Their Terminations	<p>Further revision and rework of this sub-clause to provide additional clarification of the intent of the requirements.</p> <p>Clarifies application of resistance and voltage drop limits to (a) SELV and TNV circuits that are earthed, and (b) transformer secondary windings that are earthed.</p> <p>Also, incorporates much of what was previously a</p>	Minor (+). Technically, the revisions to IEC 60950-1 2 nd Edition result in a relatively more onerous set of requirements. However, for manufacturers who previously had designed for a North American market, since this level of requirements has been part of CSA/UL 60950-1 for several years as National Differences, the true impact likely will be relatively minor.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	<p>National Difference in the U.S./Canada Standard based on the trip characteristics of overcurrent protection devices used in the U.S./Canada, e.g., test duration is 120 seconds at 200% of the Protective Current Rating for circuits protected by devices with a Protective Current Rating up to 30 A.</p> <p>Also, provides specific, new compliance criteria for Protective Bonding Conductors associated with TNV and cable distribution system circuits and used to comply with separation requirements.</p>	
2.9.4 Separation from Hazardous Voltages	<p>Former 2.2.3.1 (Separation by Double/Reinforced Insulation - Method 1), 2.2.3.2 (Separation by Earthed Screen - Method 2), and 2.2.3.3 (Protection by Earthing of the SELV Circuit - Method 3) have been reorganized into new 2.9.4, Separation from Hazardous Voltages.</p> <p>Clarification is provided that other constructions can be used that provide equivalent separation.</p>	None. Editorial and Clarification.
2.10.1.7 Insulation in Circuits Generating Starting Pulses	<p>New clarification on the application of insulation requirements to circuits associated with the generation of starting pulses used to ignite discharge lamps.</p> <p>If the circuit is a Limited Current Circuit (LCC), Functional Insulation is</p>	Minor. Generally reflects present practice, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment. Most NCBs have been aware of the pending changes for several years and have allowed similar provisions.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	<p>allowed. If not, normal insulation classification considerations apply, although for Clearances, 2.10.3.5 provides some additional considerations.</p> <p>Also, see part "i" of 2.10.2.1, Determination of Working Voltage, which provides related working voltage measurement considerations.</p>	
2.10.2 Determination of Working Voltage	Sub-clause has been reworked to separate determinations of RMS and Peak Working Voltage Measurements, and provides some additional clarifications, i.e., 2.10.2.2 (RMS Working Voltage) and 2.10.2.3 (Peak Working Voltage).	None. Editorial and clarification.
2.10.2.1 Determination of Working Voltages - General	New part "f" provides clarification that any voltage within a Rated Voltage Range may be considered when measuring the highest measured value of Working Voltage.	Minor (+). First Edition only required that the "upper voltage of the Rated Voltage Range" be considered, so, potentially, there could be some limited impact.
	New part "i" provides clarification on defining working voltages for starting pulses that are used to ignite discharge lamps.	Minor. Clarification, and generally reflects present practice. There could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment. Also, see 2.10.1.7.
2.10.2.2. RMS Working Voltage	<p>Revised requirement indicates that Creepage Distances now are based exclusively on RMS Voltages (and no longer RMS or DC).</p> <p>Formula in Note illustrates how to calculate the RMS</p>	Minor (+). Generally it is expected most constructions will comply with the new criteria.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	Value of a RMS AC voltage with a D.C. offset voltage.	
2.10.3.1 Clearances – General	<p>New requirements provide direction on applying Clearances to connectors, in particular between the Bounding Surface and the conductive parts within. The minimum Clearances are not applicable to connectors that comply with either IEC 60083, IEC 60309, IEC 60320, IEC 60906-1 or IEC 60906-2 since Clearances have already been investigated as part of the investigation of the connector to these standards.</p> <p>See 2.10.4.3 for associated requirements for Creepage Distances.</p>	Minor (+). Although the new requirements generally reflect present practice, there could be some minor impact as different practices by different manufacturers and NCBs are driven to closer alignment.
2.10.3.2 Mains Transient Voltages	<p>A new sub-clause provides guidance on how to incorporate Mains Transient Voltages into Clearance determinations, which includes specific guidance for equipment connected to the AC Mains Supply (2.10.3.2 a), Earthed DC Mains Supply (2.10.3.2 b), Unearthed DC Mains Supply (2.10.3.2 c) and Battery Operation (2.10.3.2 d).</p> <p>New Table 2J is essentially equivalent to existing Table G.1 in Annex G.</p> <p>Also, reference is made to new informative Annex Z, Overvoltage Categories, which provides some additional guidance on how to identify specific</p>	Minor. Clarification, and generally reflects present practice since the details are derived from the existing Annex G.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	Overvoltage Categories based on the intended installation location.	
2.10.3.3 Clearances in Primary Circuits	New Conditions in Tables 2K & 2L allow for linear interpolation of Clearances in Primary Circuits for some applications.	Minor (-). Can be viewed as a minor relaxation of previous requirements.
2.10.3.4 Clearances in Secondary Circuits	New Condition in Table 2M allows for linear interpolation of Clearances in Secondary Circuits.	Minor (-). Can be viewed as a minor relaxation of previous requirements.
2.10.3.5 Clearances in Circuits Having Starting Pulses	New sub-clause provides requirements for determining minimum Clearances for circuits associated with generating starting pulses used to ignite discharge lamps. Compliance may be determined either per Annex G or by a steady state Electric Strength test at 150% of the Peak Working Voltage, or by 30 pulses having an amplitude equal to 150% of the Peak Working Voltage.	Minor (-). Generally reflects present practice, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment. Most NCBs have been aware of the pending changes for several years and have allowed similar provisions. Also, see 2.10.1.7.
2.10.3.7 Transients from a d.c. Mains Supply	New sub-clause provides guidance on how to determine expected transients from a d.c. mains supply for purposes of determining minimum Clearances. This sub-clause compliments the existing requirements in 2.10.3.4 of the First Edition that provided guidance on determining transients from an a.c. mains supply, and transients from telecommunication networks and cable distribution systems.	Minor. Generally reflects present practice.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
2.10.3.9 Measurement of Transient Voltages – For DC Mains Supply	When required by new 2.10.3.7, new requirements are provided on measuring transient voltages for ITE intended to be connected to a DC Mains Supply.	Minor. Generally reflects present practice.
2.10.4.3 Minimum Creepage Distances	<p>As indicated in 2.10.2.2, Creepage Distances now are based exclusively on RMS Voltages (and thus no longer RMS or DC). See Table 2N.</p> <p>New requirements provide direction on applying Creepage Distances to connectors, in particular between the Bounding Surface and the conductive parts within. The minimum Clearances are not applicable to connectors that comply with either IEC 60083, IEC 60309, IEC 60320, IEC 60906-1 or IEC 60906-2 since Creepage Distances have already been investigated as part of the investigation of the connector to these standards.</p> <p>See 2.10.3.1 for associated requirements for Clearances.</p>	<p>Minor (+). Regarding use of RMS Voltages exclusively, generally it is expected most constructions will comply with the new criteria.</p> <p>For the other changes, although the new requirements generally reflect present practice, there could be some minor impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>
	<p>Table 2N, Minimum Creepage Distances, has been greatly expanded to now include Working Voltages up to 63 kV (based on requirements of IEC 60664-1).</p> <p>A Condition to Table 2N clarifies that if applying Linear Interpolation to Reinforced Insulation (like Table 2N already allows), the calculated value for Basic Insulation shall be doubled</p>	Minor. Generally reflects present practice due to existence of parallel requirements in IEC 60664-1.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	first before applying the rounding off. This was a point of confusion applying the previous wording.	
2.10.5.1 Solid Insulation – General	<p>Clarifies that the requirements for Solid Insulation also apply to gel materials used for insulation purposes.</p> <p>Also clarifies that “solvent-based enamel” is only acceptable as solid insulation on winding wire for certain applications described in new 2.10.5.13, Wire with Solvent-based Enamel in Wound Components, and when tested according. 2.10.5.13 only permits such constructions for applications associated with 2.3.2.1 (TNV).</p>	<p>Minor (+). Generally reflects present practice.</p> <p>For ‘solvent-based enamel’, since CSA/UL 60950-1 had similar requirements in it for TNV applications as a National Difference, and most ITE is global in nature, a similar level of requirements has been applied to most impacted ITE in the past. Also, see related component discussion in Annex P (2.10.5.13).</p>
2.10.5.4 Semiconductor Devices	Clarifies that solid insulation in semiconductor devices also may be investigated to 2.10.5.3, Insulating Compound as Solid Insulation.	None. Editorial. Previous statement in informative ‘Note 1’ now revised into normative statement/ requirement.
2.10.5.5 Cemented Joints	<p>Previous 2.10.8 (Spacings Filled by Insulating Compound) has been reworked into 2.10.5.5, which provides options available when cemented joints need a performance evaluation to determine that application of Clearances and Creepage Distances through the joint is not needed. The previous performance test remains in similar form, but is restructured under 2.10.11, Tests for Semiconductor Devices and for Cemented Joints.</p> <p>Note – When testing printed</p>	<p>Minor (+). Mostly Clarification. Generally reflects present practice.</p> <p>However, see 2.10.6.3 for discussion of application of requirements to insulation between conductors on the same inner layers of printed boards.</p>

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	boards, no testing required when the temperature of the printed board measured during the test of 4.5.2 does not exceed 90 C.	
2.10.5.6 Thin Sheet Material - General	First Edition's 2.10.5.2, Thin Sheet Material, now has been broken up into separate requirements for Separable Thin Sheet Material, 2.10.5.7, and Non-Separable Thin Sheet Material, 2.10.5.8.	Minor (+). For thin sheet materials with separable layers, or for thin sheet materials with non-separable layers of two layers or less, the requirements are similar to the existing requirements in the First Edition. Considerable (+). For thin sheet materials with non-separable layers of three layers or more, the requirements in 2.10.5.8, 2.10.5.9 and Annex AA are more onerous than existing requirements. See additional discussion on 2.10.5.8, 2.10.5.9, 2.10.5.10 and Annex AA.
2.10.5.8 Non-Separable Thin Sheet Material	New requirements for thin sheet material provided in multiple layers to align the requirements with IEC 61558-1, Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests. Greatest impact will be on Reinforced Insulation with three (3) or more layers since new testing per Annex AA, Mandrel Test, will be required. In addition to the alignment with IEC 61558, the Note to Table 2P provides background information on	Considerable (+). For thin sheet materials with non-separable layers of three layers or more, the requirements in 2.10.5.8, 2.10.5.9 and Annex AA are more onerous than existing requirements. See additional discussion on 2.10.5.6, 2.10.5.9 and Annex AA.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	the new requirements and states, "The purpose of the tests in Annex AA is to ensure that the material has adequate strength to resist damage when hidden in inner layers of insulation. Therefore, the tests are not applied to insulation in two layers. The tests in Annex AA are not applied to SUPPLEMENTARY INSULATION."	
2.10.5.9 Thin Sheet Material – Standard Test Procedure	New test procedure provided for Electric Strength testing on thin sheet materials allows the test to be conducted on a complete assembly (all layers), rather than combinations of layers like the previous requirements.	Minor. Introduces more practical application of Electric Strength testing to assemblies of thin sheet insulation material. See additional discussion on 2.10.5.6, 2.10.5.8, 2.10.5.10 and Annex AA.
2.10.5.10 Thin Sheet Material – Alternate Test Procedure	Reflects previous test procedure for conducting Electric Strength testing on thin sheet materials that allows for testing combination of layers. However, the Standard now clarifies that this procedure is permitted only for layers that can be separated for testing. Therefore, it should not be used, as sometimes used in the past, when the process of separating the layers of insulation to conduct the test results in damage to the insulation.	Minor. Reflects requirement in previous edition, but clarifies when it can be used. See additional discussion on 2.10.5.6, 2.10.5.9 and Annex AA.
2.10.5.11 Insulation in Wound Components	Clarifies that planar transformers are not considered wound components and are subjected to the requirements in 2.10.6 for	None. Clarification, and reflects present practice.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
	printed (wiring) boards.	
2.10.5.12 Wire in Wound Components	A clarification has been added that spirally wrapped tape shall be sealed and pass the tests of 2.10.5.5 a), b), or c). This means that associated Clearances & Creepage Distances associated with the layering can be considered Pollution Degree 2 without additional testing, or <i>Pollution Degree 1 if tested per 2.10.10</i> , or solid insulation if tested as a cemented joint per 2.10.11.	Minor (+). In IEC 60950-1 First Ed, performance testing was not specified in order to consider the spacings within spirally wrapped tape as Pollution Degree 1 – it was assumed. The Second Edition now requires performance testing per 2.10.10. Although it is expected most constructions will comply with this additional performance testing, the testing is an additional set of performance criteria for some constructions (including some spirally wrapped Single- and Multi-layer Insulated Winding Wire – Component (OBJT2) investigated to UL 2353).
2.10.5.13 Wire with Solvent-based Enamel in Wound Components	New sub-clause establishes minimum construction & performance requirements for wire with solvent-based enamel that is used as “separation” between SELV and TNV circuits in components not provided with other interleaved (sheet) insulation. This enamel is not considered Basic, Supplementary or Reinforced Insulation. Note - This new 'IEC' requirement replaces previous National Differences in the 2.3.2.4 and 6.2.1 of UL 60950-1, First Edition. Additional modifications have been incorporated into Annex P.2 (2.10.5.13).	Minor (+). Similar in effect to the previous U.S./ Canadian National Differences for the same wire used for the same application. Impact could be more significant (+) for ITE not previously designed for a North American market.

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
2.10.5.14 Additional Insulation in Wound Components	Summarizes several requirements for insulation associated with wound components that previously were in 2.10.5.1	None. Editorial.
2.10.6.2 Coated printed boards	Table 2Q, Minimum separation distances for coated printed boards, has been modified to now reflect Peak Working Voltages instead of rms/d.c. Note - For the First Amendment to IEC 60950-1 2 nd Edition, revisions have been made to Table 2Q to more closely align it with Table 2N since Table 2N currently allows some smaller distances without coating for some Working Voltages.	Minor. Similar level of requirements as the previous Edition.
2.10.6.3 Insulation Between Conductors on the Same Inner Surface of a Printed Board	Provides clarification that on an inner layer of a multi-layer printed board, the path between any two conductors shall comply with the requirements for a cemented joint in 2.10.5.5. Also points to new Figure F.16, Cemented Joints in Multi-layer Printed Board. Note: Per 2.10.5.5, tests for cemented joints do NOT need to be applied to the inner layers of a printed board using pre-preg if the temperature of the printed board measured during the test of 4.5.2 does not exceed 90 C.	Minor (+). Technically, an upgrade because the First Ed stated the same path was "treated as distance through insulation", without assigning specific performance requirements, e.g., cemented joint (2.10.5.5). Therefore, testing now may be required on some printed circuit board constructions when it was not required in the past. <u>However</u> , since the requirements for cemented joints only apply if the Clearances & Creepage Distances for the appropriate insulation level are not met, the impact is likely to be relatively minor for most current designs/constructions, although the impact will increase as ITE

Clause 2 (Protection from Hazards)		
Sub-clause	Discussion	Impact
		designs/constructions involving Hazardous Voltage circuits continue to shrink in size. Also, the 90 C exemption in 2.10.5.5 also will provide some relief to some constructions.

Clause 3 (Wiring, Connections & Supply)		
Sub-clause	Discussion	Impact
3.4.2 Disconnect Devices	New requirement that Disconnect Switches associated with ITE connected to parts of the AC Mains Supply that are considered Overvoltage Category IV require a contact separation according to IEC 60947-1, Low Voltage Switchgear and Control Gear (versus the normal 3mm contact gap for other OV Category I, II and III applications).	Minor (+). Very little ITE is connected to parts of the AC Mains that is considered Overvoltage Category IV. For such equipment, switches used in the ITE likely already will incorporate larger contact gap separations due to the higher voltage and power levels involved.
	<p>The minimum 3mm contact gap requirement has been expanded to include ITE connected to DC Mains Supply at Hazardous Voltage.</p> <p>For equipment intended to be powered from a DC Mains Supply that is not at a Hazardous Voltage, a disconnect device is required with a contact separation at least equal to the minimum Clearance for Basic Insulation.</p> <p>Note – The standard still is unclear whether ‘float voltages’ per 1.6.1.2 (D2 National Difference) and IEC TR 62102, Electrical safety – Classification of interfaces for equipment to be connected to information and communications technology networks, should be considered into the classification of a DC Mains Supply as Hazardous Voltage. It is anticipated additional discussion with the</p>	<p>Minor (+). Although a disconnect device contact gap requirement has not been consistently applied to ITE connected to DC Mains Supply, it is expected at this time that impacted ITE likely already employs such a device, or the ITE is connected to a DC Mains Supply voltage that is not considered Hazardous Voltage.</p> <p>Until further clarified by IEC TC108, it appears the set of requirements in 1.6.1.2 “for purposes of applying insulation requirements” should not be used for determining whether a nominal DC Mains Supply Voltage is a Hazardous Voltage. Therefore, a nominal 60V dc mains would be considered SELV (and not TNV-2 or Hazardous) for the purposes of application of 3.4.2.</p>

Clause 3 (Wiring, Connections & Supply)		
Sub-clause	Discussion	Impact
	appropriate Technical Committees and future clarification in the Standard will be necessary.	
3.4.6 Number of Poles – Single Phase and d.c. Equipment	Provides some additional clarification on the application of disconnect device requirements to multi-pole circuits.	None. Clarification.
3.5.4 Data Ports for Additional Equipment	<p>Adds new requirement that SELV circuits associated with data ports that supply/source power to other devices shall be classified as a Limited Power Source (LPS).</p> <p>The rationale supporting this revision includes the consideration that manufacturers of accessories & peripherals (e.g., mouse, keyboard, etc.) intended for connection to these ports consider the enclosures of their accessories/peripherals to be Decorative Parts and not Fire Enclosures. As a result they use HB materials, which the Standard only justifies if the power source supplying power to the device is LPS.</p>	Minor (+). Technically, this requirement is an upgrade. However, some NCBs (like UL) have already been requiring such ports to be LPS for many years as a certification requirement, and most Industry Specifications for such ports (e.g., IEEE 802.3af, IEEE 1394) also require such ports to be LPS (NEC Class 2).

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
4.1 Stability	A revision to the existing 10 degree tilt test now only requires the test if the unit has a mass of 7 kg (15.4 lbs) or more.	Minor (-). Relaxation. Many lighter products (in mass) no longer will need to be subjected to the 10 degree tilt stability test. However, current practice already is to waive the test on some lighter devices based on sound engineering judgment.
4.2.1 Mechanical Strength – General	A new Note provides examples of cases when a Mechanical Enclosure must be able to sufficiently contain or deflect parts that could cause a hazard/injury, e.g., CD/DVD drives with rotational speeds greater than 8000 r.p.m. Note - For the First Amendment to IEC 60950-1 2 nd Ed, specific constructional requirements have been added to address this consideration.	None. Informative Note.
4.2.5 Impact Test	Provides clarification that the bottoms of enclosures are subjected to an Impact Test if the User Instructions permit a mounting or use orientation where the bottom of the enclosure becomes a top or side enclosure.	Minor (+). Generally reflects present practice.
	Clarifies that the Impact Test is not applied to the face of CRTs.	Minor (-). Generally reflects present practice since previously certified CRTs usually are used in ITE.
4.2.6 Drop Test	Provides a broadening of equipment subject to the Drop Test to include “Movable Equipment requiring lifting or handling by the User as part of its intended use.”	Minor (+). An upgrade, in particular for some Movable Equipment that can be expected to be handled or lifted, such a document (paper) shredders, and even some projectors that don’t meet the Transportable

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
	<p>A note provides as an example a paper shredder that needs to be lifted from the waste paper basket to empty the basket.</p> <p>Such equipment requires the 750 mm height version of the Drop Test, instead of the one meter version that is required for Transportable Equipment, Hand-Held, and Direct Plug-in Equipment.</p>	<p>Equipment definition. However, it is expected that most (but possibly not all) impacted equipment probably is designed to comply with this level of performance requirement.</p>
4.2.8 Cathode Ray Tubes	Clarification on application of IEC 60065 requirements to ITE with Cathode Ray Tubes.	None. Editorial. Reflects present practice.
4.2.10 Wall or Ceiling Mounted Equipment	Clarifies that the force used for the test is applied "downwards through the centre of gravity of the equipment" instead of the 'geometric centre of gravity' of the equipment.	None. Editorial. Reflects present practice.
4.2.11 Rack Mounted Equipment	<p>Additional construction, performance & marking requirements have been added for Rack Mounted Equipment that provide a means of evaluating slide rail designs for safety related to their installation, service and maintenance. The requirements consist of a construction requirement that end stops be provided (4.2.11), performance considerations, such as a Variable - Mechanical Strength Test (4.2.11.1), a 250 N - Mechanical Strength Test (4.2.11.2, and a Rack Mounted Equipment Marking (4.2.11.4).</p>	<p>Considerable (+). Although many constructions of rack mounted equipment with slide rails have been investigated to this Standard before, and have been subjected to varying levels of construction/ performance requirements, this set of requirements is the first time that the Standard explicitly addresses these constructions via construction, performance and marking requirements. The manufacturers on the task group that developed the requirements believe that most slide rail designs being introduced on the market today are already</p>

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
	<p>The requirements are based on work being conducted within IEC TC108 in relation to the future IEC 62368 Standard, and were developed by a multi-interest ad hoc group, including manufacturers and test houses. They have been added to the first amendment to IEC 60950-1, 2nd Ed.</p>	<p>designed to a level of requirements consistent with 4.2.11.</p> <p>Note – Until if/when a protocol is developed for conducting the new tests on sub-assemblies (rack mounted equipment) that are not actually supplied in racks (and therefore a complete ‘system’ is not available that includes all mounting hardware), <u>4.2.11 can only be applied to complete rack/cabinet systems that include both the rack mount equipment, complete set of slide rail components and rack</u>, unless the rack mounted equipment is investigated and specified for use in a specific OEM’s rack/ cabinet.</p> <p>Eventually, it ‘may’ be possible to develop a generic rack test protocol (e.g., based on EIA-310-D, Cabinets, Racks, Panels, & Associated Equipment).</p>
4.3.8 Batteries	<p>A new NOTE 3 references IEC 60896-21, IEC 60896-22, and EN 50272-2 for requirements applicable to stationary batteries.</p>	<p>Minor (+). Informative Note, and generally, requirements applied to constructions with stationary batteries have been subjected to a level of requirements consistent with IEC 60896-21, IEC 60896-22, and EN 50272-2.</p>
	<p>A new requirement for Operator-replaceable batteries for Transportable Equipment (e.g., battery packs) requires that the contacts/terminals be designed so they cannot be</p>	<p>Minor (+). Although technically an upgrade, due to past field problems, most modern battery packs either have hidden contacts/terminals, or have protection features that prevent risk of</p>

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
	shorted with the test finger, or if shorted, the batteries are inherently protected without creating a hazard.	fire if the contacts/terminals short.
	New requirement requires a battery tray if the battery contains liquid or gel electrolyte.	Minor (+). Although technically an upgrade, generally reflects present industry practice.
	<p>Within the compliance criteria (italicized text), the criteria have been reworked to more clearly communicate the procedure to determine compliance with the requirements for safety of batteries.</p> <p>In particular, the criteria has been segmented into the following elements: Overcharging of a rechargeable battery; Unintentional charging of a non-rechargeable battery; Reverse charging of a rechargeable battery; and Excessive discharging rate for any battery.</p>	Minor (+). Although there has been considerable modification of the compliance criteria, generally it is compatible with present designs and consistent with present practice. However, there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
4.3.13 Radiation <i>[IEC TC108 MT2 Interpretation Panel Q49]</i>	Regarding Effect of UV radiation on materials (4.3.13.3) and Human exposure to UV radiation (4.3.13.4), although there have not been any revisions to these sub-clauses of any significance, it is noted that the IEC TC108 MT2 Interpretation Panel issued an interpretation (Q49) in April 2005 that documents it was the intent of the TC that essentially UV requirements do not apply to ITE with lamps emitting radiation that do not have a large percentage of their total radiation in the UV spectrum.	Considerable (-). Considerable relaxation for some equipment. For LCD Projectors, since the amount of UV radiation emitted by lamps typically used in them is only a small percentage of the total radiation emitted by the lamp (e.g., which includes IR, visible light, etc.), such equipment no longer is required to be subjected to 4.3.13.3 and 4.3.13.4.

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
4.3.13.5 Lasers (including LEDs)	Sub-clause references new standard, IEC 60825-12, Safety of laser products Part 12: Safety of free space optical communication systems used for transmission of information.	Minor. Reflects present practice.
4.5 Thermal Requirements	Sub-clause 4.5 has been reorganized to specify Temperature Tests (4.5.2), Temperature Limits for Materials (4.5.3) and Touch Temperature Limits (4.5.4).	None. Editorial and Clarification.
4.5.1 Thermal Requirements - General	New reference is made to IEC 60065 for loading requirements of audio amplifiers during Temperature Tests.	Minor. Although this is a new test specification, the loading requirements for audio amplifiers in IEC 60065 are (technically) less onerous than that required by IEC 60950-1 (60065 allows audio amplifiers to deliver one-eighth (1/8) of the non-clipped output power to the rated load impedance).
4.5.3 Temperature Limits for Materials	Three new temperature classes have been added to Table 4B, i.e., Class 200, Class 220 and Class 250.	None. Reflects present practice since these temperature limits already are part of IEC 60085 and UL 1446.
4.5.4 Touch Temperature Limits	In condition "a" of Table 4C, Touch Temperature Limits, a hot surface symbol or warning is required for surfaces that are hotter than the limits in the Table but do not exceed 100 C.	Minor (+). The Standard allowed these temperatures in the past for this condition, but did not require a Hot Surface symbol or marking.
4.5.5 Resistance to Abnormal Heat	Existing formula has been corrected to reflect the manufacturer's specified ambient (Tma) into the heating cabinet (oven) condition.	Minor. The fact that thermoplastic parts supporting circuitry in Primary circuits are tested at minimum 125 C typically negates much of the real impact of the modified requirement. Depending on the Tma, the revised formula

Clause 4 (Physical Requirements)		
Sub-clause	Discussion	Impact
		may have some minor impact on thermoplastic parts supporting Hazardous Voltages in Secondary Circuits.
4.6 Openings in Enclosures	New Note clarifies that Top/Side (4.6.1) and Bottom (4.6.2) opening requirements do not apply to Transportable Equipment. Only 4.6.4 applies to Transportable Equipment.	None. Informative Note and clarification that reflects resent practice.
4.6.2 Bottoms of Fire Enclosures	New statement clarifies for equipment intended to be used in more than one orientation, the requirements of 4.6.2 apply in each appropriate orientation. This requirement is consistent with 1.3.6, Orientation during Transport and Use.	None. Clarification that reflect present practice.
4.6.4 Openings in Transportable Equipment	A few minor modifications have been made to the requirements and notes to clarify that conductive parts covered with conformal coatings are not conductive, and "other equivalent measures" may be used in addition to the examples provided. These revisions are intended to allow greater flexibility designing Transportable Equipment to meet the Standard, including products like portable projectors that need significant openings to accommodate cooling.	Minor (-). Clarification, but provides some expanded room to demonstrate compliance with the intent of the requirements.

Clause 5 (Electrical requirements & simulated abnormal conditions)		
Sub-clause	Discussion	Impact
5.1.2 Configuration of Equipment Under Test (EUT)	Sub-clause has been completely reworked to try to clarify the application of requirements to equipment with multiple connections to the AC Mains Supply.	Minor (+). Clarification, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
5.1.2.3 Simultaneous multiple connections to an A.C. Mains Supply.	<p>Revised sub-clause provides clarification on application of Touch Current requirements to equipment with multiple connections to the A.C. Mains Supply that are operating simultaneously.</p> <p>Test measurements, in particular those with touch current exceeding 3.5 ma, also need to consider the provisions in 5.1.7.2, Simultaneous Multiple Connections to the Supply.</p> <p>Based on the revisions associated both with 5.1.2.3 and 5.1.7.2, it now appears the process of testing ITE with redundant multiple connections to the supply will be:</p> <ul style="list-style-type: none"> a) First, measure total touch current with all mains supply sources energized and all the protective earth conductors tied together (single touch current measurement of complete system). b) If the combined touch current is 3.5 ma or less, the system complies. Stop. c) If the combined touch current is more than 3.5 ma, apply 5.1.7 (marking) to the complete 	<p>Minor (+). Clarification, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p> <p>Note: In the past, some manufacturers producing ITE with multiple connections to the A.C. Mains Supply requested that they be allowed to address constructions having Touch Current above 3.5 ma by specifying in their Installation Instructions that the individual connections to the supply needed to be made to separate (dedicated) branch circuits. This allowance was proposed to IEC TC108 for consideration for inclusion in the Second Edition, but it was not supported by IEC TC108. Therefore, it no longer is a valid option since TC108 was not supportive of adding it to the Standard.</p>

Clause 5 (Electrical requirements & simulated abnormal conditions)		
Sub-clause	Discussion	Impact
	<p>equipment/system.</p> <p>d) Measure touch current again through each protective protective earthing conductor individually per 5.1.7.2 (one energized mains supply connection at a time).</p> <p>e) If each individual measurement is 3.5 ma or less, Stop.</p> <p>f) If an individual measurement is more than 3.5 ma, then confirm it does not exceed 5% of the input current per line, and apply 5.1.7.1a) to the individual line (supply cord).</p>	
5.1.7 Equipment with Touch Current Exceeding 3.5ma	<p>Rework of 5.1.7 to clarify the requirements for equipment with Touch Current exceeding 3.5 ma.</p> <p>The new requirements provide some feasible options for determining compliance to the Standard of Pluggable Equipment Type A with high touch current that were not in previous editions of the Standard.</p>	Minor (-). Clarification. Generally reflects present practice, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
5.1.7.2 Simultaneous Multiple Connections to the Supply	<p>New 5.1.7.2 specifies the implementation of the Touch Current measurements to equipment with simultaneous multiple connections to the supply.</p> <p>See comments on 5.1.2.3.</p>	Minor (+). Clarification. Generally reflects present practice, although there could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
5.2.2 Electric Strength – Test Procedure	Sub-clause 5.2.2 has been reworked to provide clarification of the Electric Strength Test procedure.	Minor (+). Clarification. Generally reflects present practice, although there could be some impact as different practices by

Clause 5 (Electrical requirements & simulated abnormal conditions)		
Sub-clause	Discussion	Impact
	<p>New Table 5C, Test Voltages for Electric Strength Tests Based on Required Withstand Voltages, has been added as an alternative method, and is linked to the requirements in Annex G.4. Now, for Overvoltage Categories I or II, Tables 5B or 5C may be used, although Table 5C only may be used for Overvoltage Categories III or IV.</p> <p>Also, some of the Peak Working Voltage columns in Table 5B have been adjusted to align Table 5B with Peak Working Voltage rows in Table 2K, Minimum Clearances for Insulation in Primary Circuits and Between Primary and Secondary Circuits.</p> <p>Also, for Routine Tests, the Standard now clarifies, "Where, elsewhere in this standard, ROUTINE TESTS are required to be conducted in accordance with 5.2.2, it is permitted to reduce the duration of the electric strength test to 1 s and to reduce the test voltage permitted in Table 5C by 10 %."</p>	different manufacturers and NCBs are driven to closer alignment.
5.3.6 Audio Amplifiers	<p>New 5.3.6 provides specific considerations for audio amplifiers when evaluating for abnormal operating and fault conditions.</p> <p>Sub-clause 4.3.4 of IEC 60065 is similar to existing 5.3.7, Simulation of faults, of IEC 60950-1. Sub-clause 4.3.5 requires equipment</p>	Minor (+). Although technically a new requirement, use of substantial audio amplifiers in ITE remains relatively uncommon, and the required tests per 4.3.4 and 4.3.5 of IEC 60065 likely will not result in non-compliance of existing designs.

Clause 5 (Electrical requirements & simulated abnormal conditions)		
Sub-clause	Discussion	Impact
	containing an audio amplifier to be subject to the standard signal (4.1.6) adjusted to deliver the most unfavorable output power from zero up to the maximum attainable output power to the rated load impedance, or, if applicable, to the most unfavorable load impedance connected to the output terminals including short-circuit and open circuit.	
5.3.7 Simulation of Faults	<p>Revision to part d) of the First Edition removes consideration for applying faults to "signal outputs" of ITE. This modification should simplify the application of 5.3.7 to ITE with numerous types of signal outputs.</p> <p>The existing test remains a valid consideration for ITE that delivers power from the equipment, e.g., power pins on USB, PoE, etc.</p>	Minor (-). Relaxation of level of requirements found in the First Edition. However, generally reflects present practice.
	To make parts d) and f) consistent, the qualifier "and that deliver power" has been added to part f) to clarify the types of internal circuits that qualify for overloading considerations, i.e., not connectors that deliver signal outputs.	Minor (-). Relaxation of level of requirements found in the First Edition. However, generally reflects present practice.
	Note - Previous D3 National Differences in this sub-clause have been removed, including those exempting circuits supplied by Limited Power Sources from being subjected to abnormal operation considerations,	Minor (+). Technically an upgrade, but this D3 National Difference that allowed 'waiving' some abnormal operating testing is not commonly used, in part because there is no similar consideration in IEC

Clause 5 (Electrical requirements & simulated abnormal conditions)		
Sub-clause	Discussion	Impact
	<p>and similarly circuits provided with high impedances.</p> <p>Note – The consideration of whether a circuit is supplied by LPS still may be a sound engineering consideration when deciding the amount (numbers) of abnormal operation (fault) testing to apply to individual constructions.</p>	<p>60950-1 and global ITE could not utilize it.</p>
<p>5.3.9.1 Compliance Criteria for Abnormal Operating and Fault Conditions – During the Tests</p>	<p>New Table 5D, Temperature Limits for Overload Conditions, provides expanded criteria for determining insulation limits during abnormal operating conditions allowing the insulation class to be considered.</p>	<p>Minor. Clarification. Generally reflects present practice.</p>

Clause 6 (Connection to Telecommunication Networks)		
Sub-clause	Discussion	Impact
6.1.2.1 Separation of Telecommunication Network from Earth – Requirements	Previous requirements for minimum d.c. sparkover voltage ratings have been replaced with a new formula that includes consideration of expected peak voltages associated with the mains and manufacturers' specifications for the surge suppressor.	Minor (+). Although the determination of suitability of individual surge suppressors will take additional time, it is expected that most manufacturers are already incorporating compatible surge suppressors in ITE with TNV circuits.
6.2.1 Protection of Users from Overvoltages on Telecommunication Networks – Separation Requirements	Clarifies that the separation requirements for protection against telecommunication overvoltages also applies between TNV-1 or TNV-3 <u>and</u> TNV-2 circuits.	Minor (+). Technically a new requirement, although most products with both TNV-1/TNV-3 and TNV-2 have been evaluated for such separation by nature of the separation/insulation requirements for such circuits in 2.3.2. There could be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
	Note - Previous D2 National Difference addressing digital circuits has been dropped since this consideration is consideration (by the BNWG) to now be inherent to the IEC Standard (and in the definition of TNV-1).	None. Editorial.
6.5 Acoustic Tests	Note - Previous 6.5 has been restructured and moved to 1.1.1. and Annex NAD.	See 1.1.1 and Annex NAD.

Clause 7 (Connection to Cable Distribution Systems)		
Sub-clause	Discussion	Impact
7.1 General	New Note 1 clarifies that unless a connection to the external network is via coaxial cable, the circuit is not a Cable Distribution System and Clause 6 applies.	None. Clarification. Generally reflects present practice.
7.3 Protection of Equipment Users from Overvoltages on the Cable Distribution System	<p>New requirement exempts from application of 6.2 (separation requirements) any circuits connected to a Cable Distribution System and treated as TNV-1 (per 7.2), but that have an earthed/ common side of the internal circuit connected to the screen of a coaxial cable intended to be earthed at the installation.</p> <p>This requirement was incorporated into the 2nd Edition because many/most circuits connected to a Cable Distribution System do not have separation between them and SELV.</p>	Minor (-). Relaxation of requirements in existing 7.3 (First Edition). However, most NCBs have been aware of this pending change for several years and have allowed similar provisions or else such equipment could not be certified.
7.4.2 Voltage Surge Test	Revised first paragraph clarifies the application of the test, including a new allowance for disconnecting components connected between the circuit connected to the Cable Distribution System and protectively earthed parts.	Minor (-). Clarification.
7.4.3 Impulse Test	Revised first paragraph clarifies the application of the test, including a new allowance for disconnecting components connected between the circuit connected to the Cable Distribution System and protectively earthed parts.	Minor (-). Clarification.

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Annex B	Discussion	Impact
Annex B Motor Tests Under Abnormal Conditions	For Tables B.1 & B.2, three new temperature classes have been added, i.e., Class 200, Class 220 and Class 250. Adjustments have been made to several other classes.	None. Clarification, and reflects present practice.
Annex B.6.3 Running Overload Test for d.c. Motors in Secondary Circuits – Alternative Test Procedure	Alternative test procedure allows Running Overload Test to be conducted outside of the EUT.	Minor (-). Reflects present practice.
Annex B.6.4 Running Overload Test for d.c. Motors in Secondary Circuits - Electric Strength Test	New Electric Strength requirement has been added for motors subject to the Running Overload Test and having Working Voltages exceeding 42.4 Vp or 60 Vd.c. Aligns this test with similar tests in Annex B.	Minor (+). Very few motors used in ITE secondary circuits require the running overload test per existing criteria. Motors subjected to the test likely already are designed to comply with this additional compliance criteria.
Annex C	Discussion	Impact
Annex C.1 Transformers – Overload Test	For Table C.1, three new temperature classes have been added to Table 4B, i.e., Class 200, Class 220 and Class 250. Adjustments have been made to several other classes.	None. Clarification, and reflects present practice.
	New requirement added for application of Transformer Overload Test when the temperature of a ferrite core exceeds 180 C and the Tma has been used to calculate the maximum temperature. For such constructions, the new requirement now will require that the test be conducted in an environmental chamber (oven) set at a temperature of Tma. This new requirement	Minor (+). New requirement will require some constructions to be tested in an environmental chamber (oven), which may prolong testing and complicate the test procedure. However, the limits remain the same, so it is anticipated that most constructions that comply with the existing First Edition requirements will comply with the revised requirements.

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	addresses potential deterioration of ferrite cores at temperatures approaching 200 C that could lead to thermal runaway. Such conditions cannot be simulated via use of a calculation using Tma.	
Annex F	Discussion	Impact
Annex F Measurement of Clearances and Creepage Distances	Five new example constructions (Figures F.14-.18) have been included in normative Annex F to illustrate the application of the revised Solid Insulation requirements in 2.10.5 to theoretical constructions.	None. Clarification.
Annex G	Discussion	Impact
Annex G Alternative Method for Determining Minimum Clearances	<p>Several revisions have been made to this Annex, mainly associated with the application of the Annex to earthed and unearthed d.c. Mains Supplies.</p> <p>Annex G.1.1 clarifies, "It is permitted to use either the requirements of 2.10.3 for Overvoltage Category I or II, using the PEAK WORKING VOLTAGE, or the requirements in Annex G for Overvoltage Category I, II, III or IV, using the REQUIRED WITHSTAND VOLTAGE, for a particular component or subassembly or for the whole equipment."</p> <p>Also, Table G.2, Minimum Clearances for up to 2000 m above sea level, has been updated to include Pollution Degree considerations.</p>	None. Clarification. Generally reflects present practice.
Annex M	Discussion	Impact

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Annex M Criteria for Telephone Ringing Signals	To more closely align with the U.S. FCC Rules Part 68 requirements, Annex M.3.2.1, Conditions for Use of a Tripping Device or a Monitoring Voltage, has been revised to clarify that the specified resistances for making measurements are a minimum value.	None. Clarification. Generally reflects present practice.
Annex N	Discussion	Impact
Annex N Impulse Generators	Table N.1 indicates that the Resistor Tests in 1.5.7 use either the Reference 1, 2, or 3 circuits depending on whether the resistors bridge insulation associated with circuits connected to an AC Mains (Reference 2), antenna (Reference 3), or cable network (Reference 1). Also, see discussion on 1.5.7.	None. Clarification. Generally reflects present practice.
Annex P	Discussion	Impact
Annex P.1 (1.5.2) Surge Suppressors (non-VDR type)	Revised entry for Surge Suppressors now is limited to types not considered VDRs, e.g., gas tube type. VDRs now are addressed in Annex P.2 (1.5.9).	None. Non-VDR suppressors always were required by Annex P.1 to comply with the appropriate UL or CSA component standard, so there is no impact.
Annex P.1 (2.10.5.4) Insulated Transformer Winding Wire	Previous reference to Subject 758 is obsolete, and has been replaced with a reference to the new Standard for Single- and Multi-Layer Insulated Winding Wire, UL 2353.	None. Editorial. Component requirements are the same.
Annex P.2 (1.5.9) Varistors or MOVs (VDRs)	Since VDRs now have their own specific component requirements, and the specified IEC component standard, IEC 61051-2, is considered an adequate technical	Minor (+). For global compliance, a determination that VDRs now comply with IEC 61051-2 will be required since UL 1449 is not IEC-harmonized with that

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	<p>specification, UL 1449 has been placed in Annex P.2 as a suitable alternative to IEC 61051-2.</p>	<p>Standard.</p> <p>It is expected some VDRs will be dual certified to IEC 61051-2 & UL 1449, although feedback from OEMs to date is that there are not a significant number of IEC 61051-2 compliant VDRs on the market.</p> <p>For ITE to be provided with a CB Report to the 2nd Edition of IEC 60950-1 under the IECEE CB Scheme, NCBs will be checking for evidence of compliance of VDRs with IEC 61051-2, for example a component license to either IEC 61051-2 or EN 61051-2.</p> <p>Note - Like other components for which the IEC component standard is considered an adequate technical specification, individual certification organizations may have additional certification requirements, such as a requirement that the component be subjected to adequate factory surveillance (follow-up service).</p>
<p>Annex P.2 (2.10.5.4) Optical Isolators</p>	<p>Since Opto-couplers are explicitly covered in 2.10.5.4 now, the reference to the component standard has been moved from 1.5 to 2.10.5.4</p>	<p>None. Editorial.</p>

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<p>Annex P.2 (2.10.5.13) Enamel Coated Wire</p>	<p>Since restricted use of enamel-coated wire is explicitly addressed in the Standard now, the previous UL National Differences in 2.3.2.4 & 6.2.1 have been removed.</p> <p>In 2.10.5.13 the specified IEC component standard, IEC 60317, is considered an adequate technical specification, so the North American component standard for the same magnet wire, ANSI/NEMA MW1000, has been placed in Annex P.2 as a suitable alternative standard.</p>	<p>Minor (+). For global compliance, a determination that magnet wire complies with IEC 60317 will be required now since ANSI/NEMA MW1000 is not IEC-harmonized with that Standard.</p> <p>Note - Like other components for which the IEC component standard is considered an adequate technical specification, individual certification organizations may have additional certification requirements, such as a requirement that the component be subjected to adequate factory surveillance (follow-up service).</p>
<p>Annex P.2 (4.2.8) CRTs</p>	<p>Previous reference in Annex P.1 (4.2.8) has been replaced by a new reference in Annex P.2 (4.2.8) since the base IEC component requirements specified in 4.2.8 are considered adequate technical specifications, and the specified UL and CSA component requirements are suitable alternative component requirements.</p>	<p>Minor (+). For global compliance, a determination that CRTs comply with Clause 18 of IEC 60065 will be required.</p> <p>Note - Like other components for which the IEC component standard is considered an adequate technical specification, individual certification organizations may have additional certification requirements, such as a requirement that the component be subjected to adequate factory surveillance (follow-up service).</p>

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Annex P.2 (4.3.13.3) Materials (UV Exposure)	The base IEC UV requirements in 4.3.13.3 reference ISO 527 and are considered adequate technical specifications. The requirements for ultraviolet radiation in UL 746C, which are also associated with UL's Component Plastics (QMFZ2) program are considered adequate alternative requirements, and are essentially equivalent to those in ISO 527.	Minor. Including a reference to UL 746C is important due to reliance of ITE manufacturers on pre-selection of materials and use of UL Recognized Component Plastics (QMFZ2).
Annex Q	Discussion	Impact
Annex Q Voltage Dependant Resistors (VDRs)	New component requirements for Voltage Dependent Resistors (VDR), requires investigation to (a) preferred climatic category, (b) maximum continuous voltage, and (c) pulse current requirements, per IEC 61051-2, Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors. Also see discussion under 1.5.9.	Considerable (+). For the first time the Standard explicitly addresses the general use of surge suppressors, which likely will have some impact as different practices by different manufacturers and NCBs will now be driven to be more closely aligned. See discussion under 1.5.9 and Annex P.2 (1.5.9). Feedback from OEMs to date is that there are not a significant number of IEC 61051-2 compliant VDRs on the market.
Annex U	Discussion	Impact
Annex U Insulated Winding Wires for Use Without Interleaved Insulation	In addition to several editorial revisions, Table U.2, Oven Temperature, has been revised to add three new temperature classes, i.e., Class 200, Class 220 and Class 250.	None. Clarification, and generally reflects present practice.
Annex Z Overvoltage Categories	New informative Annex provides guidance on determining the appropriate Overvoltage Category for ITE	Minor. Clarification, and generally reflects present practice.

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	based on its point of connection to the AC Mains Supply. <u>A key clarification is that Permanently Connected Equipment is not automatically considered Overvoltage Category III.</u>	
Annex AA Mandrel Test	New Annex provides test protocol for testing solid insulation consisting of three or more layers of non-separable thin sheet material. Test procedure is based on IEC 61558-1, Safety of Power Transformers, Power Supply Units and Similar – Part 1: General Requirements and Tests.	Considerable (+). For thin sheet materials with non-separable layers of three layers or more, the test procedures per Annex AA are more onerous than existing requirements. See additional discussion on 2.10.5.6, 2.10.5.8, 2.10.5.9, and 2.10.5.10.
Annex NAD	Discussion	Impact
NAD.1 Acoustic Tests - General	<p>Acoustics requirements/ tests that were previously in Clause 6 have been relocated to new Annex NAD.</p> <p>Regarding demonstrating compliance with acoustic requirements, more emphasis has been placed on <i>'manufacturers of [ITE] having acoustic outputs at communication receivers ...shall demonstrate...'</i> compliance with acoustic requirements since acoustic testing of most modern communications equipment, in particular digital equipment requires involvement of the design engineers associated with the equipment when a specific test program is developed, including identifying appropriate</p>	Minor (+). Affected ITE manufacturers will need to increasingly provide more test support for the Application of Annex NAD (including IEEE 269) due to the complexity of the requirements and the complexity of the equipment being subjected to the requirements.

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	codec.	
	<p>The legacy test equipment/methods in CSA/UL 60950, Third Edition (and earlier editions) have been added back into the Standard, and may be used when the test equipment is compatible with the type of receiver used in the ITE. In Annex NAD, the equipment/test methods associated with IEEE 269 is referred to as Method 1, and the legacy equipment/test methods from previous standards are known as Method 2. Also, per the compliance statement, when IEEE 269 allows use of alternate ear simulators, test fixtures, or methods of test, the choice is specified by the manufacturer.</p>	<p>Minor (-). The Standard now allows another option for acoustics testing some ITE requiring compliance with acoustic limits. This may provide some flexibility, in particular with ITE connected to analog networks. However, since some of the legacy ear simulators are not designed for modern headset configurations, it will continue to be more appropriate to use IEEE 269 and its references to more modern test equipment and protocols.</p>
<p>NAD.2 Acoustic Pressure Limiting</p>	<p>Note 4 mentions that the alternate test fixtures permitted by Annex B of IEEE 269 are allowed when its Table B.1 specifies they are allowed. It also is clarified that if an older Type ear simulator is allowed by Annex B of IEEE 269, testing does not be repeated with a Type 3.3 or 3.4 ear simulator even though IEEE 269 recommends it.</p>	<p>Minor (-). Additional options are now permitted.</p>
<p>NAD.3 Short-duration Impulses</p>	<p>Testing considerations for short-duration impulses now allow for IEEE 269 (Method 1) and legacy test methods (Method 2). Limits remain the same.</p>	<p>Minor (-). Additional options are now permitted.</p>

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NAD.4 Long-duration Disturbances	Test considerations for long-duration disturbances now allow for IEEE 269 (Method 1) and legacy test methods (Method 2). Limits remain the same.	Minor (-). Additional options are now permitted.
Annex NAE	Discussion	Impact
Annex NAE (2.6.5.7)	The 2005 NEC (250.8) now specifically prohibits the use of sheet metal screws to be associated with protective earthing (grounding) and bonding.	Minor (+). Most ITE does not use sheet metal screws associated with protective earthing and bonding. Therefore, generally reflects present Industry practice.
Annex NAE (2.7)	For ITE used in ITE (computer) rooms, the 2008 NEC now explicitly permits multiple panelboards within a single cabinet/enclosure if each panelboard is limited to no more than 42 overcurrent devices.	None. Reflects present practice.
Annex NAE (4.3.12)	Maximum allowed quantities of flammable liquid in Table NAE.6 have been adjusted to be more aligned with the latest edition of NFPA 30, the Flammable Liquids Code.	None (-). Clarification, and generally reflects present practice.