

**CERTIFICATION IMPACT ANALYSIS CSA/EN/UL/IEC 62368-1, Ed. No. 3  
(includes 2023-08-23 Revision of CSA/UL 62368-1)  
Audio/Video, Information and Communication Technology Equipment  
– Part 1: Safety Requirements**

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This analysis is intended to identify and study the impact of notable differences between the latest *IEC 62368-1:2018* (Ed. No. 3) standard for *Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements* and its predecessor, *IEC 62368-1:2014* (Ed. No. 2). This analysis will permit people already familiar with Ed. No. 2 to become familiar with the likely certification impact of the latest Ed. No. 3. Other select observations are included that may be of interest to the reader. We will provide periodic updates as we learn more about the application of the new standard.

This analysis provides a more comprehensive review of the changes than given in the Foreword of Ed. No. 3. For reference, the Foreword to Ed. No. 3 includes the following information:

Compared to the previous edition, this document includes the following changes.

Addition of requirements for

- outdoor equipment
- optical radiation
- insulating liquids
- work cells
- wireless power transmitters
- fully insulated winding wire (FIW)

Alternative

- method for determination of top, bottom and side openings for fire enclosures
- requirements for sound pressure

Also included in this analysis are changes to the National Differences associated with the latest bi-national standard, *CSA CC2.2 No. 62368-1/UL 62368-1, Ed. No. 3*, which was published on December 13, 2019 and revised on October 22, 2021.

The revisions dated October 22, 2021 mostly align National Differences with the 2020 editions of NFPA 70, National Electrical Code, and NFPA 75, Fire Protection of Information Technology Equipment plus some additional updates to referenced component standards.

In Europe, CENELEC published EN IEC 62368-1:2020/A11:2020 (also based on IEC 62368-1:2018) on March 06, 2020. Included in this analysis are indications of the significant, or otherwise noteworthy, European Common Modifications and Special National Conditions in EN IEC 62368-1:2020/A11:2020.

## Background

IEC 62368-1 is the International Standard for Safety of AV and ICT Equipment, including AV/ICT components, sub-assemblies and peripherals. It encompasses under its scope audio equipment, video equipment, information technology equipment, communication technology equipment, office appliances and multi-media equipment and components, including power supplies, for use in the home, office, business, school, computer room and similar locations. The first edition of IEC 62368-1 was published in 2010, the second edition was published in 2014, and the third edition was published in 2018.

In the U.S. and Canada, the Bi-National Standard (BNS) for 62368-1, formally designated *CSA C22.2 No. 62368-1/UL 62368-1*, includes U.S./Canadian deviations (National Differences) to address needed national requirements that are not in the base IEC document. The technical content of the BNS is developed and maintained by the CAN/US Technical Harmonization Committee (THC), which consists of representation from UL Solutions, CSA, and a variety of U.S. and Canadian AV, IT and communication technology equipment manufacturers. As stated previously, the latest bi-national standard, *CSA CC2.2 No. 62368-1/UL 62368-1, Ed. No. 3*, was published on December 13, 2019, and revised on October 22, 2021.

The Effective Date for UL 62368-1 Ed. No. 3 (including revisions dated October 22, 2021) has been designated January 06, 2023 to align with the CENELEC Date of Withdrawal (DOW) of superseded standards aCsospiyorcigah2@tt0 e2d1tU hiw LNE LL CIEC 62368-1 :2020/A11:2020. (See below.) As in the past, this alignment of U.S./UL Effective Date with the EU/CENELEC DOW is beneficial to AV/ICT manufacturers globally since such alignment allows coordination of market access to two major regions of the world based on the same transition date.

### **AV/ICT Sector Review Process:**

<https://www.ul.com/consumer-technology/en/consumer-technology-sector-review-process/>

### **UL 62368-1 Effective Date Information:**

<https://www.ul.com/consumer-technology/en/knowledge-center/ul-62368-1-effective-date-information/>

In Europe, the current standard is EN IEC 62368-1:2020/A11:2020 (also based on IEC 62368-1:2018), which includes European Common Modifications, Special National Conditions and A-deviations that are developed and maintained by CENELEC.

The Date of Withdrawal (DOW) of superseded standards associated with EN IEC 62368-1:2020/A11:2020 is 2023-01-06.

### Notes to this analysis:

- Unless otherwise noted, all Sub-clause/Annex references are to IEC 62368-1, Ed. No. 3
- Discussion of changes and differences associated with IEC 62368-1, Ed. No. 3 is in plain text
- Discussion of new or revised National Differences specifically associated with revisions of the Bi-National Standard, CSA C22.2 No. 62368-1/UL 62368-1, Ed. No. 3 are noted, **CAN/U.S. ND**
- Discussion of new or revised special national conditions (differences) associated with EN IEC 62368-1:2020/A11:2020 are noted, **CENELEC ND**

## Explanation of Impact Statements:

Statement	Impact
None	Anticipate no impact on the present certification practice to IEC 62368-1 of most AV/ICT equipment due to the change.
Minor*	Anticipate limited impact on the present certification practice to IEC 62368-1 of some, or all AV/ICT equipment due to the change.
Considerable*	Anticipate sizable impact on the present certification practice to IEC 62368-1 of some, or all AV/ICT equipment due to the change.

\* For new/revised requirements that are considered at this time **more onerous** than superseded requirements, the Impact Statement (Minor, Considerable) will be followed by a (+). For new / revised requirements that are considered at this time **less onerous** than the superseded requirements, the Impact Statement (Minor, Considerable) will be followed by a (-). No symbol next to a Minor or Considerable statement indicates that, although there could be impact associated with the change, it is indeterminate whether the impact will be more or less than current.

## Revision History:

March 2019: Modifications to sub-clauses: 1, 5.4.2.3.2.1, 5.5.9, 6.2.3.2, 10.2, F.3.7, J.1, Q.3, S.2, DVA (1), DVA (5.5.9, G.4.3), DVA (F.3.3.6), DVA (G.7), DVA (Q), DVE (G.13), DVF (M), DVH (5.6.3).

December 2019: Modification to reflect publication of CSA/UL 62368-1 Ed. No. 3 for Canada/U.S. (published Dec. 13, 2019). In Cl. 1, new commentary added on ND associated with the IEC 62368-3 reference.

March 2020: Modification to reflect publication of EN IEC 62368-1:2020/A11:2020.

October 2021: Modifications to reflect publication of revisions to CSA/UL 62368-1 Ed. No. 3 dated October 22, 2021 align with the 2020 Editions of NFPA 70 and NFPA 75, plus some component standard updates and other relatively minor clarifications.

Clause 0 (Principles of this product safety standard)		
Sub-clause	Discussion	Impact
<b>0.2.1 Persons - General</b>	Several countries have expressed concern with the use of the term <i>instructed person</i> in relation to an <i>ordinary person</i> or <i>skilled person</i> . It is believed that there may be some in-country legal requirements that could exceed the assumptions IEC 62368-1 makes about the degree of training that may be involved to be considered an <i>instructed person</i> . Therefore, a new note has been added.	None. Clarification of a principle.
<b>0.5.1 Safeguards - General</b>	Clarifies that IEC 62368-1 is aligned with the principles of <i>ISO/IEC Guide 51, Safety aspects - Guidelines for their inclusion in standards</i> , and its hierarchy of safeguards.	None. Clarification of a principle.

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
<b>1 Scope</b>	Ed. No. 3 now incorporates in its base content (primarily in 8.5.4, <i>Special categories of equipment containing moving parts</i> ) the previous requirements that were in <i>IEC 60950-23, Large data storage equipment</i> . As part of the transition, the requirements have been made hazard-based to coincide with the rest of IEC 62368-1. Also, they have been made more generic and can apply to any large equipment with MS3 energy sources installed in restricted access areas (for example, a data center), and are not limited to large data storage equipment with robotics as was the case in 60950-23.	Minor (+). Generally, reflects present practice.
	However, the standard does not cover non-self-contained robotics, such as industrial types used on a factory floor, and it does not cover personal care robots, including mobile servant robots, physical assistant robots and person carrier robots, which have their own ISO and IEC standards.  [Note – Although not referenced in the Standard yet, for specialized service, communication, information, education and entertainment (SCIEE) robots, a new certification document	Minor. Generally, reflects present practice.

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
	(Outline) is also available for use – UL Subject 3300].	
	Ed. No. 3 now incorporates in its base content (primarily Annex Y, <i>Construction requirements for outdoor enclosures</i> ) the previous requirements that were in <i>IEC 60950-22, Outdoor ITE</i> . The requirements have been made hazard-based.	Minor (+). Generally, reflects present practice.
	<p>A reference is included to IEC 62368-3 for AV/ICT with DC power transfer through communication cables or ports. IEC 62368-3 is based on the original IEC 60950-21 standard (in Clause 6), but includes additional material (Clause 5) to address forms of power distribution other than remote power feeding. In particular, the standard addresses the power interface of power sourcing equipment (PSE) and powered devices (PD) for power transfer protocols like USB and PoE.</p> <p>It is noted that IEC 62368-3 does not apply to equipment using a proprietary protocol for power distribution. (Such protocols will need separate consideration within their proprietary system to meet the principles/requirements of IEC 62368-1.)</p>	Considerable (+). The expanded scope of IEC 62368-3 means that it will cover more constructions than 60950-21 with some additional evaluation required of communication ports, such as USB and PoE. However, the requirements are considered equitable with most current designs due to their compatibility with the associated industry specifications.
<b>CAN/U.S. ND</b>	<p>New ND states “<i>1DV.2.3 Additional requirements for equipment with DC power transfer through communication cables and ports are given in IEC 62368-3. IEC 62368-3 clause 5 for DC power transfer at ES1 or ES2 voltage levels is considered informative. IEC 62368-3 clause 6 for remote power feeding telecommunication (RFT) circuits is considered normative (see ITU K.50). Alternatively, equipment with RFT circuits are given in either UL 2391 or CSA/UL 60950-21. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits (<math>\leq 200V</math> per conductor to earth).</i>”</p> <p>Canada and the U.S. (via the THC) decided not to produce a CAN/U.S. version of IEC 62368-3 for several reasons. First, there are some technical</p>	Minor. Although IEC 62368-3 will be required for Europe and (likely) a few other regions, for Canada and the U.S. there will be minimal impact as a result of the reference to new IEC 62368-3. Clause 5 is informative, and Clause 6 reflects the previous content of IEC 60950-21.

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
	<p>issues with its first edition, both in its Clause 5 (lacks some refinement) and Clause 6 (additional work is needed to align it with the latest ITU K.50). Also, subsequent to the publication of IEC 62368-3, IEC TC108 made a decision to begin a new project to split IEC 62368-3 into two separate standards outside of the 62368-series since the standard has been designated a basic safety publication for electronic products with DC power transfer and thus does not apply only to AV/ICT equipment. Therefore, the THC believed IEC 62368-3 needs some additional refinement before it is feasible to mandate its use in CAN and U.S. As a result, a new National Difference has been added to the Scope of CSA/UL 62368-1 providing options for compliance other than straight application of IEC 62368-3:</p> <ul style="list-style-type: none"> <li>• Clause 5 of IEC 62368-3 essentially has been made informative, so it does not need to be applied to USB, PoE and similar protocols in equipment investigated for CAN and the U.S.</li> <li>• Clause 6 remains normative for ICT equipment with remote power feeding technology (RFT), but one of the following compliance options may be used — either Clause 6 of IEC 62368-3, or the existing UL 60950-21, <i>Remote Power Feeding</i>, or the existing UL 2391, <i>Outline of Investigation for Equipment with Remote Feeding Telecommunication Circuits Intended for Backwards Compatibility in Legacy Telecommunication Equipment</i>.</li> </ul>	
	<p>Several countries have expressed concern with the use of the term <i>instructed person</i> in relation to an <i>ordinary person</i> or <i>skilled person</i>. It is believed that there may be some in-country legal requirements that could exceed the assumptions IEC 62368-1 makes about the degree of training that may be involved to be considered an <i>instructed person</i>. Therefore, a new note has been added.</p>	<p>None. It is unknown at this time will the concern about legal requirements associated with <i>instructed</i> or <i>skilled persons</i> impact the application of the standard. However, it is reasonable to</p>

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
		assume there will be no impact on the application.
<b>CAN/U.S. ND</b>	Includes updated references in Clause 1 and Annex DVA to NFPA 70:2017, CSA C22.1-2018, NFPA 75-2017, and IEEE C2-2017.	Minor. Most of the associated changes, unless otherwise identified in this Analysis, are changes to the sections/ clauses referenced within these standards/codes.

Clause 2 (Normative References)		
Sub-clause	Discussion	Impact
	Note - Various new standards are referenced in Clause 2 when they are referenced elsewhere in the standard normatively. Details are covered in the analyses of individual sub-clauses.	None. Informative.

Clause 3 (Terms, definitions and abbreviated terms)		
Sub-clause	Discussion	Impact
<b>3.3.2.5 Outdoor Enclosure</b>	To facilitate the incorporation of IEC 60950-22 into the body of IEC 62368-1, a new term and definition for <i>outdoor enclosure</i> has been added.	None. Definition.
<b>3.3.3.2 Fixed Equipment</b>	To distinguish between types of mounted equipment, a new definition of <i>fixed equipment</i> was developed.  Typically, fixed equipment will be wall, ceiling or floor mounted.  See 8.6.1 for additional information.	None. Definition.
<b>3.3.3.5 Outdoor Equipment</b>	To facilitate the incorporation of IEC 60950-22 into the body of IEC 62368-1, a new term and definition for <i>outdoor equipment</i> has been added.	None. Definition.
<b>3.3.3.9 Professional Equipment</b>	Although the terminology and requirements for <i>professional equipment</i> were an important element of IEC 60065, originally it was thought that a definition for <i>professional equipment</i> was	None. Definition.



Clause 3 (Terms, definitions and abbreviated terms)		
Sub-clause	Discussion	Impact
	not needed for IEC 62368-1. However, since there are specific requirements in IEC 62368-1 that are not applicable to equipment for use in trades, professions or related industries where the equipment is not intended for sale to the general public (consumers), a new term and definition have been added so specific requirements, like those for button batteries and acoustic energy associated with personal music players, can be excluded for such equipment.	
<b>3.3.3.12 Wireless Power Transmitter</b>	IEC 62368-1 now accommodates use of <i>wireless power transmitters</i> in Clause 9, so a new term/definition for <i>wireless power transmitter</i> has been added to Clause 3.	None. Definition.
<b>3.3.4.1 Combustible Material</b>	To remove the term from the definition, the definition of combustible material has been revised to, a material that is capable of being ignited or burned.	None. Definition.
<b>3.3.5.4 Insulating Liquid</b>	IEC 62368-1 now accommodates use of <i>insulating liquids</i> so a new term/definition for <i>insulated liquid</i> has been added.	None. Definition.
<b>3.3.5.6 Solid Insulation</b>	Definition of <i>solid insulation</i> has been revised, in part to align with IEV, but also to contrast with <i>insulating liquid</i> .	None. Definition.
<b>3.3.6.2 Backfeed</b>	Since back-up battery systems integral to equipment have been, and are becoming more prevalent in some forms of ICT equipment, new <i>backfeed</i> requirements have been added to Ed. No. 3, along with a new definition that <i>backfeed</i> is a condition in which a voltage or energy available within a battery backed up supply is fed back to any of the input terminals, either directly or by a leakage path, while operating in the stored energy mode and with mains power not available. It is noted, <i>uninterruptible power supplies (UPS)</i> remain outside the scope of IEC 62368-1.	None. Definition.
<b>3.3.6.7 Outdoor Location</b>	To facilitate the incorporation of IEC 60950-22 into the body of IEC 62368-1, a new term and definition for <i>outdoor location</i> has been added.	None. Definition.

Clause 3 (Terms, definitions and abbreviated terms)		
Sub-clause	Discussion	Impact
<b>3.3.6.12 Stored Energy Mode</b>	Associated with the new requirements for <i>Backfeed</i> , a new term and definition for <i>stored energy mode</i> was needed, which is defined as a stable mode of operation that the battery backed up supply attains under specified conditions. The definition is consistent with IEC 62040-1.	None. Definition.
<b>3.3.6.16 Work Cell</b>	To accommodate the incorporation of IEC 60950-23 into IEC 62368-1, a new term/definition for <i>work cell</i> was needed, which is defined as the space within the equipment of such size that a person can enter completely or partially (for example, entire limb or head) for servicing or operating the equipment and where mechanical hazards may be present. Also included are accompanying notes that a <i>work cell</i> may contain more than one compartment, a compartment can be used for either operational or service purposes, and the equipment containing the work cell is typically installed within a restricted access area.	None. Definition.
<b>3.3.11.1 Backfeed Safeguard</b>	To accommodate the incorporation of new backfeed requirements into IEC 62368-1, a new term/definition has been added for <i>backfeed safeguard</i> , which is defined as a control scheme that reduces the risk of electric shock due to backfeed.	None. Definition.
<b>3.3.11.11 Protective Earthing</b>	Although requirements for protective bonding and protective conductors have been in IEC 62368-1 since the beginning, modification has been made to Clause 5 that include the term <i>protective earthing</i> , now defined as a point or points in a system or in an installation or in equipment, for purposes of electrical safety.	None. Definition.
<b>3.3.14.3 Prospective Touch Voltage</b>	Clarification has been made on the definition of <i>prospective touch voltage</i> that it also includes the voltage between one conductive part and earth.	None. Definition.
<b>3.3.14.8 Working Voltage</b>	To accommodate some clarifications in Clause 5, the definition of <i>working voltage</i> has two new notes that external transients are disregarded, and recurring peak voltages are disregarded.	None. Definition.

Clause 3 (Terms, definitions and abbreviated terms)		
Sub-clause	Discussion	Impact
<b>3.3.15.1 Class I Equipment</b>	The existing definition of <i>Class I equipment</i> was causing some confusion due to its complexity. A refined definition for <i>Class I equipment</i> has been included that is aligned with the IEC 851-15-10.	None. Definition.
<b>3.3.17.1 Battery</b>	Additional clarification has been made to the existing definition that a battery is “...one or more cells...”	None. Definition.
<b>3.3.17.5 Lowest Specified Charging Temperature</b>	A note has been added to the definition of <i>lowest specified charging temperature</i> clarifying, it is usually assumed that the end-product manufacturer is responsible to specify the safety sensitive temperature, voltage or current of the battery, based on the specifications provided by battery supplier.	None. Definition.
<b>3.3.18 FIW Terms</b>	IEC 62368-1 now accommodates use of <i>fully insulated winding wire (FIW)</i> , sometimes known as ‘zero defect wire.’ Therefore, new terms/ definitions for <i>fully insulated winding wire (3.3.18.1)</i> and <i>grade of FIW (3.3.18.2)</i> have been added to Clause 3.	None. Definition.
<b>3.3.19 Sound Exposure</b>	New terms/definitions from EN 50332-3 have been included to accommodate an alternative method added to the standard for measuring acoustic energy. These terms/definitions include, 3.3.19.1, <i>Calculated sound dose (CSD)</i> , 3.3.19.2, <i>Momentary exposure level (MEL)</i> , 3.3.19.3, <i>Sound exposure (E)</i> , 3.3.19.4, <i>Sound exposure level (SEL)</i> , and 3.3.19.5, <i>Digital signal level relative to full scale, 0dBFS</i> .	None. Definition.
<b>CENELEC ND</b>	Includes some relatively minor modifications to the definitions associated with sound exposure.	None. Definition.

Clause 4 (General requirements)		
Sub-clause	Discussion	Impact
<b>4.1.1 Application of requirements and acceptance of materials,</b>	The existing provision that allows for use of IEC 60065 and IEC 60950-1 compliant components and subassemblies in equipment investigated to IEC 62368-1 has been clarified that it applies to both internal and external components.	None. Reflects present practice but helps promote more consistent application by certifiers.

Clause 4 (General requirements)		
Sub-clause	Discussion	Impact
<b>components and subassemblies</b>	This provision remains in Ed. No. 3 for the transition. However, it is the intent of IEC TC108 that it will be removed during the next revision of IEC 62368-1, whether in Am. No. 1 of Ed. No. 3, or as Ed. No. 4 of IEC 62368-1.	
<b>4.1.4 Equipment installation</b>	<p>As part of the integration of IEC 60950-22 into IEC 62368-1, a new requirement is provided that outdoor enclosures that provide a safeguard function shall comply with new Annex Y, <i>Construction requirements for outdoor enclosures</i>.</p> <p>Both Outdoor equipment and outdoor enclosures are required to be suitable for use at any temperature in the range specified by the manufacturer. If the manufacturer does not specify a range, the range is taken as – 33 °C through + 40 °C, which is based on IEC 60721-3-4.</p>	<p>None.</p> <p>Generally consistent with the technical requirements in IEC 60950-22.</p>
<b>4.1.6 Orientation during transport and use</b>	<p>Now clarifies, if equipment has means for fixing in place by an <i>ordinary person</i>, such as the provision of screw holes for direct attachment to a mounting surface or through the use of brackets or the like either provided with the equipment or readily available in the market, all likely positions of orientation of the equipment shall be taken into account, including the possibility of mounting to a non-vertical surface <u>regardless of the installation or user instructions that are provided by the manufacturer</u>.</p> <p>For example, most TVs have prefabricated mounting patterns (screw holes) per VESA standards that can be mounted to any VESA compatible mounting bracket. Such TVs potentially can be mounted at atypical angles, such as when installed in a sports bar.</p> <p>Intended to clarify that instructional safeguards need to be consistent with likely use or misuse, especially if instructing an ordinary person.</p>	<p>Minor (+).</p> <p>For most equipment, generally reflects present practice.</p> <p>However, for some equipment, such as TVs and monitors, there may be considerable impact since mounting in non-vertical positions (e.g., ceiling) may need to be considered if third-party mounts are available and even if the installation/user instructions do not mention such as mounting orientation.</p>

Sub-clause	Discussion	Impact
<b>4.1.8</b> <b>Liquids and liquid filled components (LFC)</b>	<p>Although new requirements for insulating liquids are now included in IEC 62368-1, for liquids in general, unless investigated as an insulating liquid, they are to be treated as electrically conductive materials.</p> <p>Additional material also has been added to serve as a base reference to the annex for LFC (G.15), with clarification that equipment with more than one (1) liter of liquid is not covered by G.15, although IEC TR 62368-2 indicates G.15 may be used for larger systems too if the requirements are compatible.</p>	<p>Minor (+).  As a general requirement, generally reflects present practice since most liquids have been treated as electrically conductive.  The clarification on the volume of liquid covered by G.15 for LFC will be helpful promoting consistency since it was not clear in the existing edition whether G.15 applied to all or only some types of systems.</p>
<b>4.4.3.4</b> <b>Impact tests</b>	<p>Clarifies, the impact test of T.6 does not apply to the surface of the enclosure of stationary equipment, including equipment for building in, which is not accessible, <u>or</u> is protected after installation. Previously both conditions had to be true.</p>	<p>Minor (-).  Clarification.</p>
<b>4.4.3.7</b> <b>Glass fixation test</b>	<p>Concern had been expressed that glass used as a safeguard against access to class 3 energy sources other than PS3 (i.e., glass used for other than a fire enclosure) should be subjected to some mechanical testing, albeit at a reduced level.</p> <p>For such safeguards, it has been clarified the following is applied:</p> <ul style="list-style-type: none"> <li>– a glass impact test as given in Clause T.9 with an impact of 1 J applied 3 times; and</li> <li>– a push/pull test with 10 N applied in the center of the glass in the least favorable direction.</li> </ul>	<p>Minor (+).  New application of mechanical requirements for glass could be more onerous for some glass that had been exempted in the past.</p>
<b>4.4.3.8</b> <b>Thermoplastic material tests</b>	<p>Clarifies the stress relief test of Clause T.8 only applies to moulded or formed thermoplastic material.</p>	<p>Minor (-).  Generally, reflects present practice.</p>
<b>4.4.4</b> <b>Displacement of a safeguard by an insulating liquid</b>	<p>Although insulating liquids used as a safeguard have specific requirements based on the type of energy source involved, a general sub-clause was needed to tie everything together and point to the appropriate requirements in clauses 5 and 6.</p>	<p>Minor (+).  Although this is a new requirement, use of insulating liquids in the past have been considered</p>

<b>Clause 4 (General requirements)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	<p>Also, key principles in considering use of insulating liquids are, (a) both partial and total loss of the insulating liquid is to be considered an abnormal operating condition of the equipment and, (b) the standard does not consider use of insulating liquids to replace a basic insulation, a supplementary insulation, or a reinforced insulation. (The Standard may evolve one day to consider this, but it does not include today.)</p> <p>As a result, 4.4.4 points to,  – 5.4.12 and 6.4.9 for the insulating liquid; and  – 5.4.2 and 5.4.3 for requirements for the equipment with and without the insulating liquid present.</p>	<p>“constructions not specifically covered,” with appropriate requirements being applied, albeit inconsistently. Therefore, although the legacy standards have not had specific requirements associated with their use, some level of requirements typically have been applied.</p> <p>(The IEC requirements for insulating liquids were derived from some UL Solutions requirements in other standards/categories, thus most global products have been subjected to something similar.)</p>
<b>4.4.5 Safety interlocks</b>	<p>Although component requirements for safety interlocks existed in Ed. No. 2 in Annex K, there was only one reference in 6.4.8.3 pointing to Annex K. However, since a safety interlock may be associated with safeguarding from one or multiple energy sources, a more general reference to Annex K and its requirements has been added to Clause 4.</p>	<p>Minor (+).  Generally, reflects present practice.</p>
<b>4.8 Equipment containing coin/button cell batteries</b>	<p>Clarifies via removal of the modifier ‘lithium’ that such battery requirements apply to coin/button cell batteries regardless of chemistry.</p>	<p>Minor.  Generally, reflects present practice.</p>
<b>4.8.3 Equipment containing coin/button cell batteries – construction</b>	<p>Contains additional torque and angle criteria for opening battery compartment doors/covers.</p>	<p>Minor (+).  May result in some small number of designs that were previously accepted no longer being accepted.</p>

Clause 4 (General requirements)		
Sub-clause	Discussion	Impact
<b>4.10 Component requirements</b>	<p>A legacy requirement from 60065 &amp; 60950-1 was missing that AV/ICT equipment requires a disconnect device from the mains. Although the standard had an Annex L for disconnect devices, a reference in the body of the standard to Annex L was needed and has been added.</p> <p>Similar references have been added for Switches (G.1) and Relays (G.2).</p>	<p>Minor. Generally, reflects present practice.</p>

Clause 5 (Electrically-caused injury)		
Sub-clause	Discussion	Impact
<b>5.2.1.1 Classification and limits of electrical energy sources - Electrical energy source classifications- ES1</b>	For ES1, clarifies a single fault condition includes single fault of a supplementary safeguard, in addition to a basic safeguard.	None. Clarification. Generally, reflects present practice.
<b>5.2.2.2 Steady state voltage and current limits</b>	Equivalent peak voltage values (to RMS) have been added for AC > 1kHz.	None. Clarification.
<b>5.2.2.3 Capacitance limits</b>	In Table 5, the capacitance limits for 0.133 nF or less have been corrected for the ES1 (25k to 30k) and ES2 (50k to 60k) columns.	None. This row is not commonly used.
<b>5.2.2.4 Single pulse limits</b>	For Tables 6 and 7, the application conditions have been slightly modified.	None. Generally, reflects present practice.
<b>5.2.2.5 Limits for repetitive pulses</b>	<p>Previous Table 8 associated with this sub-clause has been removed and replaced with a statement "For pulse off times less than 3 s, the <i>peak</i> values of 5.2.2.2 apply. For longer durations, the values of 5.2.2.4 apply."</p> <p>Key clarification is that 'peak' values now are associated with 5.2.2.2. Note, this is an issue that IEC TC108 continues to discuss.</p>	<p>Minor (+). Most of the change is editorial, but the association of 'peak' vs. 'dc' with 5.2.2.2 could have some implications for some waveforms since the limit may be lower from how 60950-1 was applied.</p>

Clause 5 (Electrically-caused injury)		
Sub-clause	Discussion	Impact
		Also, during hiccup mode, there may be some limited impact on circuits that have complied with the provision in 2.2.3 of IEC 60950-1 for voltages longer than 200ms.
<b>5.3.1 Protection against electrical energy sources - General</b>	New material has been added on interconnected ES3/ES2/ES1 circuits in isolated secondary circuits of switch mode power supplies (SMPSs) and similar applications. These requirements, which are similar to the 60950-1 approach for investigating interconnected circuits in the secondary of SMPSs, help address an area in Ed. No. 2 that was causing confusion since users of the standard had a difficult time correlating the theoretical three block model and the practical application of the standard when interconnected energy sources/circuits were involved.	Minor (+). Reflects present practice. There may be some limited impact on circuits that have complied with the provision in 2.2.3 of IEC 60950-1 for voltages longer than 200 ms.
	A new statement also points to 5.8 for a battery backup supply capable of backfeeding to the input a.c. terminals.	Minor (+). Although battery backup requirements are new to IEC 62368-1, generally they reflect present practice.
<b>5.3.2 Accessibility to electrical energy sources and safeguards - Requirements</b>	For outdoor equipment, carried over into 62368-1 from 60950-22 are the accessibility requirements for wet contact, mainly that touch voltage limits are not to exceed 0.5 times the ES1 limits under normal, abnormal and single fault condition, and are not to exceed ES1 after a fault of a basic or supplementary safeguard.  However, clarification has been added that these lower limits for accessibility only apply for <i>ordinary persons</i> .	None. In effect, generally consistent with IEC 60950-22 (outdoor ITE), but in hazard-based form.
<b>5.3.2.4 Terminals for connecting stripped wire</b>	Clarifies, for an <i>instructed person</i> accessing such terminals with stripped wire, there shall not be contact with ES3.	Minor (+). Generally, reflects present practice.
<b>5.4.2.1 Clearances – General requirements</b>	Clarifies that for higher altitudes, multiplication factors apply before linear interpolation, before rounding up, and before other multiplication factors from other tables are applied.	Minor. Generally, reflects present practice, but will promote consistency.



<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	<p>Due to the complexity of clearance determinations per clause 5, some manufacturers desired to be able to use the existing clearances that have been stable for many years in IEC 60950-1.</p> <p>Since these 60950-1 clearances are a conservative application of the requirements in IEC 60664-1 (resulting in larger clearances), they have been incorporated into Annex X as another alternative to the more theoretical-based IEC 60664-1 methods. However, they only are permitted for equipment connected to mains voltages not exceeding 400 V peak (300 V rms) and associated with Overvoltage Category II since this was the most common application - the additional 60950-1 considerations that allowed for reducing clearances even further under special conditions (such as if subjected to a QA program) have not been carried over.</p>	<p>Minor (-).</p> <p>For manufacturers not looking to minimize spacings (and shrink product designs), the existing 60950-based clearances will continue to meet their needs and provides another option for determining compliance with IEC 62368-1.</p>
<b>5.4.2.2 Procedure 1 for determining clearances</b>	Clarifies in Tables 10 and 11 the voltages in column one are peak voltages.	<p>None.</p> <p>Generally, reflects present practice, but will promote consistency.</p>
<b>5.4.2.3.2.1 Determining transient voltages – General</b>	Provides criteria for determining the highest mains transient voltages for outdoor installations.	<p>None.</p> <p>Consistent with IEC 60950-22.</p>
<b>CAN/U.S. ND</b>	<p>Allows as an alternative, components used to reduce the overvoltage category to comply with ANSI/IEEE C62.11, the appropriate part of the CSA C22.2 No. 269 series - Surge Protective Devices, or UL 1449.</p> <p>Also, Installation of Surge Arrestors, over 1 kV (over 750 V for CEC) external to the ITE to reduce overvoltages or to bypass surge current, are required to installed per applicable sections of the CSA C.22.1 and NFPA 70.</p> <p>Installation of Surge-Protective Devices (SPDs), 1 kV or less (750 V or less for CEC) for installation external to the ITE to reduce overvoltages or to</p>	<p>None.</p> <p>These National Differences have their origin without considerable modification in CSA/UL 60950-22.</p>

<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	bypass surge current, are required to be installed per the applicable sections of the CEC and ANSI/NFPA 70.	
<b>5.4.2.3.2.3 Determining dc mains transient voltages</b>	Provides criteria for determining d.c. mains transient voltages, typically 1.5 kV for outdoor equipment.  If the d.c. distribution system is not within the same building, the manufacturer is required to declare the expected transient voltages.	None. Consistent with present practice.
<b>5.4.2.3.2.5 Determining transient voltages by measurement</b>	Clarifies that internal surge suppressors for external circuits are left in the circuit during measurements.	Minor (-). Reflects present practice.
<b>5.4.4.9 Solid insulation requirements at frequencies higher than 30 kHz</b>	Insulation requirements for constructions operating at frequencies higher than 30 kHz are new to IEC 62368-1 (vs. 60065 & 60950-1), originally introduced in Ed. No. 1. However, during the application of the first two editions it had been identified that there was the need for some additional clarifications, so clarifications were added to 5.4.4.9.  Clarifications have been added on (a) determination of the value of the breakdown of electric field strength, $E_p$ , including the allowance for the manufacturer to declare a value; and (b) additional clarifications on the application of the electric strength test option in place of $E_p$ from IEC 60664-4.	Minor. Clarification. Generally, reflects practice.
<b>5.4.5 Antenna terminal insulation</b>	When this requirement was incorporated into IEC 62368-1 it was expanded to cover more than what IEC 60065 covered, which required insulation between the antenna terminal and ES1 and/or ES2 circuits. However, this expanded requirement was not consistent with existing designs and did not have a hazard-based rationale. Therefore, the requirement has been further modified to make it closer to what was in IEC 60065. Other refinements also are included.	Minor (-). Relaxes the requirement for some applications and is consistent with IEC 60065 practice.

<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>5.4.9.1 Electric strength test - Test procedure for type testing of solid insulation</b>	For method 2, it is clarified that the test voltage according to Table 26 is selected using the peak of the working voltage, or recurring peak voltage, whichever is higher.	Minor. Reflects present practice.
	For application of a DC test voltage during the electric strength test, mandated application of the voltage under reverse polarity has been removed, although the intent of the HBSDT is that, if such a test can be affected by reverse polarity it should remain a consideration.	Minor (-).
<b>5.4.9.2 Test procedure for routine tests</b>	As a new Note, a reference to IEC 62911 ( <i>Audio, video and information technology equipment - Routine electrical safety testing in production</i> ) has been added for routine test specifications.	Minor (+). Reflects present practice.
<b>5.4.11.3 Separation from external circuits and earth - Test and compliance criteria</b>	Provides clarification that selection of test voltage is based on the <i>required withstand voltage</i> for the mains voltage of the equipment.	Minor. Reflects present practice.
<b>5.4.12 Insulating liquids</b>	When insulating liquids displace a safeguard (e.g., air), one set of considerations for requirements of that safeguard are related to electrically caused injury (electric shock).  Sub-clause 5.4.12 includes <i>general requirements</i> (5.4.12.1), <i>electric strength requirements</i> (5.4.12.2), and <i>compatibility of insulating liquid with other safeguards, such as solid insulation</i> (5.4.12.3). Additional requirements (5.4.12.4) address any containers containing insulating liquids, such as having pressure relief, and the need for special considerations if the insulating liquid is a hazardous substance.	Minor (+). See 4.4.4.
<b>5.5.2.2 Capacitor discharge after disconnection of a connector</b>	Clarifies that a resistor, or a group of resistors used as a safeguard against capacitor discharge are not subjected to simulated single fault conditions if the resistor or the group of resistors complies with 5.5.6.	Minor (+). See 5.5.6.

<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	This is an important clarification since the requirements and practice in IEC 60065 and IEC 60950-1 are not the same.	
<b>5.5.6 Resistors</b>	<p>In AV/ICT applications, resistors are used as a safeguard for a variety of applications, including in capacitor discharge, EMI (bridging reinforced insulation), antenna discharge and similar constructions/applications.</p> <p>In IEC 60065 and IEC 60950-1 the minimum requirements for such resistors used in such applications were not consistent, so considerable effort has been made to both refine and substantiate the requirements in IEC 62368-1. The considerable rewrite of 5.5.6 and Table 29 is a result of this effort.</p> <p>Now, in 5.5.6 and Table 29, there is clarification of application and specific test conditions (with references to Annex G.10), which should help with the more consistent application of requirements.</p> <p>A key impact will be that (bleeding) resistors used as a capacitor discharge safeguard now will be subjected to overload testing per G.10.6.</p>	<p>Considerable (+). The modifications to 5.5.6 are considerable in nature since many AV/ICT products have EMI components. However, overall there likely will be varying impact on the variety of equipment covered by the Standard. Although it is expected that most constructions do comply with the stated requirements, the fact that 60065 and 60950-1 had different requirements, means that some constructions now will have to be tested that were not tested in the past even though it is expected most constructions will comply.</p>
<b>5.5.7 SPDs</b>	Clarifies that a varistor between line and neutral is to comply with Annex G.8.	<p>Minor (+). Generally, reflects present practice.</p>
<b>5.5.9 Safeguards for socket-outlets in outdoor equipment</b>	Consistent with a new requirement that had been added to Ed. No. 2 of IEC 60950-22 for outdoor equipment, 5.5.9 now requires that for outdoor equipment, a residual current protective device (RCD) with a rated residual operating current not exceeding 30 mA is to be used in the mains supply to socket-outlets intended for general use. The RCD may be an integral part of the outdoor equipment or may be part of the building installation.	<p>None. This requirement (necessitating use of a GFCI, typically Class A or C) has been a standing requirement for CSA/UL 60950-1 for many years. Combined with the more recent inclusion in IEC 60950-22 of a similar requirement, the impact likely is to be minimal.</p>

<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>CAN/U.S. ND</b>	Mains socket outlets (receptacles), rated 125-V, single phase, 15- or 20-A, accessible to either ordinary, instructed, or skilled persons, are required to be provided with GFCI Protection for Personnel if the equipment containing the receptacles is installed outdoors.	None. These National Differences have their origin without considerable modification in CSA/UL 60950-22.
<b>5.6.2.1 Requirements for protective conductors – General requirements</b>	Since legacy construction requirements for studs or screws with multiple protective conductors (e.g., earthing and bonding) were not carried over from IEC 60065 and IEC 60950-1, the omission was causing confusion. A requirement has been added that reflects present practice.	Minor (+). Reflects present practice.
<b>5.6.8 Functional earthing</b>	<p>Functional earthing has been a construction covered under IEC 60950-1 for many years (typically is used to allow manufacturers comply with EMI/EMC requirements). However, it was something not covered in detail in the first two editions of IEC 62368-1. To remedy this, requirements for functional earthing have been placed in new 5.6.8.</p> <p>Essentially, it requires, if a protective earthing conductor in the mains supply cord is only used for establishing functional earthing:</p> <ul style="list-style-type: none"> <li>– the requirements for conductor size per G.7.2 apply to the earthing conductor of the mains supply cord; and</li> <li>– the marking for class II equipment with functional earthing shall be used per F.3.6.2: and</li> <li>– the appliance inlet, if used, shall comply with the creepage distance and clearance requirements for double insulation or reinforced insulation.</li> </ul>	Minor (+). Consistent with IEC 60950-1.
<b>5.7.4 Prospective touch voltage, touch current and protective conductor current - Unearthed Accessible Parts</b>	Although Ed. No. 2 had requirements for measuring touch current from earthed accessible parts, there has been some confusion on how to treat <i>unearthed accessible parts</i> . To address this confusion, a new sub-clause has been added to clarify application.	Minor (+). Generally, reflects present practice.

<b>Clause 5 (Electrically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>5.7.6 Requirements when touch current exceeds ES2 limits</b>	<p>Numerous modifications have been made to 5.7.6, primarily to clarify the intent and make it more user-friendly.</p> <p>However, additionally, if the touch current exceeds 10 ma, the manufacturer now is required to indicate the value of the protective conductor current in the installation instructions. This information is intended to be used at the installation site if it could impact external wiring and protective features.</p>	Minor (+). Clarifications.
<b>5.7.7.1 Prospective touch voltage and touch current associated with external circuits - Touch current from coaxial cables</b>	<p>Clarification added that instructions on connecting the shield of the coaxial cable to the building earth only is required if lack of such connection is likely to create a hazard.</p> <p>However, the lack of criteria to determine whether a hazard is likely to occur could continue to cause some confusion, resulting in inconsistent application.</p>	Minor (-). Clarification.
<b>5.8 Backfeed safeguard in battery backed up supplies</b>	<p>A new requirement with accompanying compliance criteria has been added into Ed. No. 3 that a battery backed up supply capable of backfeeding is required to prevent greater than ES1 from being present on the mains (a.c. or d.c.) terminals after interruption of the mains power.</p> <p>These requirements are similar to requirements found in UPS and load transfer (switch) equipment standards. However, <i>uninterruptible power supplies (UPS)</i> and transfer switches remain outside the scope of IEC 62368-1.</p>	Considerable (+). Although backfeed requirements have not been in 60950-1 or 62368-1 before now, UL practice has been to supplement the requirements with requirements from the UL 1778 UPS standard, which is consistent with these requirements. However, there is some precedent by some NCBs to not supplement 60950-1 with additional requirements, so the impact on some equipment could be considerable if the required safeguards have not been incorporated into the equipment in the past.

Clause 6 (Electrically-caused fire)		
Sub-clause	Discussion	Impact
<b>6.2.2.3</b> Power source circuit classifications - Power measurement for worst-case source fault	Clarifies equipment containing audio amplifiers is to be tested under abnormal operating conditions as specified in Clause E.3.	Minor (+). Consistent with present practice.
<b>6.2.3.2</b> Classification of potential ignition sources - Resistive PIS	To align with measurements made under normal operating conditions, a resistive PIS is determined by the amount of power that is <i>dissipated</i> in a part (to be classified as PIS) in a PS2 or PS3 circuit under a single fault condition of an electronic circuit, regulator, etc., and is <b>not</b> the <i>maximum available power</i> to the part as a result of the fault.	Minor (-). Change should promote more consistency and may result in fewer locations being considered a resistive PIS.
	Also, for practical consideration, the first three (3) seconds may be disregarded immediately after the introduction of the fault if electronic circuits, regulators or PTC devices are used.	Minor (-). Change may result in fewer locations being considered a resistive PIS.
<b>6.3.1</b> Safeguards against fire under normal operating conditions and abnormal operating conditions – Requirements	For combustible materials that are not located inside a fire enclosure, including electrical and mechanical enclosures, and decorative parts, they now may be qualified using a Glow-Wire test at 550 °C according to IEC 60695-2-11 (as an alternative to HB class testing).	Minor (-). Provides manufacturers with additional options, aligned with a level of requirements that previously were in IEC 60950-1.
	Parts with a mass less than 4 g of combustible material now are exempted.	Minor (-). Provides manufacturers with an additional option.
	Optical lenses are now exempted.	Minor (-). Consistent with present practice.
<b>6.4.3.1</b> Reduction of the likelihood of ignition under single fault conditions in PS2	This sub-clause has been restructured to reflect the intent of IEC TC108 that the conditions specified in it are normative and not options to demonstrate compliance. This is especially important for the first dashed paragraph “- providing separation from an arcing PIS or a	Minor (+). Since there was not wide application of Ed. Nos. 1 & 2, there likely will be relatively minor impact due to inconsistent

<b>Clause 6 (Electrically-caused fire)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>circuits and PS3 circuits - Requirements</b>	<p>resistive PIS shall be separated as specified in 6.4.7.” This change results in <u>both</u> single fault testing <u>and</u> PIS separation being required for the "reduce the likelihood of ignition" path, which was not always the interpretation of the same requirement in Ed. Nos. 1 and 2.</p> <p>See IEC TR 62368-2, 6.4.3.1 and Figure 21 for additional information.</p>	<p>interpretations of this sub-clause in the past. However, these changes and more recent dialogue within IEC TC108 to clarify intent, should promote more consistency on application.</p>
	<p>Also, a clarification has been added that an arcing PIS or a resistive PIS shall be separated as specified in 6.4.7 with the accessible outer surface of the equipment considered to be covered with a combustible material.</p>	<p>Minor (+). Clarification, but might be considered more onerous than present practice.</p>
<b>6.4.5.2 Control of fire spread in PS2 circuits – Requirements</b>	<p>Parts having a size of less than 1 750 mm<sup>3</sup> are exempt from the V-2 or better requirement.</p>	<p>Minor (-). Provides additional option.</p>
	<p>Another option is available for qualifying flammability of components, allowing for components not to ignite during single fault conditions as specified in 6.4.3.2.</p>	<p>Minor (-). Provides an additional option.</p>
	<p>Regarding wire insulation, a change has been made to 6.5.1 to address challenges manufacturers are having securing wiring that complies with IEC 60332-1-2, IEC 60332-1-3, IEC 60332-2-2, or IEC/TS 60695-11-21.</p> <p>In 6.5.1, the words “... or equivalent” have been added after the references to these standards, along with a Note, “Wire complying with UL 2556 VW-1 is considered to comply with these requirements.” This change should help manufacturers more clearly source wiring that meets the intent of IEC 62368-1.</p> <p>Since the change in 6.5.1 has universal applicability throughout Clause 6, a simple reference to 6.5.1 for wire insulation has been</p>	<p>Considerable (-). Since there are large volumes of wiring and cable that meet the VW-1 designation, this change should be a relief to manufacturers. See 6.5.1</p>



<b>Clause 6 (Electrically-caused fire)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	made in 6.4.5.2 instead of referencing the individual IEC standards.	
	Also, for some materials and parts not separated from a PIS according to 6.4.7, they are to be subjected to single fault testing per 6.4.3.2. These parts include, supplies, consumable materials, media, recording materials, and parts required to have particular properties in order to perform intended functions, such as synthetic rubber rollers, ink tubes, and materials requiring optical characteristics.	Minor (-). Provide an additional performance option.
<b>6.4.6 Control of fire spread in a PS3 circuit</b>	Parts with a mass of combustible material less than 4 g now are exempted.	Minor (-). Provides manufacturers with an additional option.
	See 6.4.5.2 and 6.5.1 for a new VW-1 equivalency allowance for the requirement that wire needs to meet the flammability requirements in IEC 60332-1-2, IEC 60332-1-3, IEC 60332-2-2, or IEC/TS 60695-11-21.	Considerable (-). Since there are large volumes of wiring and cable that meet the VW-1 designation, this change should be a relief to manufacturers. See 6.5.1.
	Where reference to HB materials are made, the glow-wire test at 550 °C according to IEC 60695-2-11 is another option.	Minor (-). Provides manufacturers with an additional option.
<b>6.4.7.1 Separation of combustible materials from a PIS - General</b>	Existing second paragraph revised to help clarify that the additional requirements for a fire enclosure or a fire barrier of combustible material in 6.4.6.4 only apply for parts specifically located within 13 mm of an arcing PIS or 5 mm of a resistive PIS.	Minor (-). Clarification. Will promote consistent application of requirements.
<b>6.4.7.2 Separation by distance</b>	The consideration of effect of <i>airflow</i> on fire cone orientation has been removed from Ed. No. 3 because the principles behind the requirement were never confirmed via validation testing and the requirements were very difficult to apply consistently in practice.	Considerable (-). Will simplify application of 6.4.7.2 fire cone considerations.
	Parts having a volume less than 1 750 mm <sup>3</sup> now are exempted from PIS separation requirements.	Minor (-). Provides manufacturers with an additional option.

<b>Clause 6 (Electrically-caused fire)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	Parts with a mass of combustible material less than 4 g now are exempted.	Minor (-). Provides manufacturers with an additional option.
<b>6.4.8.2.2 Fire enclosure and fire barrier material properties - Requirements for a fire enclosure</b>	The sub-clause has been restructured to read better and promote consistency.	Minor (-). Mostly editorial.
<b>6.4.8.3.1 Constructional requirements for a fire enclosure and fire barrier – Fire enclosure and fire barrier openings</b>	<p>The Ed. No. 2 requirements for top, bottom and side openings for fire enclosures were reviewed by an IEC TC108 HBSDT task group to address the considerable impact they were having on products, previously compliant with IEC 60950-1, but which require large volumes of air flow to comply with performance and energy efficiency requirements (such as enterprise servers installed in data centers, but other types of products have been impacted also).</p> <p>The output of the task group resulted in various changes within 6.4.8.3, including a clarification of what constitutes top, side and bottom openings, as illustrated in new Figure 40.</p> <p>Requirements now include clarification that the determination of top openings, side openings and bottom openings is to be done in accordance with Figure 40, taking into account all possible orientations of use (also see 4.1.6).</p>	Considerable (-). Changes to 6.4.8.3.1 will promote consistent and more practical identification of what constitutes a top, side and bottom opening in the context of 62368-1.
<b>6.4.8.3.3 Top openings and top opening properties</b>	Provides further clarification on what openings are considered top and side openings, and which requirements apply, including provision that such openings that fall within the Figure 41 fire cone are subjected to testing per Annex S.2.	Considerable (-). In conjunction with 6.4.8.3.1 and 6.4.8.3.4, will promote consistent application of requirements.
<b>6.4.8.3.4 Bottom openings and bottom opening properties</b>	Provides further clarification on what are considered bottom openings and which requirements apply.	Considerable (-). In conjunction with 6.4.8.3.1 and 6.4.8.3.3, will promote consistent application of requirements.

<b>Clause 6 (Electrically-caused fire)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	For IEC 60950-1, meshed screens and perforated plates sometimes were used to comply with bottom opening requirements. These requirements, including previous Tables 34 and 35, have been removed from Ed. No. 3 since the dimensions and sizes associated with these constructions are viewed as already being covered by the basic bottom opening requirements in 6.4.8.3.4, for example, 3 mm in any dimension, or 1 mm in width regardless of length. Additionally, the baffled plate construction (Figure 43) originally from 60950-1 now also has been included.	Minor (-). Will promote consistent application of requirements.
<b>6.4.8.3.5 Side openings and side opening properties</b>	A key output of the task group that worked on sub-clause 6.4.8.3 was the reintroduction of the side openings requirements from IEC 60950-1 that were based on consideration of a 5-degree downward projection of combustible materials. This resulted in additional material being added into 6.4.8.3.5 and a new Figure 44, which should aid in consistent application.	Considerable (-). The reintroduction of the 5-degree principle from IEC 60950-1 will result in considerable relief to manufacturers who were struggling to meet the side opening requirements in Ed. No. 2 of IEC 62368-1.
<b>6.4.8.4 Separation of a PIS from a fire enclosure and a fire barrier</b>	Clarifies a <i>fire barrier</i> made of VTM-0 class material also may be used. However, the fire enclosure requirement remains unchanged.	Minor (-). Provides manufacturers with an additional option.
<b>6.4.9 Flammability of insulating liquid</b>	Since requirements for insulating liquids now are included in IEC 62368-1, consideration of the flammability of the insulating liquid also have been added to Clause 6.  To demonstrate compliance, the liquid should not have an auto ignition temperature less than 300 C as determined by ISO 871 or similar national standard (for example ASTM E659-84); and, shall not flash, or shall have a flashpoint higher than 135 C determined by ISO 2719 using Pensky-Martens closed cup method (or a national 4538 standard for example ASTM D93), or by the Small Scale closed cup method by ISO	Minor (+). Although it is expected that most of the insulating liquids and oils being used in AV/ICT equipment will meet the new requirements, since the requirements were not specified in the Standard previously, the impact of the requirements involve new testing. However, very few product types will be affected.

<b>Clause 6 (Electrically-caused fire)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	<p>3679 and 3680 (or national standards for example ASTM D3828 and ASTM D3278).</p> <p>For oil-based liquids, if the transformer oil, silicon oil, mineral oil or other similar oil is used as insulating liquid, the oil is required to comply with the flash point, fire point or flammability requirements of the applicable IEC standard. Table 34 lists the IEC standards.</p> <p>Finally, components in contact with an insulating liquid are not allowed to have temperatures exceeding the flashpoint of the insulating liquid.</p>	
<b>6.5.1 Internal and external wiring - General requirements</b>	Equivalency statement added to allow use of VW-1 rated wiring per UL 2556 to meet the flammability requirements in IEC 60332-1-2, IEC 60332-1-3, IEC 60332-2-2, or IEC/TS 60695-11-21.	Considerable (-). Since there are large volumes of wiring and cable that meet the VW-1 designation, this change should be a relief to manufacturers.
<b>6.5.3 Internal wiring for socket-outlets</b>	Added to the requirements for internal and external wiring is a new requirement that internal wiring for socket-outlets or appliance outlets providing <b>mains</b> power to other equipment is to have a nominal cross-sectional area at least as specified in Table G.7.	Minor (+). New requirement, but considered likely to be consistent with present practice.
<b>6.6 Safeguards against fire due to the connection of additional equipment</b>	Rewritten for clarity and provides a provision that the specified limits do not apply to outputs of audio amplifiers.	Minor (-). Reflects present practice.

<b>Clause 7 (Injury caused by hazardous substances)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>7.1 General</b>	Informative note added that the classification of other possible hazardous substances not addressed in Clause 7 are not covered by this standard, in part since in many regions of the world different legislation apply, such as	None. Informative Note.

<b>Clause 7 (Injury caused by hazardous substances)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	Restriction of Hazardous Substances. More background is in TR 62368-2.	

<b>Clause 8 (Mechanically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>8.2.1 Mechanical energy source classifications – General classification</b>	In Table 35, line 5, equipment mass, a clarification has been added as a new condition 'f' that the mass of consumables is intended to be considered into the energy source classification.	Minor (+). Clarification, but generally consistent with industry practice.
	In Table 35, line 6, wall or ceiling mount, the description has been modified to include 'other structure' to allow for consideration of equipment mounted on poles and other surfaces.	Minor (+). Clarification, but generally consistent with industry practice.
<b>8.4.1 Safeguards against parts with sharp edges and corners – Requirements</b>	Clarifies that the considerations in this sub-clause only apply to those parts (sharp edges) classified as MS 2 or MS3, i.e., potential for pain, or injury requiring hospital attention.	Minor. Clarification, but generally consistent with industry practice.
<b>8.5.1 Safeguards against moving parts – Requirements</b>	Clarifies differences in requirements for MS2 and MS3 moving parts that are required to be accessible due to the function of the equipment.	Minor (+). Clarification, but generally consistent with industry practice.
	Due to the integration of 60950-23 in this edition, this sub-clause now provides requirements for manually activated stopping device generally consistent with what was required in IEC 60950-23.	Minor (+). Generally consistent with industry practice.
<b>8.5.4 Special categories of equipment comprising containing moving parts</b>	Sub-clause 8.5.4 is the main content incorporation of IEC 60950-23 into IEC 62368-1 since -23 primarily addressed mechanical hazards (energy sources).  Sub-clause 8.5.4.1 is broken into the following sub-clauses, 8.5.4.1 – General	Minor (+). Since the requirements are consistent with what was required in IEC 60950-23, the impact on manufacturers producing equipment covered by the

<b>Clause 8 (Mechanically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	<p>8.5.4.2 – Equipment containing work cells with MS3 parts</p> <p>8.5.4.2.1 - Protection of persons in the work cell</p> <p>8.5.4.2.2 - Access Protection Override</p> <p>8.5.4.2.3 - Emergency stop system</p> <p>8.5.4.2.4 - Endurance requirements</p>	requirements likely will be minor.
<b>8.6.1 Stability of equipment - Requirements</b>	<p>A static stability test now is required instead of the horizontal force test for class MS2 equipment with front mounted accessible user controls and equipment having displays with moving images likely to be used in the home or similar installation environments where the equipment may be accessible to children (aka, TV, but possibly other equipment).</p> <p>This change is attempting to address stability of TVs and similar equipment that may be placed on top of a dresser or similar furniture and that may easily topple onto children if unstable.</p>	<p>Minor (+).</p> <p>It is anticipated that some designs of TVs may need to be altered to comply with this modified application of stability requirements.</p>
	<p>Table 36 now refers to a defined term, <i>Fixed Equipment</i>, rather than just the word, <i>Fixed</i>. This change, and the new term/definition for Fixed Equipment, will help with the consistent application of the associated requirements.</p>	<p>Minor (-).</p> <p>Clarification.</p>
	<p>A clarification has been added to Table 36 that the glass slide test is not applicable to floor standing equipment even when the equipment may have controls or a display.</p>	Minor (-).
	<p>In an effort to place additional emphasis on the importance of following instructional safeguards for placement and mounting of TVs to prevent injury, especially to children, the example text has been made more unambiguous.</p>	<p>Minor (+).</p> <p>Some instructions associated with TVs likely will need to be updated.</p>
<b>8.6.2.2 Static stability - Static stability test</b>	<p>The requirements for static stability have been restructured and refined to make the requirements clearer and more closely aligned with actual conditions likely to be encountered.</p>	<p>Minor (+).</p> <p>The requirements have been changed, but it is expected equipment that complied previously will continue to comply.</p>

<b>Clause 8 (Mechanically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	For the test option where the equipment is placed on a horizontal non-skid surface and subjected to a force equal to 50 % of the weight of the unit vertical downwards, but not more than 100 N, a new provision has been added that “If, during the test, the supporting surface prevents the equipment from overturning, the test shall be repeated such that the supporting surface is not used to pass the test.” This provision was mainly added to prevent acceptance of inherently unstable large TVs and monitors.	Minor (+). Clarification, but may be more onerous for some constructions.
<b>8.6.5 Horizontal force test and compliance criteria</b>	The applied horizontal force considerations have been revised from 13% to 20% of the weight of the equipment, and from 100 N to 250 N maximum value. The value that is less is used.	Minor (+). The requirements have been adjusted to make them more onerous and it is anticipated some designs may need to be altered to comply.
<b>8.7.1 Equipment mounted to a wall, ceiling or other structure - Requirements</b>	Aligned with Table 36, line 6, wall or ceiling mount, the wording has been modified to include ‘other structure’ (such as a pole or tower) to allow for consideration of equipment mounted on poles and other surfaces.  Additional test clarifications have been added to all three tests.	Minor (+). Clarification of intent, and it is expected that equipment that complied previously will continue to comply.
<b>8.8.1 Handle strength - General</b>	As a result of some confusion on what constitutes a “handle” in the application of this sub-clause, additional refinement has been made to the requirements and compliance criteria.	Minor. Clarification.
<b>8.9.1 Wheels or casters attachment requirements - General</b>	Clarifies, when equipment is intended to be used with carts, stands and similar carriers provided with wheels or casters, the classification is applied using the combined mass.	Minor (+). Clarification - it is expected that equipment that complied previously will continue to comply.
<b>8.11 Mounting means for slide-rail mounted equipment (SRME)</b>	Further refinement of requirements for SRME, mainly clarification in 8.11.2 about application of the tests during installation and service conditions. Also includes the need for, and content for instructional safeguards. The sub-clause titles in 8.11.3 also have been revised to	Minor (+). Most of the changes are refinements, and it is expected that equipment that complied previously will continue to comply.

<b>Clause 8 (Mechanically-caused injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	provide more accurate descriptions of the requirements in each sub-clause.	

<b>Clause 9 (Thermal burn injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>9.3 Touch Temperature Limits</b>	<p>Several key changes have been made to Touch Temperature requirements in 9.3.</p> <p>The requirements for parts required to get hot for proper function of the equipment have been taken out as conditions in Table 38 and placed in 9.4, with additional modification that such considerations are allowed for both internal and external parts if required for proper function of the equipment. This change makes IEC 62368-1 more compatible with 3D printers and other products that may have such accessible parts.</p> <p>Additionally, for purposes of touch temperature measurements, 9.3.2 (touch method and compliance criteria) has been further modified to make even clearer that such measurements are taken in a room ambient of 25 +/- 5° C. This is important for touch temperature measurements since the limits are taken from IEC Guide 117, and the limits in this guide are based on research and testing conducted at a 25° C ambient. Although this condition already was in Ed. No. 2, often it had been overlooked.</p>	<p>Minor (+). The refinements to 9.3 make the requirements more realistic to apply to modern AV/ICT equipment and do not involve new requirements.</p>
	To better accommodate wearable technology, a new row has been added to Table 38, with an accompanying condition that provides details on the application of touch temperature requirements to such devices, allowing normal operating temperatures in the range of 43-48°C.	<p>Minor. Clarified intended application of touch temperature requirements to wearable devices.</p>
<b>9.3.1 Requirements</b>	New allowance has been added for devices/parts with Small Heat Capacity (considerations per IEC Guide 117) instead of Table 38.	<p>Minor (-). Helpful option for manufacturers needing more compliance options, and who are willing to take</p>



<b>Clause 9 (Thermal burn injury)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
		the time to determine and document compliance with the principles of IEC Guide 117.
<b>9.4 Safeguards against thermal energy sources</b>	The requirements in Table 38 for high temperature parts required to be accessible for the function of the equipment have been removed as condition to Table 38 and into normative material in 9.4, with a broadening of allowed application to include both internal and external parts, subject to several conditions. This will allow 62368-1 to better accommodate 3D printing equipment and other equipment covered under its scope.	Minor (-). Allows manufacturers more flexibility demonstrating compliance with the principles and requirements of 62368-1.
<b>9.6 Requirements for wireless power transmitters</b>	New to Ed. No. 3 is sub-clause 9.6 containing requirements for wireless power transmitters, in particular thermal measurement on metallic foreign objects to determine that they do not exceed limits for 70°C when they are placed in the transmission field at full power.	Minor (+). Although a new requirement for Ed. No. 3, the requirements are derived from the adopted industry specifications for wireless power transmitters, so it is anticipated that most constructions subjected to the tests will comply since they already are being designed to meet industry standards.

<b>Clause 10 (Radiation)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
<b>10.2 Radiation energy source classifications</b>	For lasers and lamps, rather than attempt to force-fit the energy levels from the horizontal standards (IEC 60825, IEC 62471) into the RS1, RS2 and RS3 limits in IEC 62368-1, a decision was made to rely on the established classifications in these horizontal standards. Therefore, Table 39 has been revised and restructured accordingly. Additionally, since IEC 62471-5 recently has been published for laser illuminated projectors, additional changes have been incorporated into	Minor (-). Clarification.

<b>Clause 10 (Radiation)</b>		
<b>Sub-clause</b>	<b>Discussion</b>	<b>Impact</b>
	Table 39 to accommodate this type of equipment.	
	It is noted, condition 'b' of Table 39 requires that 'abnormal operating' and 'single fault' conditions shall be taken into account for classifying the risk group per IEC 62471 although IEC 62471 only requires such measurements under normal operating conditions. Therefore, some classifications in components/assemblies that are pre-selected as IEC 62471-compliant may require additional investigation within a system investigated to 62368-1.	Minor (+). There are not a lot of lamps investigated in AV/ICT that are likely to be impacted by this requirement, especially if the lamp is a type indicated as exempt in condition 'b'. However, some likely could be impacted, including lamps with ultra-violet radiation.
	Also, for personal music players, a condition has been added to Table 39 clarifying that fault testing measurements are not required for listening devices and personal music players to ensure compliance to RS1 and RS2 limits. This was done due to the nature of the energy and the practicality of considering such faults.	Minor (-). Clarification.
<b>10.2.2 RS1</b>	Since unique considerations are considered into the RS1 classification for x-radiation sources and acoustic radiation sources, this sub-clause has been modified to provide these specific considerations for each.	Minor. Clarification.
<b>10.3 Safeguards against laser radiation</b>	Refinement has been made to 10.3 to clarify that although the horizontal standards for laser radiation (e.g., IEC 60825) are applicable, including measurement and classification, the specific requirements in this standard (62368-1) for safeguards, operating conditions and safety interlocks remain applicable.  Also, a clarification has been included that laser equipment intended for use by an <i>ordinary person</i> or an <i>instructed person</i> shall not be Class 3B or Class 4.	Minor. Clarifications that reflect general practice.
<b>10.4 Safeguards against optical radiation from lamps and lamp</b>	Sub-clause 10.4 has been extensively rewritten to clarify the requirements for radiation resulting from lamps. Since the IEC 62471 series standards cover a variety of radiation sources, 10.4 and Table 40 have been revised to more	Minor (+). Many of the requirements in 10.4 are stated in the Standard for the first time, but since they are derived

Clause 10 (Radiation)		
Sub-clause	Discussion	Impact
<b>systems (including LED types)</b>	clearly indicate how to address each form of radiation energy source. The requirements are broken up into <i>General</i> (10.4.1), <i>Requirements for enclosures</i> (10.4.2) and <i>Instructional Safeguards</i> (10.4.3), including extensive supporting information in Tables 41 & 42, and Figure 48.	from the horizontal standards, it is expected that manufacturers generally can accommodate to the changes without considerable impact.
<b>10.6 Safeguards against acoustic energy sources</b>	For safeguarding against acoustic energy, industry is transitioning to the <i>dose measurement</i> method as given in 10.6.3. This sub-clause has been modified considerably to include this method.	Minor. Provides another method for classifying acoustic energy sources.
<b>CENELEC ND</b>	Contains various modifications throughout the sub-clauses within 10.6 to comply with European acoustic energy source regulations for personal music players (PMPs).	Minor (+). For most PMPs there is not expected to be a considerable impact since this common modification has been carried over from EN 62368-1:2014.

Annexes		
	Discussion	Impact
<b>Annex A Examples of equipment within the scope of this document</b>	IEC TC108 made a commitment in Ed. Nos. 1 & 2 not to modify Annex A and deviate from the examples extracted from the scopes of IEC 60065 and IEC 60950-1. This was done to limit any confusion on what the new 62368-1 standard covers and does not cover compared to 60065 & 60950-1. However, since there has been a need to update the Annex A examples to provide more modern examples of AV/ICT equipment, changes are being incorporated into Ed. No. 3.  The additional examples include, <i>network surveillance cameras, tablets, smart phones, wearable devices, 3D printers, and electronic kiosks.</i>	None. Informative examples but will help provide clarification on types of equipment intended to be covered under the standard's scope.

Annexes		
	Discussion	Impact
<b>B.3.2 Simulated abnormal operating conditions - Covering of ventilation openings</b>	Cardboard is an example of a type of 'card' that can be used to cover ventilation for testing purposes, but is not exclusively required. Also, the card's specification is made less precise and changed to a "... minimum density of 200 g/m <sup>2</sup> ."	Minor (-). Clarification.
<b>B.4.4 Simulated single fault conditions - Functional insulation</b>	For <i>Clearances</i> (B.4.4.1) and <i>Creepage Distances</i> (B.4.4.2) associated with Functional Insulation, a reference to IEC 60664-1 Table F.4 has been added as another prescriptive option (when clearances and creepage distances are designed for equivalency to basic insulation to avoid the need for performance testing).	Minor (-). Provides manufacturers with another option.
<b>B.4.8 Compliance criteria before and after single fault conditions</b>	Clarifies that insulation serving as a safeguard is required to withstand an electric strength test after single fault testing.	Minor (+). Generally, reflects present practice.
	Requirements addressing the opening of a trace on a printed board as a result of single fault testing has been moved from Clause 6 (6.4.3.2) into B.4.8, with an added clarification that such fault condition testing is repeated three (3) times.	Minor (+). Generally, reflects present practice.
<b>C.1.2 Protection of materials in equipment from UV radiation - requirements</b>	Clarification, the requirements in Annex C apply only to equipment, or parts of equipment, that are exposed to lamps that produce significant UV radiation in the spectrum 180 nm to 400 nm, as specified by the lamp manufacturer, and to outdoor equipment exposed to sunlight.	Minor. Generally, reflects present practice.
<b>C.2 UV light conditioning test</b>	Since the standards referenced in the exposure tests in C.2.3 (Carbon-arc-light) and C.2.4 (Xenon-arc-light) include water spray, the associated wording has been modified.	Minor (+). Aligns wording with test protocols in the referenced standards.

<b>Annexes</b>		
	<b>Discussion</b>	<b>Impact</b>
<b>F.3.1 Equipment markings – Equipment marking locations</b>	Clarifies that equipment mounted on a supporting structure may under some circumstances have markings that are not visible when mounted as long as they are visible once the equipment is not mounted.	Minor (-). Generally, reflects present practice.
<b>F.3.3.4 Equipment rating markings – rated voltage</b>	To supplement the existing requirement that equipment with more than one nominal voltage is required to have indication of the voltage at which the equipment is set when the equipment is shipped from the manufacturing facility, further clarification is provided that this indication may be in the installation instructions or provided at any location on the equipment, including inside the equipment, if the equipment is installed by a skilled person.	Minor (-). Generally, reflects present practice.
<b>F.3.3.6 Rated current or rated power</b>	New clarification added that equipment with a rated voltage range may be marked with either the maximum rated current or with the current range.	Minor (-). Generally, reflects present practice.
<b>F.3.3.7 Equipment with multiple supply connections</b>	Clarifies that equipment with multiple mains supplies may have one marking, regardless of the number of supplies, when the mains connections are identical.	Minor (-). Generally, reflects present practice.
<b>F.3.6.2 Equipment markings related to equipment classification - Equipment class marking</b>	Refinements and clarification that equipment provided with protective earthing to other equipment cannot be classified Class II.	Minor. Reflects present practice.
<b>F.3.7 Equipment IP rating marking  CAN/UL ND</b>	Outdoor enclosures additionally are required to be classified and marked in accordance with UL 50 or UL 50E, or CSA C22.2 No. 94.1 or CSA C22.2 No. 94.2.	None. These National Differences have their origin without considerable modification in CSA/UL 60950-22.
<b>F.3.8 External power supply output marking</b>	Clarifies a polarity marking is not required when the connector that prevent reverse polarity.	Minor (-). Generally, reflects present practice.
<b>F.4 Instructions</b>	For equipment with an insulating liquid, safety information on the liquid is required to be provided.	Minor (+). Generally, reflects present practice.

<b>Annexes</b>		
	<b>Discussion</b>	<b>Impact</b>
	For outdoor equipment, any special protection features needed for operation/use are required to be provided.	Minor (+). Generally, reflects present practice.
<b>F.5 Instructional Safeguards</b>	When multiple parts require an instructional safeguard, a single instructional safeguard may cover several parts, provided the parts are closely located near each other.  If the parts are not easily identifiable, or are not located adjacent to the instructional safeguard, an accompanying document or the instruction manual is to show the locations of these parts (for example, exploded view).	Minor (-). Provides additional options to the manufacturer.
<b>Annex G Components</b>		
<b>G.3.4 Protective devices - Overcurrent protective devices</b>	Clarification has been added that protective devices used as safeguards are required to have adequate breaking (rupturing) capacity to interrupt the maximum fault current (including short-circuit current) that can flow.	Minor (+). Clarification, but consistent with present practice.
<b>G.3.5.1 Safeguard components not mentioned in G.3.1 to G.3.4 – Requirements</b>	IEC 60269 for low voltage fuses, typically used in higher power applications, has been added as a reference as needing proper ratings and breaking capacity.	Minor (-). Provides additional option to manufacturers, but generally reflects present practice.
<b>G.4.2 Connectors – mains connectors</b>	IEC 60884-1 for plugs and socket-outlets for household and similar purposes, has been added as a reference standard for constructions not needing further evaluation as long as the component is used per its ratings for the purpose of interconnecting mains power.	Minor (-). Generally, reflects present practice.
<b>G.5.3.3.3 Transformer overload tests – Alternative test method</b>	Clarifies in the compliance criteria that the wrapping tissue on the wooden board shall not char or catch fire (in addition to the cheesecloth).	None. Generally, reflects present practice.
<b>G.5.3.4 Transformers using fully insulated winding wire (FIW)</b>	For transformers that use FIW, Annex G.5.3.4 contains the requirements applicable for such constructions, including component requirements for the FIW, requirements for	Minor (+). Use of FIW in AV/ICT power supplies is not common yet, so there will

Annexes		
	Discussion	Impact
	transformers with FIW used as basic insulation, requirements for transformer with FIW used as double or reinforced insulation, thermal cycling test, partial discharge test, and routine testing. The requirements are similar to those already incorporated by IEC TC 96 in their IEC 61558-2-16 (2009 + A1) standard, <i>Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units.</i>	be no impact on manufacturers until the use of such constructions becomes more common. The fact that these FIW requirements are aligned with IEC TC96 should help manufacturers of such transformers to accommodate multiple industry sectors.
<b>G.5.4.5.3 Running overload for DC motors – alternative method</b>	Clarifies in the compliance criteria that the wrapping tissue on the wooden board shall not char or catch fire (in addition to the cheesecloth).	None. Generally, reflects present practice.
<b>G.5.4.6.3 Locked rotor overload for DC motors – alternative method</b>	Clarifies in the compliance criteria that the wrapping tissue on the wooden board shall not char or catch fire (in addition to the cheesecloth).	None. Generally, reflects present practice.
<b>G.6.1 Wire insulation - General</b>	The following provision was removed since it was causing confusion: Spirally wrapped tape wound with not more than 50 % overlap is considered to constitute one layer. Spirally wrapped tape wound with more than 50 % overlap is considered to constitute two layers. However, the principle remains valid.	Minor. Provision was removed but principle remains.
<b>G.6.2 Enameled winding wire insulation</b>	Due to the introduction of FIW into IEC 62368-1 as an allowed construction, the requirements that specify when such enameled winding wire may be used needed updating.	Minor (-). Allow additional option for manufacturers.
<b>G.7.6 Supply wiring space – General requirements</b>	New Table G.9 (originally Table 3D from 60950-1) added to G.7.6 for convenience rather than reference another table.	Minor. Generally, reflects present practice.

<b>Annexes</b>		
	<b>Discussion</b>	<b>Impact</b>
<b>G.8.1 Varistors - General</b>	<p>Varistors complying with recently published IEC 61643-331:2017 have been added as an alternate option to the existing IEC 61051-2.</p> <p>Other details, such as preferred climatic categories, also have been updated.</p>	<p>Minor (-). Allows additional option for manufacturers.</p>
<b>G.8.2 Varistors - Safeguards against fire</b>	<p>There are a variety of considerations that are applicable when varistors are used in equipment as a safeguard. Considering the hazard-based nature of 62368-1, effort has been made to be clear on which considerations and requirements are associated with risk of electric shock, and when ones are associated with risk of fire. This sub-clause addresses the main requirements associated with risk of fire.</p> <p>The key change is that additional test according to G.8.2.2 and G.8.2.3 are required if the maximum continuous AC voltage of the varistor is not sized per the test exemptions in Table G.9.</p> <p>Also, per G.8.2.3, the test is performed on the circuit containing the varistor, not the varistor itself.</p>	<p>Minor (+). Some varistors not tested in the past will have to be subjected to overload and temporary overvoltage testing per G.8.2.2 and G.8.2.3 as summarized in Table G.9. The full extent of the impact will be determined as more products are tested to Ed. No. 3.</p>
<b>G.9 Integrated circuit (IC) current limiters</b>	<p>To help address the confusion with the choice of three (3) different test programs for IC current limiters found in Ed. No. 2, IEC TC108 formed a task group with an objective to take all three test programs and replace them with a single test program. Active on the ad hoc was representatives from an IC current limiter manufacturer. The task group attempted to eliminate redundant requirements, make the test program more efficient to perform, and present the program in a simplified form, via new Table G.10.</p>	<p>Minor (+). New investigations of IC current limiters will be subjected to a single test program.</p> <p>As documented in G.8 of IEC TR 62368-2, although the existing three test programs for IC current limiters have been replaced by one test program, the task group communicated a position that the refined requirements are compatible with the legacy test programs and legacy</p>



Annexes		
	Discussion	Impact
		components should not need to be retested.
<b>G.10 Resistors</b>	<p>As part of the HBSDT study of resistors used as safeguards and the identification of applicable requirements, it was identified that G.10 could use some refinement to better state the requirements, so G.10 has been rewritten.</p> <p>Additionally, coordinated with the revised 5.5.6, and overload test has been added to align requirements for resistors used as capacitive discharge safeguards (bleeder resistors), similar to the requirements in IEC 60065.</p>	<p>Minor (+). Refinement, which generally is consistent with practice. However, resistors used as capacitive discharge safeguards that were not tested in IEC 60950-1 now will be tested.</p>
<b>G.11 Capacitors and RC Units</b>	<p>Previous G.11.4, examples of the application of capacitors, and associated Tables G.12 – G.15, have been a source of confusion and disagreement. Therefore, they have been removed in Ed. No. 3, with a direct reference remaining to IEC 60384-14 and a renumbered Table G.12.</p> <p>However, Rule 1 to the table also has been revised to state,</p> <p>“The voltage rating of the capacitor shall be at least equal to the RMS working voltage across the insulation being bridged, determined according to 5.4.1.8.2. As an exception to the requirements in the table, one Y2 capacitor may be used in cases where 2,5 kV is required.”</p> <p>This ‘exception’ is provided to acknowledge an application that has a proven safety track record even though not aligned with IEC 60384-14.</p>	<p>Minor. Generally, reflects present practice, although the full impact on consistent application of removing the tables with examples is unknown.</p>
<b>G.15.2.3 Pressured liquid filled components – Tubing and fittings compatibility tests</b>	<p>Now allows for testing to be performed on a finished LFC assembly.</p>	<p>Minor (-). Provides another option for determining compliance.</p>

Annexes		
	Discussion	Impact
<b>G.16.2 IC that includes a capacitor discharge function (ICX) - Tests</b>	For the 10,000-cycle test of connection and disconnection of the mains, the test parameters of the resistor/capacitor combination have been modified to better reflect worse case conditions.	Minor (+). Although the test parameters have changed from earlier editions, the number of ICX devices investigated to these requirements has been limited.
<b>J.1 Insulated winding wires for use without interleaved insulation - General</b>	Although not identified in the red-line version of IEC 62368-1:2018, the scope of Annex J has been widened slightly to now allow for solid square and solid rectangular (flatwise bending) winding wires with cross-sectional areas of 0,03 mm <sup>2</sup> to 19,6 mm <sup>2</sup> .	None. Wider scope of wires that can be covered by Annex J.
<b>K.7 Safety interlocks - Interlock safety isolation</b>	The safety isolation requirements for safety interlock systems have caused some confusion the last few years as IEC 60950-1 and IEC 62368-1 attempted to refine the requirements and make them more compatible with principles in other parts of the standard. In particular the requirements for circuit elements outside component interlock devices needed clarification. The requirements have been rewritten in Ed. No. 3.	Minor (+). The restated requirements are intended to be refinements, but could impact some constructions more than others depending on the class of energy/potential hazard associated with the interlock system.
<b>Annex M Equipment containing batteries and their protection circuits</b>		
<b>M.1 General requirements</b>	Clarifies that only M.3 and M.10 apply to consumer grade, non-rechargeable carbon-zinc or alkaline batteries.	Minor (-). Needed clarification that reflects present practice.

Annexes		
	Discussion	Impact
<b>M.2.1 Safety of batteries and their cells - Requirements</b>	The list of component battery standards has been updated to the latest IEC 62133-1 (alkaline or other non-acid) & IEC 62133-2 (Lithium) structure, with continuing additional reference to IEC 62133 for transitional purposes.	Minor (+). Most of the changes will be accommodated by the cell and battery industry since manufacturers are following such developments closely.
	IEC 62619 has been added as a component battery standard for non-portable applications of secondary Lithium.	Minor (+). New requirements for batteries used in stationary, non-portable applications.  Note - May impact the current ND in CSA/UL 62368-1 that allowed for UL 1973 or UL 2054 or IEC 62133 until IEC 62619 was available as an IEC standard.
<b>M.3.1 Protection circuits for batteries within the equipment</b>	Clarifies that replaceable batteries (by an ordinary person) shall prevent reverse polarity installation if this could create a class 2 or class 3 energy source.	Minor (+). Generally, reflects present practice.
<b>M.3.2 Protection circuits for batteries provided within the equipment – Test method</b>	There has been an editorial modification to properly place in the sub-clause the test condition for unintentional charging of a non-rechargeable battery.	None. Editorial.
<b>M.4.2.1 Additional safeguards for equipment containing a portable secondary lithium battery - Charging safeguards – requirements</b>	Editorial modification on charging safeguard requirements to clarify intended application.	None. Editorial

Annexes		
	Discussion	Impact
<b>M.4.3 Fire enclosure</b>	<p>The current structure of M.4.3 was causing confusion on intended application, so it was rewritten to clarify that a fire enclosure is required. However, such a fire enclosure can be associated with either, a secondary lithium battery, or single cell, or combination of cells, or equipment containing the secondary lithium battery.</p> <p>However, batteries having single cells (in essence, a single cell) with PS1 outputs do not require a fire enclosure.</p>	<p>Minor (-). Generally, reflects present practice.</p> <p>However, there could be considerable (+) impact for some constructions previously investigated to Ed. No. 2 if M.4.3 was not applied as originally intended.</p>
<b>M.7 Risk of explosion from lead acid and NiCd batteries</b>	<p>As part of the determination whether battery ventilation is designed to maintain a suitable hydrogen concentration below the explosive hydrogen LEL threshold, new calculations and refinement of the existing performance test has been provided. As part of this effort, Table M. 1 provides the needed detail based on type of battery.</p>	<p>Minor (+). The changes in M.7 only impact a small percentage of manufacturers, and the origin of the requirements are other industry standards that address risk of explosion from lead acid and NiCd batteries. There will be some additional work required to determine compliance, but it is expected manufacturers will comply.</p>
<b>M.10 Instructions to provide reasonably foreseeable use</b>	<p>Although battery replacement instructions are justified as needing to be provided per the general provisions of Annex F, it was thought that more specificity would be helpful for equipment containing a battery that is replaceable by an ordinary person. Therefore, additional detail has been added to M.10.</p>	<p>Minor (+). May impact those constructions that are provided with instructions but do not include the details specified in M10.</p>
<b>Annex O Measurement of creepage distances and clearances</b>	<p>The TC responsible for IEC 60664-1 provided some feedback to IEC TC108 that they disagreed with the examples O.17 – O.20 in Annex O, so they have been removed from Annex O and future effort may be made to find suitable replacements.</p>	<p>Minor. Although the examples were normative, their removal should not impact the application of the standard significantly.</p>

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	<b>Discussion</b>	<b>Impact</b>
<b>Q.3</b> <b>Summary of requirements for Voltage, Current, Power and Marking requirements associated with paired conductor and coax communications cables wiring connected to building wiring</b>  <b>CAN/U.S. ND</b>	<p>At the request of the communication technology equipment industry, Annex Q.3 was added to Annex Q to summarize requirements from NFPA 70, NEC, that are required to be considered to allow for installation of ICT equipment per the NEC. Most of the individual requirements are covered elsewhere, such as in Annex DVA, but they are additionally summarized here for convenience.</p>	<p>Minor (+).  Most of these requirements are known to ICT equipment manufacturers, but there will be some adjustment as these requirements, as a suite, begin to be incorporated into ICT equipment designs and evaluated during investigations to this standard, especially to equipment with PoE (Article 725) &amp; coax (Chapter 8).</p>
<b>Annex S</b> <b>Tests for resistance to heat and fire</b>		
<b>S.1</b> <b>Flammability test for fire enclosure materials of equipment where the steady state power does not exceed 4000 W</b>	<p>The number (3) of test specimens has been clarified.</p>	<p>Minor (+).  May require additional test samples.</p>
<b>S.2 Flammability test for fire enclosure and fire barrier integrity</b>	<p>The number (3) of test specimens has been clarified.</p>	<p>Minor (+).  May require additional test samples.</p>
	<p>Also, to accommodate application of the test to top openings when referenced in Clause 6, a statement has been added that, "Top openings are covered with single layer of cheese cloth."</p> <p>Additionally, other details on the application of the test have been included, such as "The test flame is applied at a distance measured from the closest point of a PIS to the closest surface</p>	<p>Considerable (-).  Changes made to Clause 6 top opening requirements, with test method adjustments in Annex S, generally reflect a more practical application of top opening requirements and are less onerous than Ed.</p>

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	<p>point of the test specimen. The application of the flame is measured from the top of the needle flame burner to the closest surface point, see Figure S.1.”</p> <p>Note - There are various sub-clauses in Clause 6 that reference S.2 for needle-flame testing (including those associated with fire barrier integrity) and they all are not associated with top openings. Therefore, the changes made to the Cl. 11/IEC 60695-11-5 section of S.2 were overreaching since they now also impact those parts of S.2 that don't apply to top enclosure openings, which does not make sense. There likely will be the need for a corrigendum or interpretation until the requirements can be further revised in amendment 1. There also might be the need for some further adjustment of the sub-clause 9.3 / IEC 60695-11-5 section too. In the meantime, some practical application of the original intent of the requirements will be needed.</p>	<p>No. 2. When considered in combination with the other changes made in Clause 6 for top openings, these changes introduce considerable improvement of the overall practical application of 62368-1.</p>
<b>Annex T Mechanical strength tests</b>	<p>Corrections have been made to height of Annex T.7 drop tests.</p>	<p>Minor. Clarification.</p>
#	<p>[Note – In the previous CSA/UL 62368-1 version of the standard, the first paragraph of T.7 from IEC 62368-1 that identifies the number of samples and associated drops was inadvertently removed from the subclause. This omission has been corrected.]</p>	
	<p>Numerous questions have arisen about the application of the glass impact tests in Annex T.9, so effort was made to further refine and clarify the intended application of the requirements.</p>	<p>Minor (+). The changes may impact some manufacturers who have not had constructions tested in the past, but the resulting requirements are considered compatible with current designs.</p>

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<b>Annex W Comparison of terms introduced in this document</b>	Numerous editorial changes to Annex W have been made to update wording in alignment with the latest referenced documents and other adjustments.	None. Informative Annex.
<b>Annex X Alternative method for determining clearances for insulation in circuits connected to an a.c. mains not exceeding 420 V peak (300 V RMS)</b>	<p>Due to the complexity of clearance determinations per clause 5, some manufacturers desired to be able to use the existing clearances that have been stable for many years in IEC 60950-1.</p> <p>Since these 60950-1 clearances are a conservative application of the requirements in IEC 60664-1 (resulting in larger clearances), they have been incorporated into Annex X as another alternative to the more theoretical-based IEC 60664-1 methods. However, they only are permitted for equipment connected to mains voltages not exceeding 400 V peak (300 V r.m.s.) since this was the most common application - additional 60950-1 considerations that allowed for reducing clearances under special conditions (such as if subjected to a QA program) have not been carried over.</p>	Minor (-). For manufacturers not looking to minimize spacings, the existing 60950-based clearances will continue to meet their needs and provide another option for determining compliance with IEC 62368-1.
<b>Annex Y Construction requirements for outdoor enclosures</b>	<p>As indicated in Clause 1, Ed. No. 3 now incorporates in its base content (62368-1) the previous requirements that were in <i>IEC 60950-22, Outdoor ITE</i>. However, the requirements have been made hazard-based.</p> <p>In Annex Y are <i>General (Y.1)</i> requirements; and requirements for <i>resistance to UV radiation (Y.2)</i>; <i>UV light conditioning test (Y.3)</i>; <i>resistance to corrosion (Y.4)</i>; <i>gaskets (Y.5)</i>; <i>protection of equipment within an outdoor enclosure (Y.6)</i>, including <i>protection from moisture and dust</i>; and <i>mechanical strength of enclosures (Y.7)</i>.</p>	Minor (+). Generally, reflects present practice.

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<p><b>Annex DVA (1)</b> <b>Canadian &amp; US regulatory-based requirements</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Service Equipment</b></p> <p>Outdoor equipment Listed/Certified to CSA/UL 60950-1 &amp; 60950-22 in the past sometimes has included Listed/certified Service Equipment on its front end to allow for remote powering from other than a branch circuit. However, there never was a formal National Difference in the Standard.</p> <p>So that CSA/UL 62368-1, Third Edition can more formally permit such constructions, as other UL and CSA standards permit, Annex DVA was amended to allow the use of service equipment in AV/ICT Equipment. In particular, such equipment for control and protection of services and their installation must comply with Article 230 of the National Electrical Code (NEC), NFPA 70 and Section 6 of the Canadian Electrical Code, Part I, CSA C22.1. Also, the service equipment must be certified and marked as being suitable for use as service equipment.</p>	<p>Minor (+). Generally, reflects present practice when such service equipment has been associated with Outdoor ITE.</p>
<p><b>Annex DVA (1)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Storage Batteries</b></p> <p>The National Electrical Code (NEC), NFPA 70, covers requirements for <i>Storage Batteries</i> in Article 480. Specifically, the Scope of Article 480 states, “<i>This article applies to all stationary installations of storage batteries.</i>” In the 2017 NEC, new Section 480.3 states, “<i>480.3 Equipment. Storage batteries and battery management equipment shall be listed. This requirement shall not apply to lead-acid batteries.</i>”</p> <p>Clause 1 already has a National Difference (1DV.4.1 [DC]) addressing back-up (storage) batteries with a reference to UL 1973, <i>Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications</i>. Since new NEC 480.3 now adds a regulatory driver, additional</p>	<p>Minor (+). Change to NEC reflects present practice, but provides regulatory driver.</p>



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	material was added into regulatory annex (DVA) associated with such batteries, with additional modification of 1DV.4.1 for alignment.	
<p><b># Annex DVA (1)</b></p> <p><b>CAN/U.S. ND</b></p> <p><b>(Also, Annex DVA (Annex M))</b></p>	<p><b>Uninterruptible Power Supplies (UPS)</b></p> <p>NFPA 75-2020 contains a completely rewritten and expanded section <b>11.5, Uninterruptible Power Supplies (UPSs)</b>, which now covers, <b>UPS systems (11.5.1), Batteries (11.5.2), Lead-Acid and Nickel-Cadmium Batteries (11.5.3), Lithium-Ion Batteries (11.5.4), Other Battery Types (11.5.5).</b></p> <p>Although there is no direct impact on ICT equipment since CSA/UL 62368-1 does not cover UPS and external energy storage systems, due to the association of equipment covered by these new NEC requirements with ICT equipment installed in IT Equipment Rooms (Data Centers), a reference has been added to Annex DVA as helpful information to IT equipment manufacturers.</p>	<p>None.</p> <p>Installation requirements do not directly impact equipment under the scope of CSA/UL/IEC 62368-1 and use of constructions now specified in NFPA 75 generally reflects present practice.</p>
<p><b># Annex DVA (1)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Reconditioned Equipment</b></p> <p>In the 2017 NEC new requirements were added for Reconditioned Equipment for the first time. For the 2020 NEC, the requirements now have been further refined, with a definition of Recondition Equipment being added to NEC Article 100 and additional detail being added to Sections 110.21(A)(2) and 800.3(G) that could impact some reconditioned AV/ICT equipment.</p> <p>Although there is no direct impact on new AV/ICT equipment submitted to this standard, the inclusion of this information in Annex DVA is considered helpful to manufacturers.</p>	<p>None.</p> <p>No impact on new equipment. However, reconditioners of used equipment should be aware of the new Code-driven requirements.</p>

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	A parallel reference to the requirements for Reconditioned Equipment in the Canadian Electrical Code also has been added.	
Annex DVA (5.5.9, G.4.3)  CAN/U.S. ND	<b>GFCIs</b>  National Difference added to include requirements of Listed Ground Fault Current Interrupter (GFCI) receptacles instead of Residual Current Devices (RCDs).	None. These National Differences have their origin without considerable modification in CSA/UL 60950-22.
CAN/U.S. ND	<b>Wiring terminals for connector of external conductors</b>  For outdoor equipment accessed only by skilled persons, the loading of a 125-V, single phase, 15- or 20-A convenience receptacle, intended for use only during servicing of the equipment, may be treated as a non-continuous load. In such applications, a marking shall be provided nearby the receptacle, stating, "Not for Continuous Load or Use.	Minor (+). Additional optional marking requirement for those receptacles used in outdoor equipment that manufacturers do not want to design/rate for continuous loading, such as receptacles used to power tools during servicing.
# Annex DVA (6)  CAN/U.S. ND	<b>Automatic Fire Detection Monitoring within ITE cabinets</b>  NFPA 70:2020 has modified requirements for <b>Automatic Detection Systems (9.2)</b> to address fire detection when monitored inside ITE cabinets. These are not new normative IT equipment requirements, but are potential installation requirements that ICT equipment may need to accommodate. Therefore, including this information in Annex DVA is considered helpful to ICT equipment manufacturers.	Minor. Installation consideration.
# Annex DVA (B.2.3)  CAN/U.S. ND	<b>Supply Voltage</b>  NEC Article 100 establishes nominal voltage and supply range for the satisfactory operation of equipment by reference to CSA CAN3-C235 and ANSI C84.1.	Minor (+). For AC applications, if a manufacturer wants to continue to use the +10% tolerance in IEC 62368-1 (B.2.3) for product investigations to CSA/UL

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	<p>The supply voltage tolerance of +10% in IEC 62368-1 exceeds the upper, extreme operating range of CSA CAN3-C235-83 (R2015) Preferred voltage levels for AC and the Voltage Range B ranges of ANSI C84-1-2016 Standard for Electric Power Systems and Equipment—Voltage Ratings (60 Hertz), which is +6%.</p> <p>This change (via reference to the CSA &amp; ANSI standards) is not the result of any new code changes, but reflects a relaxation of the voltage tolerance for U.S. and Canada in recognition of the widespread adoption of these standards and long-established use by regulators, municipalities and electrical utilities.</p>	<p>62368-1, this is permitted. However, the manufacturer should declare the wider tolerance than the +6% required by the referenced CSA and ANSI standards.</p> <p>If the manufacturer does not declare a wider tolerance than +6%, then testing should be based on the +6% specified in this National Difference.</p>
<p><b>Annex DVA (F.3.3.6)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Rated output current-continuous loads</b></p> <p>Both the National Electrical Code (NEC), NFPA 70, 210.19 and Canadian Electrical Code, CSA C22.1, 8-104, where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load. Equipment that supplies power to other equipment must therefore be marked with output electrical ratings.</p> <p>For permanently-connected equipment supplied by distribution equipment, since the installer of the equipment may be using the marked ratings to size external branch circuits from distribution equipment, the output electrical ratings is permitted to also be marked as “continuous plus noncontinuous loading,” or “continuous loading” if only continuous loading is permitted or assumed.</p>	<p>Minor (-).</p> <p>For some installations of permanently connected equipment, there may be some additional flexibility allowed with sizing supply wiring if non-continuous loads. However, the new provision does not address cord-connected power distribution units (PDUs) and similar devices which are assumed to supply continuous loads.</p>

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# Annex DVA (G.1)  CAN/U.S. ND	<b>Switches</b>  NEC Section 404.7 has a new requirement that specifies, where mounted in an enclosure, vertically mounted <b>disconnect switches</b> and <b>circuit breakers</b> with vertical operating means extending outside the enclosure shall indicate in a location visible when accessing the external operating means whether the switch or circuit breaker is in the open (off) or closed (on) position.	Minor (+). Generally expected to reflect present design practice.
Annex DVA (G.7)  CAN/U.S. ND	<b>Power supply cords</b>  Added national difference (G.7ADV.2) to include marking requirement for flexible cords used outdoors, i.e., suffix “W” marked on the flexible cord.	None. These National Differences have their origin without considerable modification in CSA/UL 60950-22.
Annex DVA (Q)  CAN/U.S. ND	<b>Cables used in ITE (computer) rooms</b>  In the 2017 edition of NFPA 75, the occupancy standard covering Fire Protection of ITE (in Data Centers), three new and/or revised sections (11.3.7.1, 11.3.7.2, and 11.3.7.3) were added providing details when Plenum-rated cables are required for air space below raised floors. In the past, plenum rated cables were never required previously by NFPA 75 or NEC Article 645 in such areas, although some local codes / regulations required them. These requirements also are in the 2020 edition of NFPA 75 and have been documented in Annex DVA for convenience.	Minor (+). Selection of cables installed below a raised floor is an installation consideration, so the requirements are not likely to greatly impact equipment manufacturers.
# Annex DVA (Q)  CAN/U.S. ND	<b>Power sources for Class 2 circuits - Marking</b>  In the 2017 Edition of the National Electrical Code (NEC), NFPA 70, a number of interrelated proposals were introduced into Articles 725 (Class 1, Class 2 & Class 3 Remote Control, Signaling & Power Limited Circuits) and 840 (Premises-Powered Broadband Communication Systems) to address higher levels of power	Considerable (+). Most of the described changes in the 2017, and now 2020 NEC are installation requirements that will not impact AV/ICT equipment directly, although there is a new equipment marking

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	<p>being transferred over network cabling ('building wiring' in 62368-1 terms), typically associated with Power Over Ethernet (PoE) or a similar protocol. These cables may be associated with Class 2 circuits, involving CL2 cable, or Premises Communications Circuits, involving CM Cable.</p> <p>Specifically, the changes were made in NEC Sections: 725.2, 725.144, 725.170, 840.1, 840.2, 840.160 and 840.170. Subsequently, several Tentative Interim Amendments (TIA) also were issued by NFPA to provide further clarification.</p> <p>In the 2020 NEC, there have been further refinement of these requirements, including the marking requirements in Section 725.121(C), which has been revised to require <b>rated current</b> output per conductor in addition to <b>maximum voltage</b> for circuits supplied by Limited Power Sources (LPS).</p> <p>Additionally, a new informational note (1) provides clarification on what is considered the rated output current and that it is as declared by the manufacturer. Also, another informational note (2) provides an example of acceptable content to be provided on the label.</p> <p>To align the Standard with these specific changes, modifications were made to several areas of Annex DVA (Q).</p>	<p>requirements for some LPS circuits., mainly associated with PoE, so these new markings are a considerable change for products like servers with PoE outputs.</p> <p>However, the true impact of these changes, including the NEC Section 725.121(C) marking requirement for certain Limited Power Source (LPS) outputs, likely won't be known until the latest Codes are more widely adopted in the U.S. and applied by Authorities Having Jurisdiction (AHJs).</p>
<p><b># Annex DVA (Q)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Separation of Circuits</b></p> <p>In the 2020 NEC, Section 725.139(D) provides conditions when Class 2 and Class 3 circuits may be routed together with communication circuits in the same cable.</p> <p>Although this primarily is an installation consideration, including this information in</p>	<p>Minor. Installation consideration.</p>

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	Annex DVA is considered helpful to ICT equipment manufacturers.	
<b># Annex DVA (Q)</b>  <b>CAN/U.S. ND</b>	<p><b>Communication Systems</b></p> <p>Article 800 of the preceding 2017 NEC was renumbered as Article 805 in the 2020 NEC to make room for a new “General” section that begins to consolidate common requirements in the 2017 NEC Articles 800, 820, 830 and 840, including many of the grounding (protective earthing) requirements. This consolidation was done with the intent of no technical changes being introduced to the NEC, and were prompted by usability considerations, mainly significant redundant material.</p> <p>As a result, there are numerous changes being made to the NEC Chapter 8 references throughout Annex DVA to accommodate this restructuring of the NEC.</p>	Minor. Generally considered installation considerations without intent to introduce more onerous requirements.
<b>Annex DVA (Q)</b>  <b>CAN/U.S. ND</b>	<p><b>Community Antenna Television and Radio Distribution Systems</b></p> <p>Expanded entries to the Annex DVA table for Community Antenna Television and Radio Distribution Systems to show the source requirements.</p> <p>Added a new entry on functional insulation designation of two wire CATV Line-Grounded Conductor Insulation. This is due to the redundant nature of the grounding in the CATV Distribution System as noted in Cable Grounding Section.</p>	Minor. Clarification. Generally, reflects present practice.
<b># Annex DVA (Q)</b>  <b>CAN/U.S. ND</b>	<p><b>Premised-powered Broadband Communication Systems - Powering Circuits</b></p> <p>Extensive revisions were made to NEC Section 840.160 to clarify the types of circuits that may be associated with cables powering communications equipment, and what are the requirements when communications cables are</p>	Minor. Generally considered installation considerations.

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	<p>substituted for Class 2 or Class 3 cables. Included is a reference to the existing listing requirement per 840.170(G).</p> <p>An important new exception to this main requirement (requiring 725.144 compliance) is provided for listed 4-pair communication cables where the rated current of the power source does not exceed 0.3 amperes in any conductor 24 AWG or larger. A new Informational Note specifically references PoE as a typical application.</p> <p>Although primarily installation considerations, including this information in Annex DVA is considered helpful to ICT equipment manufacturers.</p>	
<p><b># Annex DVE (G.4.2)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Appliance couplers</b></p> <p>The IEC standard covering Appliance Couplers is IEC 60320-1, <i>Appliance Couplers for Household and Similar General Purposes - Part 1: General Requirements</i>. However, for many years the U.S. and Canada did not have an IEC 60320-based standard. In the U.S, such couplers were certified to UL 498, Attachment Plugs and Receptacles, via a specialized test/evaluation program. In the 2000s, UL published UL 60320-1 (bi-National w/CSA) and the second edition had a future effective date of May 2021, including an Industry File Review to update any certifications that were originally based on UL 498.</p> <p>It is noted, there are some important National Differences in CSA/UL 60320-1, including Table 1ADV, which provides higher electrical ratings than in IEC 60320-1 to reflect the CAN/US electricity supply system. Thus, accepting IEC 60320-1 compliant (only) appliance couplers is not sufficient for CAN/US.</p>	<p>Minor.</p> <p>Generally reflects present certification practice.</p>

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	<p>Currently, there is a reference to UL 60320-1 in Annex DVF added during the THC's Ed. No. 3 work. Since the UL 498 to UL 60320-1 transition involved a 10-year future effective date, the THC thought it was inappropriate to replace UL 498 with UL 60320-1 in Annex DVE immediately. Therefore, a decision was made to keep UL 498 in Annex DVE and place UL (and CSA) 60320-1 in DVF, with an intent to update the Standard later.</p> <p>However, now that UL 60320-1 has replaced UL 498 for Appliance Couplers, there is the need to move UL 60320-1 to DVE (removing it from DVF).</p>	
<p><b>Annex DVE (G.13)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Printed Wiring Boards</b></p> <p>For <i>flexible printed wiring boards</i> supporting ES2, ES3, PS2 or PS3, UL 796F, for flexible printed wiring boards, was added in addition to the existing UL 796 for rigid boards.</p>	<p>Minor (-). Clarification, and generally reflects present practice.</p>
<p><b>#Annex DVF (G.1 &amp; G.2)</b></p> <p><b>CAN/U.S. ND</b></p>	<p>UL has transitioned several types of industrial control switches and controllers from UL 508 to UL 60947-4 series standards, including UL 60947-4-2 and UL 60947-4-3. Also, UL now has a UL 61810-1-2 standard parallel to the IEC standard referenced in IEC 62368-1. These updates will need to be proposed for the next version of CSA / UL 62368-1, but since they are component certification replacements for the specific components mentioned in G.1 and G.2 of Annex DVF, they are considered equivalent for purposes of certification.</p> <p>See the following bulletin for additional background: <a href="https://www.ul.com/resources/industrial-control-equipment-transition-iec-standards">https://www.ul.com/resources/industrial-control-equipment-transition-iec-standards</a></p>	<p>Minor (-). These component options are not frequently used in AV/ICT equipment.</p>



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<p><b>Annex DVF (M)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Secondary Batteries and Battery Packs used with stationary equipment</b></p> <p>Ed. No. 2 of CSA/UL 62368-1 had a National Difference for equipment with stationary batteries in Annex M.2.1. This ND was placed in the CSA/UL standard because none of the IEC standards referenced in Ed. No. 2 of IEC 62368-1 included requirements for battery packs (typically Li-Ion) used in <i>stationary equipment</i>. Until recently there was not an IEC standard that covered such applications.</p> <p>However, since Ed. No. 2 was published in 2014 the following IEC standard has been published that can accommodate such batteries and packs: <i>IEC 62619:2017, Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications</i>, which per its scope, also covers stationary applications. IEC 62619 now is referenced in M.2.1 of IEC 62368-1:2018 (Ed. No. 3)</p> <p>Since IEC 62133 (now 62133-1 and -2) only covers portable applications under its scope, and IEC 62619 covers both industrial and stationary applications, modification is being made to the existing Ed 2. National Difference M.2.1DV [DC].</p> <p>Since IEC 62619 now is the base IEC (international) requirement for batteries in stationary equipment, to align with the structure of the rest of the CSA/UL 62368-1, the existing national difference in Annex M.2.1 was moved into Annex DVF, which covers CSA and UL component standards that can be used as an alternative (for CAN and the U.S.) to the IEC standard/requirements.</p>	<p>Minor (-).</p> <p>Although the addition of IEC 62619 to Annex M.2.1 of IEC 62368-1 likely will impact some manufacturers since it's a new standard, that is a base IEC consideration. The fact that a National Difference continues to allow for UL/IEC 62133 and UL 2054 for some sub-system powering (e.g., orderly shutdown) should provide some relief during the transition.</p>

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	<p>However, the THC also agreed that for Secondary Batteries and Battery Packs used with stationary equipment, but for sub-system powering only, both 62133 and 2054 remain viable options since such batteries packs typically are a similar format as batteries and battery packs used in portable equipment and only provide sub-system powering of part(s) of the equipment for orderly shutdown and similar functional purposes in the event of power loss (compared to storage batteries for full system powering).</p> <p>Finally, since IEC 62133 and UL 2054 do not have in them requirements for Battery Management Systems (BMS) like both IEC 62619 and UL 1973 do, BMS investigation criteria was carried over.</p>	
<p><b># Annex DVH (5.2)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Identification of terminal for earthed conductor (neutral)</b></p> <p>In Section 200.9 of the 2020 NEC, the field-wiring terminal intended for the connection of a grounded circuit conductor (neutral) now may be identified by means of a metallic coating that is substantially 'silver' in colour (as an alternative to the existing 'white' colour).</p>	<p>Minor (-).</p> <p>Provides an additional option of identification.</p>
<p><b># Annex DVH (5.6.3)</b></p> <p><b>CAN/U.S. ND</b></p>	<p><b>Tightening Torque</b></p> <p>The National Electrical Code (NEC), NFPA 70, covers general requirements for all electrical installations in Article 110. In the 2017 NEC, new Section 110.14(D), Electrical Connections – Installation, was added to address tightening torque associated with terminals.</p> <p>These requirements were further refined in the 2020 NEC, resulting in a relatively minor change to the associated National Difference.</p>	<p>Minor (+).</p> <p>Field wiring terminals for permanent connection now may be subjected to more scrutiny by AHJs with regards to tightening torque, but the true impact is unknown at this time.</p>

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	<b>Discussion</b>	<b>Impact</b>
	Since per NEC Section 110.3, AV/ICT with field wiring is subjected to review by Authorities Having Jurisdiction (AHJs), it is considered helpful to manufacturer for this requirement to be noted in Annex DVH, Permanently connected equipment - mains connections.	
<b>Annex ZA Normative references to international publications with their corresponding European publications  CENELEC ND</b>	Provides formal references to international publications with their corresponding European publications for purposes of application of EN 62368-1.	Minor. Most of the EN references are harmonized with IEC and were similarly referenced in EN 62368-1:2014.
<b>Annex ZB Special National Conditions  CENELEC ND</b>	Provides various special national conditions consistent with previous EN 62368-1:2014.	Minor.
<b>Annex ZC A-deviations  CENELEC ND</b>	Provides various national deviation due to regulations consistent with previous EN 62368-1:2014.	Minor.
<b>Annex ZD IEC and CENELEC code designations for flexible cords  CENELEC ND</b>	Provides various national deviation due to regulations consistent with previous EN 62368-1:2014.	Minor.