

**CERTIFICATION IMPACT ANALYSIS:
UL/IEC 60950-22, FIRST EDITION
Safety of Information Technology Equipment –
Equipment Installed Outdoors**

Compiled by: Thomas M. Burke, P.E.
Principal Engineer - Strategic, ITE Business Sector
Underwriters Laboratories Inc.

This analysis reviews the anticipated impact on information technology equipment (ITE) of the introduction of the the First Edition of IEC 60950-22, Safety of Information Technology Equipment – Equipment Installed Outdoors, and its U.S. counterpart, UL 60950-22. In particular, it identifies *notable* differences in certification practices resulting from the publication of the 60950-22 standards compared to certification of the same equipment to 60950-1 before 60950-22 was available. Also considered is past UL practice as outlined in the *UL Application Guideline: Certification of ITE Installed Outdoors* (June 01, 2001). Other select observations are included that may be of interest to the reader. This analysis will be updated as additional information on the application of the new Standards becomes known.

Background

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

The latest version of IEC 60950-1, its Second Edition, was published in December 2005. In the U.S. & Canada, the Bi-National Standard for Safety of ITE, CSA C22.2 No. 60950-1/UL 60950-1, Second Edition, is harmonized with the Second Edition of IEC 60950-1, and like its predecessors includes U.S./Canadian National Differences to address national requirements not in the base IEC document. CSA/UL 60950-1, Second Edition was published on March 27, 2007.

IEC TC108, the international technical committee responsible for IEC 60950-1, collaborated for several years to develop the Part 2 Standard for safety of ITE to be installed outdoors, IEC 60950-22. It was published in October 2005. It joins the existing Part 2 Standards, IEC 60950-21, Safety of ITE, Remote Power Feeding, and IEC 60950-23, Safety of ITE, Large Data Storage Equipment.

As indicated in Foreword to IEC 60950-22, *"This Part 22 of IEC 60950 is intended to be used with IEC 60950-1. The sub-clauses of IEC 60950-1 apply as far as reasonable. Where safety aspects are similar to those of Part 1, the relevant Part 1 clause or sub-clause is shown for reference in parentheses after the clause or sub-clause title in Part 22. Where a requirement in Part 22 refers to a requirement or criterion of Part 1, a specific reference to IEC 60950-1 is made."* Therefore, 60950-1 and 60950-22 are to be used together.

Copyright © 2007 Underwriters Laboratories Inc.



the standard in safety

Underwriters
Laboratories

In the U.S. & Canada, CSA C22.2 No. 60950-22/UL 60950-22, First Edition, is harmonized with IEC 60950-22, and like its predecessors includes U.S./Canadian Deviations to address National considerations not in the base IEC document. This Standard was published on April 23, 2007.

In 1991 UL published an Application Guideline for Certification of ITE Installed Outdoors because manufacturers were requesting certification of such equipment before the availability of an IEC 60950 Part 2 Standard. This Guideline was published in part to address the requirement in IEC 60905-1 that states (in 1.1.2, Additional Requirements) *"Requirements additional to those specified in this standard may be necessary for...equipment intended for operation in special environments (for example, extremes of temperature; excessive dust, moisture,...; [and] equipment intended for use where ingress of water is possible..."* The more recent publication of IEC 60950-22 and UL 60950-22 removes the likely need for the subject Application Guideline. If additional application guidance is needed in the future on the application of 60950-22, individual Practical Application Guidelines (PAGs) will be developed under PAGOS - <http://data.ul.com/pagos/> .

Notes to this Analysis:

- Unless otherwise noted, all Sub-clause/Annex references are to IEC 60950-22, First Edition.
- Discussion of changes and differences associated with IEC 60950-22, First Edition is in plain text.
- Discussion of changes and differences associated with the Bi-National Standard, CSA C22.2 No. 60950-22/UL 60950-22, First Edition is in **bold**.

Explanation of Impact Statements:

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

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

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
1.1 Scope - Equipment Covered	This Part 2 Standard only applies to ITE intended to be "installed" in an outdoor location. ITE that may be used outdoors is not Outdoor ITE unless the manufacturer specifies it is intended to be used outdoors continuously. See definition of Outdoor Equipment, 3.2.	None. Generally reflects present practice.
	This standard also applies to empty Outdoor Enclosures supplied for housing ITE to be installed in an outdoor location. This supports certification programs of empty ITE cabinets intended to be installed outdoors.	None. Reflects present practice. Also, see the UL product category, Information Technology and Communications Equipment Cabinet, Enclosure and Rack Systems, NWIN.
1.2 Scope - Additional Requirements	Additional requirements beyond this Part 2 Standard may be necessary depending on the particular installation and the unique considerations it introduces with respect to safety.	None. Reflects present practice, since the variety of "outdoor" installations varies greatly and practice has been to consider appropriate hazard-based safety considerations associated with the individual installation, as already justified by 1.3.4 (Constructions not specifically covered) of the Part 1 document.
	This Part 2 Standard does not provide safety requirements for protection against the effects of "direct lightning strikes."	None. Reflects present practice. However, the 'installation' site may need to be subjected to additional requirements associated with lightning protection, in particular as required by local/regional installation Codes.
	Normative References to U.S. & Canadian requirements for Lightning Protection	None. Reflects present practice.

Clause 1 (Scope)		
Sub-clause	Discussion	Impact
	Systems (NFPA 780 & CAN/CSA-B72-M87) have been added to replace the base IEC reference to IEC 61024-1. Also see Annex NAE (4.2) for installation requirements for Surge Arrestors and TVSS.	

Clause 2 (Normative References)		
Sub-clause	Discussion	Impact
2 Normative References	Normative References added to include UL, CSA, IEEE and NFPA standards referenced elsewhere in the Standard.	None. Reference information. See associated discussions in appropriate sub-clauses.

Clause 3 (Terms and Definitions)		
Sub-clause	Discussion	Impact
3.1 Outdoor Location	<p>New definition of "Outdoor Location" specifies it is a physical location where protection from the weather and other outdoor influences provided by a building or other structure is limited or non-existent.</p> <p>This is a somewhat different approach than adopted in the National Electrical Code (NEC) ANSI/NFPA 70, which defines (Article 100 & 110.11) locations needing additional consideration based on the degree of moisture (i.e., Dry, Damp & Wet), regardless of whether the location is indoors or outdoors.</p>	None. Definition, and consistent with present practice.
3.2 Outdoor Equipment	<p>New definition of "Outdoor Equipment," defined as equipment "specified by the manufacturer" to be installed where exposed wholly or partly to the conditions of an Outdoor Location.</p> <p>Again, physical location is emphasized, in particular the location specified by the manufacturer (e.g., per manufacturer's installation guidance).</p> <p>Accompanying Note emphasizes that notebook computers, telephones and similar products are not subjected to these requirements <u>unless specified by the</u></p>	None. Definition, and consistent with present practice.

Clause 3 (Terms and Definitions)		
Sub-clause	Discussion	Impact
	<p><u>manufacturer for "continuous use" outdoors.</u></p> <p>Note – It is expected some manufacturers of Transportable Equipment may request certification of their ITE to UL/IEC 60950-22 for marketing (competitive) purposes even if the Standard does not require it. If this occurs, appropriate certification considerations will need to be considered/introduced.</p>	
3.3 Outdoor Enclosure	<p>New definition of "Outdoor Enclosure," defined as the "part" of the Outdoor Equipment that is exposed to the adverse conditions in an Outdoor Location and is intended to protect the interior of the equipment from those conditions.</p> <p>The definition is similar in structure to existing Part 1 definitions for Fire, Electrical and Mechanical Enclosures (i.e, based on its purpose, the enclosure is subject to the appropriate requirements).</p> <p>The accompanying Notes indicate that the Outdoor Enclosure may also serve as a Fire, Electrical and/or Mechanical Enclosure.</p> <p>Also, it is important to note that a stand-alone cabinet can perform the function of an Outdoor Enclosure. <u>This definition and its</u></p>	None. Definition, and consistent with present practice.

Clause 3 (Terms and Definitions)		
Sub-clause	Discussion	Impact
	<u>structure implies, for example, Listed ITE previously investigated (certified) for use indoors can be installed outdoors if placed inside an Outdoor Enclosure.</u>	

Clause 4 (Conditions for Outdoor Equipment)		
Sub-clause	Discussion	Impact
4.1 Ambient Air Temperature	<p>The ambient temperature (Tma) range used to determine compliance with performance requirements is either -33C/+40C <u>or other values specified by the manufacturer</u>. Since the -33C/+40C default values are relatively moderate, manufacturer-specified values likely will be more commonly used since they typically will be a wider range than the default values.</p> <p>This requirement can be viewed as a minimum performance level within this "minimum safety standard." It does not take into account, as the Note indicates, 'severe' environments nor radiation by the sun (solar loading). Manufacturers typically will design the outdoor use equipment to consider more extreme environments/ conditions beyond those required by this Part 2 document, especially when NEBS and other customer requirements mandate it.</p> <p>Note - The Nordic countries have declared/specified a minimum extreme of -50 C.</p>	<p>Minor (+). The UL Application Guideline adopted the same requirement several years ago based on an awareness of the direction IEC TC108 was taking on the development of this requirement. However, like indicated in the Guideline, it is anticipated that for many/most applications the manufacturer's specifications will extend beyond the default range of -33C/+40C. Therefore, the manufacturer's specifications will be the conditions considered during performance testing.</p>
4.2 AC Mains Supply	<p>ITE installed outdoors may be subjected to higher transient overvoltages and prospective fault currents, so the requirements reflect this consideration.</p>	<p>Minor (+). The UL Application Guideline approached Overvoltage Category similarly, thus the impact of these requirements is relatively minor and is</p>

Clause 4 (Conditions for Outdoor Equipment)		
Sub-clause	Discussion	Impact
	<p>Unless additional protection is provided either internal or external to the equipment, the Overvoltage Category generally will be Overvoltage Category III or IV.</p> <p>If such additional protection is provided, the components are required to comply with Low-Voltage Surge Protective Device requirements in IEC 61643-series.</p> <p>See informative Annex Z (Overvoltage Categories) of IEC 60950-1 for additional information on identifying the appropriate Overvoltage Category.</p>	<p>generally consistent with current practice. Typically, within Outdoor ITE, OEMs will use previously certified ITE Power Supplies (e.g., QQQQ2) that were investigated for installation in an Overvoltage Category II. Therefore, to avoid needing to reinvestigate the power supply as Overvoltage Category III or IV (which requires considerably more onerous minimum spacings), manufacturers have been incorporating additional surge protection into the Outdoor ITE.</p>
	<p>A DC National Difference includes references to ANSI/IEEE C62.11, CSA Certification Notice 516, CSA No. 1, and UL 1449 for U.S. and Canadian requirements for TVSS components. Multiple standards are referenced because suitability of a specific TVSS component needs to be determined based on the intended installation anticipated by the component standard, which is reflected in different standards. Some devices are suitable for installation on the load side of the 'service' entrance only, and some are suitable for use with cord-connected equipment only. <u>The</u></p>	<p>Minor (+). Generally reflects current practice since components typically are checked for installation in accordance with their certification conditions/limitations.</p>

Clause 4 (Conditions for Outdoor Equipment)		
Sub-clause	Discussion	Impact
	<u>component certification Conditions of Acceptability, or certification limitations, will need to be reviewed/ considered.</u>	
4.3 Rise of Earth Potential	Depending on the installation, local installation codes may require special earthing requirements.	Minor (+). Although the UL Application Guideline did not address this consideration directly, all constructions need to be installed and compatible with National Codes (e.g., NEC, NESC, etc.), as applicable. Since this requirement generally is installation-based, the impact should be minor on the ITE manufacturer.

Clause 5 (Marking and Instructions)		
Sub-clause	Discussion	Impact
5 Marking and Instructions	<p>Requires that installation instructions include any details necessary to document any special features needed for protection of the equipment from conditions in an Outdoor Location.</p> <p>When a manufacturer of an Outdoor Enclosure classifies a product in accordance with IEC 60529, the IP code is required to be "declared" (e.g., in installation practice/instructions), <u>but it is not required to be marked on the enclosure.</u></p> <p>Note that a distinction is made that such a declaration is <u>only</u> applicable to an Outdoor Enclosure, <u>not</u> Outdoor Equipment. This is because Outdoor Equipment can be subject to all the requirements in -22 (e.g., Rain Test) since the complete 'system' is being tested/investigated. Therefore, there is no need to specifically classify the Outdoor Enclosure. However, for an Outdoor Enclosure, declaring, or marking an IEC 60529 classification will provide useful information when the Enclosure is later incorporated into a larger system (Outdoor Equipment).</p>	<p>None, and consistent with present practice.</p> <p>However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>

Clause 5 (Marking and Instructions)		
Sub-clause	Discussion	Impact
	Also, it needs to be kept in mind, if ITE is located within an Outdoor Enclosure, it is the Outdoor Enclosure that complies with the IEC 60529 requirements, but not necessarily the equipment inside the Enclosure (which actually may have been investigated/certified for indoor use).	
	<p>The Bi-National Standard contains a D1 National Difference referencing UL 50 and CSA 94 since these U.S./Canadian Standards correlate with national electrical installation codes in the U.S. and Canada and what they require for equipment installed outdoors (e.g., NEC 110.11 – “Unless <i>identified</i> for use in the operating environment, no...equipment shall be located in a damp or wet location...”).</p> <p>Note that the ‘intent’ of referencing UL50 is not to require that all requirements in UL 50 are applicable. The intent is to require UL 50 environmental testing only. For example, UL 50 requires use of 94-5VA materials for all thermoplastic outdoor enclosures. The intent of UL 60950-22 is not to require use of 5VA material if UL 60950-1 would otherwise allow a</p>	None. Reflects present practice in the U.S.

Clause 5 (Marking and Instructions)		
Sub-clause	Discussion	Impact
	<p>V-1 material, e.g., some small 'movable' equipment mounted to a wall.</p> <p>Also, the National Difference was added specifically to this Clause (Marking and Instructions) for convenience, although the National Difference requires more (e.g, environmental testing) than a marking/ instruction. Additional clarification likely will be added to a future revision of the Standard.</p>	
	<p>If subject to the Annex B rain test, equipment may be marked "rainproof" if there is no wetting of live parts or entrance of water above the lowest positioned live part, or "raintight" if there is no entrance of water into the enclosure. This is consistent with other UL Standards that cover outdoor installations under their scope, e.g., UL 1778 (UPS). See UL AALZ (Electrical Equipment for use in Ordinary Locations) Guide Information) Guide Information for additional information.</p>	<p>None. Reflects present practice in the U.S.</p>

Clause 6 (Protection from Electric Shock in an Outdoor Location)		
Sub-clause	Discussion	Impact
6.1 Voltage Limits of User-Accessible Parts in Outdoor Locations	<p>For "User-Accessible conductive parts" in an Outdoor Location, these parts are required to be SELV, except that the voltage limits are halved (e.g., 30 V d.c.). As the accompanying Note indicates, this is because the contact resistance of the body is reduced when subjected to wet conditions.</p> <p>One application issue that needs to be considered is the applicability of this requirement to 'parts' of the system that may be user accessible, but that have no 'circuits' that are "user-accessible conductive parts," e.g., a User accessible cable/connector assembly with no exposed circuits. It is understood that it is the intent of IEC TC108 to allow such parts/circuits to operate at normal 'dry location' SELV levels if the 'circuits' are not actually "user-accessible."</p>	<p>Minor (+) Reflects present practice, and is consistent with the requirements in the UL Application Guideline for Outdoor ITE, UL 1310 - Class 2 Power Units, and NEC Section 725.121(A) and Chapter 9, Table 11(A) & 11(B) - Notes 2 & 4.</p> <p>However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>
	<p>The allowance in 2.3.2.1 of IEC 60950-1 for voltages in SELV circuits under single fault conditions to exceed SELV limits up to TNV-2 or TNV-3 limits is not allowed in IEC 60950-22 for User-accessible conductive parts since there is potential wet contact.</p>	<p>Minor (+). There could be some additional impact for ITE accessible circuits currently designed only to IEC 60950-1 since accessible circuits in Outdoor ITE with TNV circuits now always will be limited to the reduced (halved) SELV voltages per 6.1 of IEC 60950-22 and not allowed to reach TNV-2/-3 limits.</p>

Clause 6 (Protection from Electric Shock in an Outdoor Location)		
Sub-clause	Discussion	Impact
		Since UL 60950-1 contains an existing National Difference that already limits such accessible circuits to SELV limits, there should not be as great an impact on ITE designed to UL 60950-1 although, again, the SELV limits now are halved due to potential wet contact.
6.2 Limited Current Circuits in Outdoor Locations	Since Limited Current Circuit requirements are current-, and not voltage-based, if a circuit is to be classified as a Limited Current Circuit, the Part 1 Standard current limits apply without change.	None. Reflects present practice.

Clause 7 (Wiring Terminals for Connection of External Conductors)		
Sub-clause	Discussion	Impact
7.1 Wiring Terminals for Connection of External Conductors	<p>Outdoor ITE is connected to a wider variety of mains supply sources than Indoor ITE. If the mains supply is normal building installation wiring (e.g., branch circuit) routed from inside the building and supplying power to the ITE located outside the building, the requirements for wiring terminations in the Part 1 Standard generally will be adequate. However, if the mains supply originates directly from the outside mains distribution system, more onerous and robust terminations per IEC 60364 are required.</p> <p>See informative Annex Z (Overvoltage Categories) of IEC 60950-1 for additional information on identifying the appropriate Overvoltage Category.</p>	<p>Minor (+), if the Outdoor ITE is connected to normal building installation wiring originating from inside the building.</p> <p>Considerable (+), if the Outdoor ITE is connected directly to the mains distribution system.</p> <p>The requirements in IEC 60364, Electrical Installation of Buildings, can be more onerous than the requirements in Clause 3 of IEC 60950-1. However, most Outdoor ITE is not connected "directly to the mains distribution system," so only some equipment will be significantly impacted.</p>
	<p>In the U.S. and Canada, a D1 National Difference indicates that the applicable parts of the NEC (NFPA 70) and NESC (IEEE C2) are applicable to wiring terminations that are associated with powering directly from the mains distribution system.</p>	<p>Minor (+). Generally reflects present practice. Experience has demonstrated that each installation generally has to be considered on a case-case basis based on the details of the intended installation.</p>

Clause 8 (Construction Requirements for Outdoor Enclosures)		
Sub-clause	Discussion	Impact
8.1 General	<p>Requires corrosion to be addressed, including potential corrosion of the Outdoor Enclosure, connectors, dials etc., if they serve as a functional part of the Outdoor Enclosure.</p> <p>Compliance is determined per 8.3.</p> <p>Outdoor Enclosures are not allowed to carry current during normal operation (e.g., Secondary circuit connected to chassis, thus chassis becoming part of the Secondary circuit) if this could cause corrosion that would impair safety. However, the Outdoor Enclosure can be part of the protective earthing. In such a case, protective earthing/bonding is required to comply with the appropriate parts of 60950-1's sub-clause 2.6, including the bonding impedance test, after the weather-conditioning test per 8.3.</p>	<p>Minor (+). Generally reflects present practice since the UL Application Guideline required either a protective coating (e.g., galvanized sheet steel), salt spray test per IEC 60068-2-11, or corrosion resistance test per UL 50, all of which provide similar levels of protection.</p> <p>Both 8.1 and 8.3 allow for compliance by inspection of a manufacturer's data, which should indicate a suitable protective coating is provided as verified by testing to IEC 60068-2-11, 61587-1, UL 50 or similar. However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p> <p>Investigation of protective earthing/bonding per 2.6 was not specified in the UL Application Guideline, so there could be some minor impact to designs that need preconditioning as the Part 2 Standard requires.</p>
8.2 Resistance to Ultra-Violet Radiation	<p>Requires non-metallic parts of Outdoor Enclosures be sufficiently resistant to degradation by ultra-violet (UV) radiation. The references standards are the same as referenced in the UV requirements in the Part 1 document (4.3.13).</p>	<p>Minor (+). The Part 1 and Part 2 requirements are aligned, and UV has been a consideration for Outdoor use ITE with thermoplastic enclosures investigated to IEC 60950-1.</p>

Clause 8 (Construction Requirements for Outdoor Enclosures)		
Sub-clause	Discussion	Impact
	A DC National Difference allows UV requirements in 746C (Sections 25 & 57) or CSA No. 0.17 to be used as a suitable alternative to the referenced requirement.	Minor (+). The UL Application Guideline referenced the need for UV to be addressed.
8.3 Resistance to Corrosion	As described in 8.1, this sub-clause provides specific requirements for addressing resistance to corrosion. This requires either (a) an evaluation of data provided by the manufacturer, or (b) testing per 8.3.2 – 8.3.4, based on IEC 60068-2-11 (24 day test), or (c) testing per IEC 61587-1 (A1, A2 or A3 performance level).	Minor (+). Generally reflects present practice since the UL Application Guideline required either a protective coating (e.g., galvanized sheet steel), salt spray test per IEC 60068-2-11, or corrosion resistance test per UL 50, all of which provide similar levels of protection. Both 8.1 and 8.3 allow for compliance by inspection of a manufacturer’s data, which should indicate a suitable protective coating is provided as verified by testing to IEC 60068-2-11, 61587-1, UL 50 or similar. However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.
8.4 Bottoms of Fire Enclosures	Normal Bottom Enclosure requirements apply per 4.6.2 of 60950-1, unless the installation instructions specify the equipment is to be mounted directly and permanently on a non-combustible surface (e.g., concrete). <u>This instruction does not need to be in the form of a marking</u> (unlike indoor locations).	None. Reflects present practice.

Clause 8 (Construction Requirements for Outdoor Enclosures)		
Sub-clause	Discussion	Impact
8.5 Gaskets	Gaskets used to allow the Outdoor Enclosure to comply with the Part 2 performance requirements are required to be subjected to the relevant tests in Annex D of this standard. They shall be secured by adhesive or mechanical means (8.5.3). There may be some additional consideration need to be given to appropriate performance testing for the adhesive, if used with gaskets.	Minor (+). When gaskets have been used previously, <u>and</u> they were relied upon for the ITE to comply with performance testing associated with outdoor use, the gaskets generally have been investigated for the application. However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.

Clause 9 (Protection of Equipment within an Outdoor Enclosure)		
Sub-clause	Discussion	Impact
9.1 Protection from Moisture	<p>Outdoor Enclosures are required to provide adequate protection from moisture for the enclosed equipment. Of concern is not just water entering the enclosure through openings, but also accumulation of water due to condensation since condensation is common in outdoor locations due to fluxuating temperatures, dew points, etc. Use of adequately placed drain holes and stable internal temperatures are considered methods to address this requirement.</p> <p>“Examples” of suitable constructions corresponding to desired Pollution Degree are provided in Table 2. Note 1 assumes that some equipment may be segmented into parts or subsystems (micro-environments) for purposes of identifying Pollution Degrees, and different Pollution Degrees may be associated with each micro-environment. (This type of consideration sometimes also is applied to Indoor ITE, e.g., copiers.)</p>	<p>Minor (+). Outdoor ITE subjected to the UL Application Guideline has been subjected to a similar level of requirements. However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p>
	<p>Performance testing related to protection from moisture is conducted either per IEC 60529, based on the desired IPX code, or per Annex B (Water Spray Test).</p> <p>At the conclusion of the test,</p>	<p>Minor (+). Outdoor ITE subjected to the UL Application Guideline has been subjected to a similar level of requirements. However, there may be some impact as different practices by different</p>

Clause 9 (Protection of Equipment within an Outdoor Enclosure)		
Sub-clause	Discussion	Impact
	<p>Outdoor Enclosures may have no water entering the Enclosure, and Outdoor Equipment may have water enter the Enclosure if it would not present a hazard as described.</p> <p>This presentation of the requirement may be confusing to some, since per the definitions for Outdoor Equipment and Outdoor Enclosure in 3.2 and 3.3, respectively, an Outdoor Enclosure is "part of Outdoor Equipment."</p> <p>However, The "intent" of the 9.1 compliance criteria is that the water cannot enter an Outdoor Enclosure that is investigated to 60950-22 without electronic equipment installed in it (as Note 2 to 3.3 allows), because the impact on safety of water entering the Enclosure cannot be determined. This would apply to a cabinet certified to 60950-22 as an empty cabinet. However, water is permitted to enter an Outdoor Enclosure with electronic equipment inside it if the impact on safety of water entering the enclosure can be determined and there is no hazard. This would apply to a complete system, i.e., cabinet with internal electronic components/ subassemblies.</p>	<p>manufacturers and NCBs are driven to closer alignment.</p>

Clause 9 (Protection of Equipment within an Outdoor Enclosure)		
Sub-clause	Discussion	Impact
	<p>By nature of the reference to Clause 5, appropriate UL 50 or CSA 94 requirements are applicable in the U.S./Canada.</p>	<p>None, and consistent with present practice. However, there may be some impact as different practices by different manufacturers and NCBs are driven to closer alignment.</p> <p>Also, see Clause 5 discussion. Since testing per Annex B is consistent with UL 50, additional performance testing per UL 50 is not required if testing per Annex B is chosen by the manufacturer.</p>
<p>9.2 Protection from Plants and Vermin</p>	<p>Outdoor ITE is required to be protected from plants and vermin. The main concern is with plants and vermin entering into the equipment over time and damaging critical safety features.</p> <p>However, the requirement really only becomes an issue if enclosures are designed with openings that could allow plants and vermin to enter, typically from the bottom or lower sides. Because other requirements (e.g., rain test) apply to the same openings, the likelihood of such a construction not meeting this considered is reduced.</p>	<p>Minor (+). Not formally addressed in the UL Application Guideline, so there could be some minor impact.</p>
<p>9.3 Protection from Excessive Dust</p>	<p>Outdoor ITE is required to be protected from excessive dust entering the equipment. The main concern is with the dust damaging or compromising critical safety</p>	<p>Minor (+), since generally reflects present practice and was addressed in the UL Application Guideline. However, there may be some impact as different</p>

Clause 9 (Protection of Equipment within an Outdoor Enclosure)		
Sub-clause	Discussion	Impact
	features. However, most ITE intended to be installed outdoors either has no ventilation openings, or is designed with ventilation openings provided with air filters or similar filtering systems. If a particular construction is of particular concern, relevant testing per IEC 60529 is required.	practices by different manufacturers and NCBs are driven to closer alignment.

Clause 10 (Mechanical Strength of Enclosures)		
Sub-clause	Discussion	Impact
10.1 General	Outdoor Enclosures and Outdoor Equipment are required to have adequate mechanical strength, similar to Indoor ITE. However, the main additional consideration for equipment with a polymeric enclosure is that the application of an Impact Test per Sub-clause 4.2.5 of 60950-1 is to be carried out at the minimum ambient temperature specified by the manufacturer (Tma), or -33 C if no such ambient is specified.	None, if metal enclosure. Minor (+), if polymeric enclosure. Although the Application Guideline did not specify conducting the test at the low end of the specified ambient range, most Outdoor ITE has metal, not polymeric enclosures, so the requirement will not be applicable. For Outdoor ITE with polymeric enclosures, this new condition will have to be taken into consideration, but likely is consistent with the OEM's customer requirements (e.g., NEBS), so it likely already is a design consideration.
10.2 Impact Test	See discussion of 10.1. A key consideration for/distinction between the application of the Part 1 Impact Test to Outdoor ITE (versus Indoor ITE) is that after the application of the test, not only is accessibility to hazardous parts a concern, <u>but also ingress of dust and moisture.</u>	Minor (+). See discussion of 10.1.

Clause 11 (Outdoor Equipment Containing Vented Batteries)		
Sub-clause	Discussion	Impact
11 Outdoor Equipment Containing Vented Batteries	Some Outdoor ITE have vented batteries in case Mains power becomes unavailable. If the batteries are vented type, where gassing is possible during normal usage or overcharging, adequate ventilation is required to prevent hydrogen/air concentrations from exceeding 4% by volume. For such constructions that compliance is not obvious by inspection, samples of atmospheres within the battery compartment are taken after 7 hours of operation.	Minor (+). The UL Application Guideline included this consideration, and only a relatively small percentage of Outdoor ITE have vented batteries, some of which inspection can allow a determination that they have adequate segregation or venting.

Annexes		
Annex A (Water – Saturated Sulphur Dioxide Atmosphere)	Discussion	Impact
	Test method for Outdoor ITE with vented batteries. See Discussion on 8.1 and 8.3.	See Impact of 8.1 and 8.3.
Annex B (Water Spray Test)	Discussion	Impact
	Same as UL 50 test. See Discussion on 9.1.	See Impact of 9.1.
Annex C (Ultraviolet Light Conditioning Test)	Discussion	Impact
	See Discussion on 8.2.	See Impact of 8.2.
Annex D (Gasket Tests)	Discussion	Impact
	See Discussion on 8.5.	See Impact of 8.5.
Annex E (Rationale)	Discussion	Impact
	Annex E provide a summary of the basic rationale driving the need for this Part 2 Standard, similar in structure to the Principles of Safety in the Part 1 Standard. If there any questions on why a requirement is in the Standard, this is a good place to start.	None. Informative Annex.
Annex NAE (U.S. and Canadian Regulatory Requirements – Informative)	Discussion	Impact
1.1 Equipment Covered	A general consideration added that the applicable requirements in the Part 1 Standard associated with the U.S. National Electrical Code (NEC) and National Electrical Safety Code (NESC) apply, unless amended by this Annex.	None. Reflects present practice.

Annexes		
3 Definition of Outdoor Locations	Makes note that the Location of the Equipment is defined differently in the NEC.	None. Clarification.
3 Definition of Outdoor Equipment & Enclosure	Makes note that definition of Equipment is defined differently in the NEC.	None. Clarification.
4 Communication Systems	Makes note that applicable parts of NEC Chapter 8 may be applicable to ITE installed outdoors with connections to communication systems.	Minor (+). Generally reflects present practice since this same consideration is part of the UL Application Guideline. Several requirements in NEC Chapter 8 have applicability, including lightning protection of antennae, Primary Protectors where communication circuits enter the building/enclosure, etc.
4.2 Power Supply Cords	Requires power supply cords to be suitable outdoor use type as required by Section 400-4 the NEC, i.e., marked "water resistant," "outdoor," "W" or "W-A."	Minor (+). Generally reflects present practice since this same requirement is part of the UL Application Guideline.
4.2 Installation of Surge Arrestors	Requires any Surge Arrestors installed external to the ITE to comply with the appropriate NEC requirements.	Minor (+). Generally an installation issue and reflects present practice since this same requirement is part of the UL Application Guideline.
4.2 Installation of Transient Voltage Surge Suppressors: TVSS	Requires any TVSS device installed external to the ITE to comply with the appropriate NEC requirements.	Minor (+). Generally an installation issue and reflects present practice since this same requirement is part of the UL Application Guideline.
5 (9.1) Marking of Enclosures (Due to Deteriorating	Requires equipment investigated for a damp/wet location to be	Minor (+). Generally reflects present practice since this same

Annexes		
Agents)	<p>identified for use in the type of environment.</p> <p>See discussions on Clause 5 (Marking and Instructions) and 9 (Protection of equipment within an Outdoor Enclosure).</p>	<p>requirement is part of the Part 1 Standard and part of the UL Application Guideline.</p>
7 Markings for Class 2 Terminals	<p>Requires wiring terminals intended to supply Class 2 outputs per Article 725 to be marked.</p>	<p>Minor (+). Generally reflects present practice since this same requirement is part of the Part 1 Standard and part of the UL Application Guideline.</p> <p>However, see discussion on 6.1 related to reduced voltage limits due to wet/damp contact.</p>
9.1, 5 Marking of Enclosures (Due to Deteriorating Agents)	<p>See Discussion of 5(9.1).</p>	<p>See Impact of 5(9.1).</p>
11 Storage Batteries	<p>Requires stationary installations of storage batteries external to the ITE to comply with NEC Article 480.</p>	<p>Minor (+). Generally reflects present practice since this same requirement is part of the Part 1 Standard and part of the UL Application Guideline.</p>