

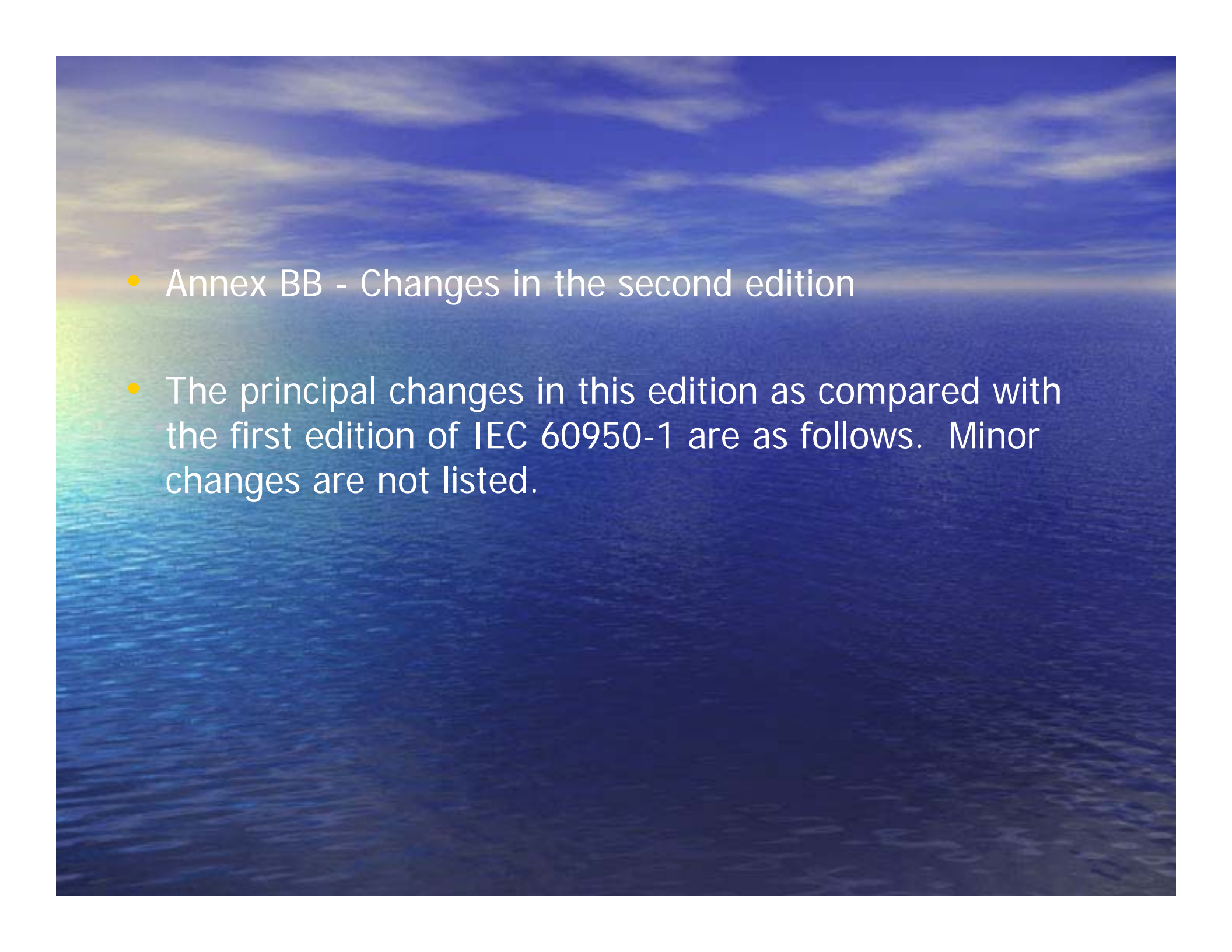


UL/CSA 60950-1 2nd Edition

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- **Date of publication:** March 27, 2007
- **Date of withdrawal of previous standards:** As of December 1, 2010, new product submittals will be evaluated using all the requirements in UL 60950-1 Second Edition.
- Products that are certified by Underwriters Laboratories Inc. to previous ITE standards may continue to be certified without further investigation, unless otherwise communicated by UL. However, any significant changes made to these products will be evaluated to the standard(s) used for new product submittals as of the date of the change request, i.e., UL 60950-1 Second Edition.

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- Annex BB - Changes in the second edition
 - The principal changes in this edition as compared with the first edition of IEC 60950-1 are as follows. Minor changes are not listed.

- Definitions Added -


- – CHEESECLOTH (1.2.13.15);
- – EQUIPMENT, PLUGGABLE (1.2.5.3);
- – INSULATION, SOLID (1.2.10.4);
- – RATING, PROTECTIVE CURRENT (1.2.13.17);
- – SUPPLY, MAINS (1.2.8.3);
- – TIME, RATED RESTING (1.2.2.3);
- – TISSUE, WRAPPING (1.2.13.16);
- – VOLTAGE, RMS WORKING (1.2.9.7).
- – DC MAINS SUPPLIES, more detailed requirements regarding:
 - CLEARANCES [2.10.3.2 b) and c), 2.10.3.7, 2.10.3.9, G.2.2, G.2.3, G.4.1 c), G.5 a)];
 - shock hazard (2.1.1.7, 2.1.1.8).

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- X and Y capacitors bridging insulation, applications clarified, aligned with IEC 60384-14 (1.5.6).
 - Resistors, bridging insulation (1.5.7).

- Surge suppressors:
 - VDRs in PRIMARY CIRCUITS, requirements clarified (1.5.9);
 - It is permitted to use any type of surge suppressor, including a voltage dependent resistor (VDR), in a **SECONDARY CIRCUIT**.
 - If a surge suppressor is used in a **PRIMARY CIRCUIT**,
 - it shall be a VDR and it shall comply with Annex Q.
 - 1.5.9.3 Bridging of functional insulation by a VDR
 - It is permitted to bridge **FUNCTIONAL INSULATION** by a VDR.

- 1.5.9.4 Bridging of basic insulation by a VDR
 - It is permitted to bridge **BASIC INSULATION** by a VDR provided that one side of the VDR is earthed in accordance with 2.6.1 a).
- 1.5.9.5 Bridging of supplementary, double or reinforced insulation by a VDR
 - It is not permitted to bridge **SUPPLEMENTARY INSULATION, DOUBLE INSULATION or REINFORCED INSULATION** by a VDR.

- Language for marking, requirement for local language removed (see 1.7.2.1 Note 3).
 - NOTE 3 In many countries, instructions and equipment marking related to safety are required to be in a language that is acceptable in the country in which the equipment is to be installed. Servicing instructions are normally made available only to **SERVICE PERSONS** and are **generally acceptable in the English language only.**
 - NOTE 4 In Germany, safety-related information, even for SERVICE PERSONS, has to be in the German language.
 - NOTE 5 In Canada, the instructions and markings should be in French and English.

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- The background of the slide is a photograph of a sunset over the ocean. The sky is a deep blue with wispy white clouds. A bright rainbow is visible on the left side, arching over the horizon. The water in the foreground is dark blue with gentle ripples.
- Overcurrent protective devices to be specified if required externally (1.7.2.3).
 - For PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, the installation instructions shall specify the maximum rating of an overcurrent protective device to be provided external to the equipment, unless there are appropriate overcurrent protective devices in the equipment.

- PROTECTIVE BONDING CONDUCTORS, requirements and test procedure modified (2.6.3.3, 2.6.3.4).
 - The PROTECTIVE CURRENT RATING of the circuit (used in Table 2D and in the test of 2.6.3.4) depends on the provision and location of overcurrent protective devices. It shall be taken as the smallest of a) or b) or c), as applicable.
 - a) For **PLUGGABLE EQUIPMENT TYPE A**, the PROTECTIVE CURRENT RATING is the rating of an overcurrent protective device provided external to the equipment (for example, in the building wiring, in the mains plug or in an equipment rack) to protect the equipment, with a minimum of 16 A.
 - NOTE 1 In most countries, 16 A is considered to be suitable as the PROTECTIVE CURRENT RATING of the circuit.
 - NOTE 2 In Canada and United States, the PROTECTIVE CURRENT RATING of the circuit is taken as 20 A.
 - NOTE 3 In the United Kingdom, the current rating of the circuit shall be taken as 13 A, not 16 A.

- b) For **PLUGGABLE EQUIPMENT TYPE B and PERMANENTLY CONNECTED EQUIPMENT** (see 2.7.1), the PROTECTIVE CURRENT RATING is the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment (see 1.7.2.3).
- c) For any of the above equipment, the PROTECTIVE CURRENT RATING is the rating of an overcurrent protective device, if provided in or as part of the equipment, that protects the circuit or part required to be earthed.

- Connectors, lower minimum Clearances and Creepage Distances (2.10.3.1, 2.10.4.3, G.6).

Connectors

- The CLEARANCES between the BOUNDING SURFACE of a connector and conductive parts within the connector that are connected to a HAZARDOUS VOLTAGE shall comply with the requirements for REINFORCED INSULATION. As an exception, for connectors that are
 - – fixed to the equipment; and
 - – located internal to the outer ENCLOSURE of the equipment; and are
 - – only accessible after removal of a USER-replaceable sub-assembly that is required to be in place during normal operation,
 - these CLEARANCES shall comply with the requirements for BASIC INSULATION.



Printed Wiring Boards and Other Materials

- Clause 2.10.4.3, Table N

For all other CREEPAGE DISTANCES in connectors, including connectors that are not fixed to the equipment, the minimum values specified in Table 2N apply.

The above minimum CREEPAGE DISTANCES for connectors do not apply to connectors that comply with a standard harmonized with IEC 60083, IEC 60309, IEC 60320, IEC 60906-1 or IEC 60906-2. See also 1.5.2.

Compliance is checked by measurement, taking into account Annex F. The following conditions apply:


- movable parts are placed in their most unfavourable positions;
- for equipment incorporating ordinary NON-DETACHABLE POWER SUPPLY CORDS, CREEPAGE DISTANCE measurements are made with supply conductors of the largest cross-sectional area specified in 3.3.4 for the terminal in question, and also without conductors; and
- when measuring CREEPAGE DISTANCES from the BOUNDING SURFACE of an ENCLOSURE of insulating material through a slot or opening in the ENCLOSURE or through an opening in an accessible connector, the accessible surface is considered to be conductive as if it were covered by metal foil wherever it can be touched by the test finger, Figure 2A (see 2.1.1.1), applied without appreciable force (see Figure F.12, point X).

Table 2N – Minimum creepage distances

| CREEPAGE DISTANCES in mm | | | | | | | | | |
|---|-------------------|-------------|-------------------|-----------------|------|------------|------|------|-----------------------|
| RMS WORKING VOLTAGE up to and including V | Pollution degree | | | | | | | | |
| | 1 ^a | 2 | 1 ^a | 2 | | | 3 | | |
| | Material group | | | | | | | | |
| | Printed boards | | | Other materials | | | | | |
| | I, II, IIIa, IIIb | I, II, IIIa | I, II, IIIa, IIIb | I | II | IIIa, IIIb | I | II | IIIa, IIIb (see Note) |
| 10 | 0,025 | 0,04 | 0,08 | 0,4 | 0,4 | 0,4 | 1,0 | 1,0 | 1,0 |
| 12,5 | 0,025 | 0,04 | 0,09 | 0,42 | 0,42 | 0,42 | 1,05 | 1,05 | 1,05 |
| 16 | 0,025 | 0,04 | 0,1 | 0,45 | 0,45 | 0,45 | 1,1 | 1,1 | 1,1 |
| 20 | 0,025 | 0,04 | 0,11 | 0,48 | 0,48 | 0,48 | 1,2 | 1,2 | 1,2 |
| 25 | 0,025 | 0,04 | 0,125 | 0,5 | 0,5 | 0,5 | 1,25 | 1,25 | 1,25 |
| 32 | 0,025 | 0,04 | 0,14 | 0,53 | 0,53 | 0,53 | 1,3 | 1,3 | 1,3 |
| 40 | 0,025 | 0,04 | 0,16 | 0,56 | 0,8 | 1,1 | 1,4 | 1,6 | 1,8 |
| 50 | 0,025 | 0,04 | 0,18 | 0,6 | 0,85 | 1,2 | 1,5 | 1,7 | 1,9 |
| 63 | 0,04 | 0,063 | 0,2 | 0,63 | 0,9 | 1,25 | 1,6 | 1,8 | 2,0 |
| 80 | 0,063 | 0,10 | 0,22 | 0,67 | 0,9 | 1,3 | 1,7 | 1,9 | 2,1 |
| 100 | 0,1 | 0,16 | 0,25 | 0,71 | 1,0 | 1,4 | 1,8 | 2,0 | 2,2 |
| 125 | 0,16 | 0,25 | 0,28 | 0,75 | 1,05 | 1,5 | 1,9 | 2,1 | 2,4 |
| 160 | 0,25 | 0,40 | 0,32 | 0,8 | 1,1 | 1,6 | 2,0 | 2,2 | 2,5 |
| 200 | 0,4 | 0,63 | 0,42 | 1,0 | 1,4 | 2,0 | 2,5 | 2,8 | 3,2 |
| 250 | 0,56 | 1,0 | 0,56 | 1,25 | 1,8 | 2,5 | 3,2 | 3,6 | 4,0 |
| 320 | 0,75 | 1,6 | 0,75 | 1,6 | 2,2 | 3,2 | 4,0 | 4,5 | 5,0 |
| 400 | 1,0 | 2,0 | 1,0 | 2,0 | 2,8 | 4,0 | 5,0 | 5,6 | 6,3 |
| 500 | 1,3 | 2,5 | 1,3 | 2,5 | 3,6 | 5,0 | 6,3 | 7,1 | 8,0 |
| 630 | 1,8 | 3,2 | 1,8 | 3,2 | 4,5 | 6,3 | 8,0 | 9,0 | 10 |
| 800 | 2,4 | 4,0 | 2,4 | 4,0 | 5,6 | 8,0 | 10 | 11 | 12,5 |

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Table 2N – Minimum creepage distances Continued on Next Page

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- Distance through insulation, requirements clarified (2.10.5) in particular:
 - optocouplers, aligned with IEC 60747 (2.10.5.4, Figure F.17);
 - non-separable thin sheet material (2.10.5.8).
 - Limited power sources, tests clarified (2.5).

- Single pole isolators, rules clarified (3.4.6).
- A disconnect device, if provided in or as part of the equipment, shall disconnect both poles simultaneously, except that
 - – if it is possible to rely on the identification of the earthed conductor in the DC MAINS SUPPLY, or an earthed neutral in an AC MAINS SUPPLY, it is permitted to use a single-pole disconnect device that disconnects the unearthed (line) conductor, or
 - – if it is not possible to rely on the identification of the earthed conductor in the DC MAINS SUPPLY, or an earthed neutral in an AC MAINS SUPPLY, and the equipment is not provided with a two-pole disconnect device, the installation instructions shall specify that a two-pole disconnect device is to be provided external to the equipment.

- Data ports for additional equipment, requirements added to limit power output (3.5.4).
 - To limit the risk of fire in an additional equipment or accessory (for example, a scanner, mouse, keyboard, DVD drive, CD ROM drive or joystick), SELV CIRCUITS of a data port for connection of such equipment shall be supplied by a limited power source that complies with 2.5. This requirement does not apply if it is known that the additional equipment complies with 4.7.
 - NOTE It is recommended that manufacturers of accessories and their INTERCONNECTING CABLES include protection against fault currents up to 8 A at 100 VA, the maximum available from a limited power source in compliance with Table 2B.

•4.2.11 Rack mounted equipment

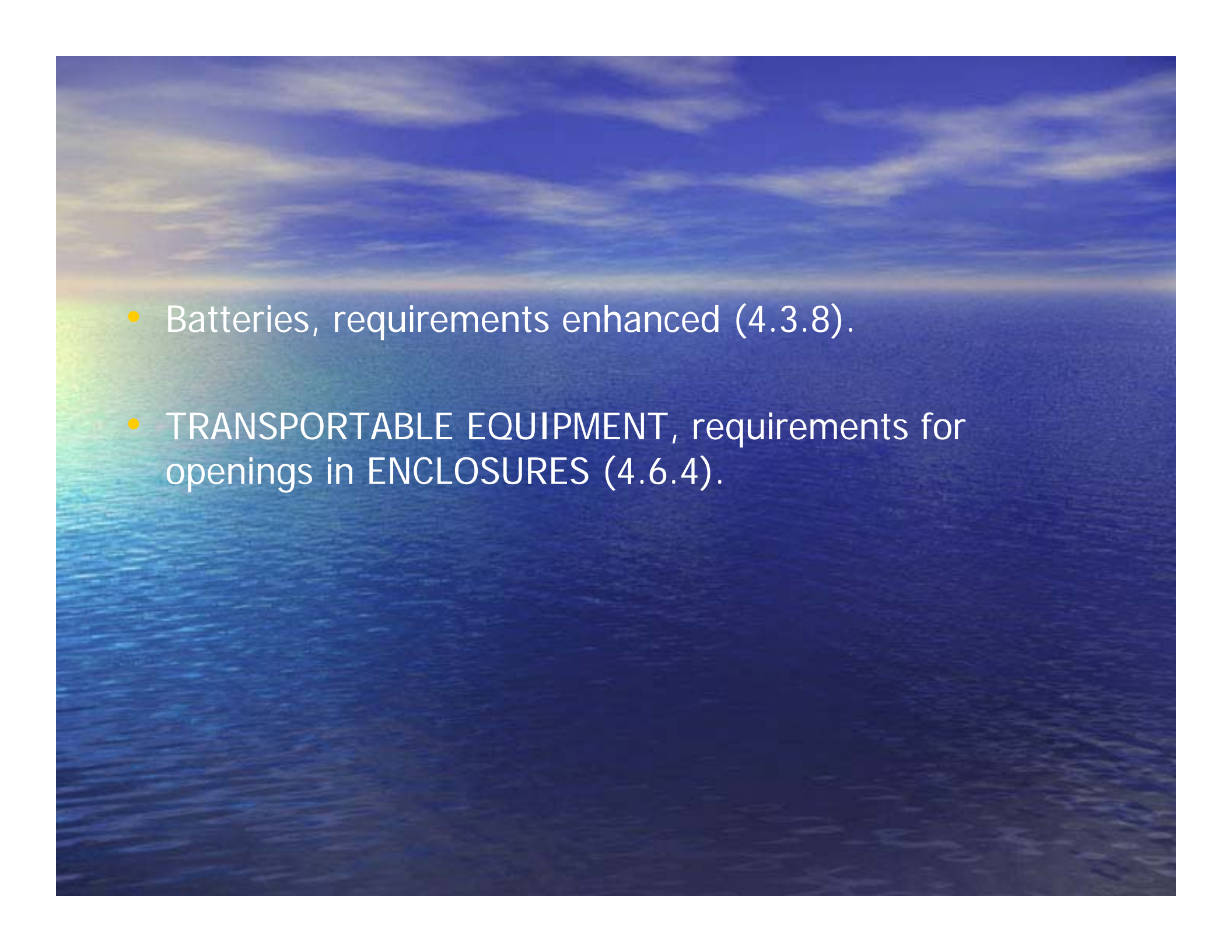
For equipment intended for mounting on racks and provided with slide/rails allowing the equipment to slide away from the rack for installation, service, maintenance and the like, the slide/rails shall be adequate.

NOTE Slide/rails include bearing slides, friction slides or other equivalent mounting means.

Such slide/rails shall have end stops that prevent the equipment from unintentionally sliding off the mounting means.

Compliance is checked by inspection and available data, or where necessary, by the tests in 4.2.11.1 and 4.2.11.2.

The equipment and its associated slide/rails shall remain secure during the tests and shall be able to perform one complete cycle of travel on its slide/rails after completion of the test. End stops shall retain the equipment in a safe position and shall not allow the equipment to slide past the end of the slide/rails.

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- Batteries, requirements enhanced (4.3.8).
 - TRANSPORTABLE EQUIPMENT, requirements for openings in ENCLOSURES (4.6.4).

- TOUCH CURRENT:
- **5.1.2.1 Single connection to an a.c. mains supply**
 - Systems of interconnected equipment with individual connections to the AC MAINS SUPPLY shall have each piece of equipment tested separately. Systems of interconnected equipment with one common connection to the AC MAINS SUPPLY shall be treated as a single piece of equipment. See also 1.4.10 regarding the inclusion of optional features.
- **5.1.2.2 Redundant multiple connections to an a.c. mains supply**
 - Equipment that is designed for multiple connections to the AC MAINS SUPPLY, only one of which is required at a time, shall be tested with only one connection.

- TOUCH CURRENT:

test procedure clarified for equipment with multiple supply connections (5.1.2, 5.1.7.2);

- **5.1.2.3 Simultaneous multiple connections to an a.c. mains supply**

- Equipment requiring power simultaneously from two or more AC MAINS SUPPLIES shall be tested with all AC MAINS SUPPLIES connected.
- The total TOUCH CURRENT through all PROTECTIVE EARTHING CONDUCTORS that are connected to each other and to earth is measured.
- A PROTECTIVE EARTHING CONDUCTOR that is not connected within the equipment to other earthed parts in the equipment shall not be included in the above tests. If an a.c. power source has such a PROTECTIVE EARTHING CONDUCTOR it shall be tested separately according to 5.1.2.1 (see also 5.1.7.2).

- TOUCH CURRENT:

- requirements extended for PLUGGABLE EQUIPMENT TYPE A (5.1.7.1).
- TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s. are permitted for the following equipment having a main protective earthing terminal:
 - – STATIONARY PERMANENTLY CONNECTED EQUIPMENT;
 - – STATIONARY PLUGGABLE EQUIPMENT TYPE B;
 - – STATIONARY PLUGGABLE EQUIPMENT TYPE A with a single connection to the AC MAINS SUPPLY, and provided with a separate protective earthing terminal in addition to the main protective earthing terminal, if any (see 2.6.4.1). The installation instructions shall specify that this separate protective earthing terminal be permanently connected to earth;
 - NOTE 1 The above equipment is not required to be installed in a RESTRICTED ACCESS LOCATION. However, the requirement to be STATIONARY EQUIPMENT is more onerous than the similar requirements in 2.3.2.3 a) because the potential hazard is greater.

- TOUCH CURRENT:

- requirements extended for PLUGGABLE EQUIPMENT TYPE A (5.1.7.1).
- – **STATIONARY PLUGGABLE EQUIPMENT TYPE A** with **simultaneous multiple connections** to the AC MAINS SUPPLY, intended to be used in a location having equipotential bonding (such as a telecommunication centre, a dedicated computer room or a RESTRICTED ACCESS LOCATION). A separate additional protective earthing terminal shall be provided on the equipment. The installation instructions shall require all of the following:
 - • the building installation shall provide a means for connection to protective earth; and
 - • the equipment is to be connected to that means; and
 - • a SERVICE PERSON shall check whether or not the socket-outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective earthing terminal to the protective earth wire in the building.

SUMMARY

- **Date of withdrawal of previous standards:**

As of December 1, 2010, new product submittals will be evaluated using all the requirements in UL 60950-1 Second Edition.

- Products that are certified by Underwriters Laboratories Inc. to previous ITE standards may continue to be certified without further investigation, unless otherwise communicated by UL. However, any significant changes made to these products will be evaluated to the standard(s) used for new product submittals as of the date of the change request, i.e., UL 60950-1 Second Edition.

