UL 60950

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Safety of Information Technology Equipment

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Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Information Technology Equipment, UL 60950

Third Edition, Dated December 1, 2000

Revisions: This Standard contains revisions through and including October 30, 2007.

Summary of Topics

These revisions are being issued solely to remove the ANSI approval information from the title page, transmittal page and the preface.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this binational standard jointly. However, the revision pages dated October 30, 2007 will not be jointly issued by UL and CSA. CSA will not be issuing revision pages because this edition has been superseded by a subsequent edition of the standard.

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The revisions dated October 30, 2007 include a reprinted title page (page1) for this Standard.

As indicated on the back side of the title page (page 2), this UL Standard for Safety has been adopted by the Department of Defense.

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New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing, Recognition, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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Safety of Information Technology Equipment

December 1, 2000

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Approved
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The U.S. Department of Defense (DoD) has adopted UL 1950 on December 21, 1994. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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PREFACE DE

This is the common UL and CSA Standard for Safety of Information Technology Equipment. It DE
is the third edition of CSA Standard CAN/CSA-C22.2 No. 60950 and the third edition of UL DE
60950. This standard is based on IEC 60950, third edition. DE

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

This common standard was prepared by the Canadian Standards Association and Underwriters DE
Laboratories Inc. and the information technology and telecommunication industries. The efforts DE
and support of the Electro Federation Canada (EFC, formerly EEMAC), the Information DE
Technology Association of Canada (ITAC), the Information Technology Industry Council (ITI, DE
formerly CBEMA), and the Telecommunication Industry Association (TIA) are gratefully DE
acknowledged. DE

This Standard was reviewed by the CSA Subcommittee on Safety of Information Technology DE
Equipment Including Electrical Business Equipment under the jurisdiction of the Technical DE
Committee on Consumer and Commercial Products and the CSA Strategic Resource Group and DE
was approved by the Technical Committee. DE

This Standard has been approved as a National Standard of Canada by the Standards Council DE
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Note: Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains DE
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Level of Harmonization DE

This standard adopts the IEC text with deviations. This standard is published as an equivalent DE
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word except for editorial changes. DE

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New product submittals through April 1, 2003 will be evaluated using all the requirements in this DE
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DC – deviations based on UL and CSA component requirements. DC deviations may be less stringent than, equivalent to, or more stringent than component requirements in IEC 60950. DE

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DE – editorial deviations that correct typographical errors in IEC 60950 or revise the terminology, but do not alter the technical intent of the requirements. This is also used for informative statements such as the Preface and Foreword. DE

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Several annexes are included at the back of the standard. Pointers to these annexes are provided in the right-hand margin of the body of the standard to direct the user to these informative/normative annexes. The pointer text is provided in ***BOLD ITALICS***. Examples of such pointers are shown here in the right-hand margin. DE ***NAAP***

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Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA International Operating Procedures. Products that comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable laws or regulations. DE

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FOREWORD (UL) DE

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable. DE

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product. DE

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements. DE

D. A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard. DE

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard. DE

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests. DE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF INFORMATION TECHNOLOGY EQUIPMENT

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60950 has been prepared by IEC Technical Committee 74: Safety and energy efficiency of IT equipment.

This third edition cancels and replaces the second edition, issued in 1991, and its amendments 1 (1992), 2 (1993), 3 (1995) and 4 (1996) and constitutes a technical revision.

The text of this edition is based on the following documents:

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FDIS	Report on voting
74/498/FDIS	74/504/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annexes A, B, C, D, E, F, G, H, J, K, L, M, N, P, U and V form an integral part of this standard.

Annexes Q, R, S, T, W and X are for information only.

In this standard, the following print types are used:

– Requirements proper and normative annexes: in roman type.

– *Compliance statements and test specifications: in italic type.*

– Notes and other informative matter: in smaller roman type.

– Normative conditions within tables: in smaller roman type.

– Terms that are defined in 1.2: SMALL CAPITALS.

The numbering system in this standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01. DE DE DE

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INTRODUCTION

0 Principles of safety

The following principles have been adopted by technical committee 74 in the development of this standard.

These principles do not cover performance or functional characteristics of equipment.

Words printed in SMALL CAPITALS are terms that are defined in 1.2 of this standard.

0.1 General principles of safety

It is essential that designers understand the underlying principles of safety requirements in order that they can engineer safe equipment.

These principles are not an alternative to the detailed requirements of this standard, but are intended to provide designers with an appreciation of the basis of these requirements. Where the equipment involves technologies and materials or methods of construction not specifically covered, the design of the equipment should provide a level of safety not less than those described in these principles of safety.

Designers shall take into account not only normal operating conditions of the equipment but also likely fault conditions, consequential faults, foreseeable misuse and external influences such as temperature, altitude, pollution, moisture, overvoltages on the mains and overvoltages on the telecommunication lines.

The following priorities should be observed in determining what design measures to adopt:

– where possible, specify design criteria that will eliminate, reduce or guard against hazards;

– where the above is not practicable because the functioning of the equipment would be impaired, specify the use of protective means independent of the equipment, such as personal protective equipment (which is not specified in this standard);

– where neither of the above measures is practicable, or in addition to those measures, specify the provision of markings and instructions regarding the residual risks.

There are two types of persons whose safety needs to be considered, USERS (or OPERATORS) and SERVICE PERSONNEL.

USER is the term applied to all persons other than SERVICE PERSONNEL. Requirements for protection should assume that USERS are not trained to identify hazards, but will not intentionally create a hazardous situation. Consequently, the requirements will provide protection for cleaners and casual visitors as well as the assigned USERS. In general, USERS should not have access to hazardous parts, and to this end, such parts should only be in SERVICE ACCESS AREAS or in equipment located in RESTRICTED ACCESS LOCATIONS.

When USERS are admitted to RESTRICTED ACCESS LOCATIONS they shall be suitably instructed.

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SERVICE PERSONNEL are expected to use their training and skill to avoid possible injury to themselves and others due to obvious hazards which exist in SERVICE ACCESS AREAS of the equipment or on equipment located in RESTRICTED ACCESS LOCATIONS. However, SERVICE PERSONNEL should be protected against unexpected hazards. This can be done by, for example, locating parts that need to be accessible for servicing away from electrical and mechanical hazards, providing shields to avoid accidental contact with hazardous parts, and providing labels or instructions to warn personnel about any residual risk.

Information about potential hazards can be marked on the equipment or provided with the equipment, depending on the likelihood and severity of injury, or made available for SERVICE PERSONNEL. In general, USERS shall not be exposed to hazards likely to cause injury, and information provided for USERS should primarily aim at avoiding misuse and situations likely to create hazards, such as connection to the wrong power source and replacement of fuses by incorrect types.

MOVABLE EQUIPMENT is considered to present a slightly increased risk of shock, due to possible extra strain on the supply cord leading to rupture of the earthing conductor. With HAND-HELD EQUIPMENT, this risk is increased; wear on the cord is more likely, and further hazards could arise if the units were dropped. TRANSPORTABLE EQUIPMENT introduces a further factor because it can be used and carried in any orientation; if a small metallic object enters an opening in the ENCLOSURE it can move around inside the equipment, possibly creating a hazard.

0.2 Hazards

Application of a safety standard is intended to reduce the likelihood of injury or damage due to the following:

– electric shock;

– energy related hazards;

– fire;

– heat related hazards;

– mechanical hazards;

– radiation;

– chemical hazards.

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0.2.1 Electric shock

Electric shock is due to current passing through the human body. The resulting physiological effects depend on the value and duration of the current and the path it takes through the body. The value of the current depends on the applied voltage, the impedance of the source and the impedance of the body. The body impedance depends in turn on the area of contact, moisture in the area of contact and the applied voltage and frequency. Currents of approximately half a milliampere can cause a reaction in persons in good health and may cause injury indirectly due to involuntary reaction. Higher currents can have more direct effects, such as burn or ventricular fibrillation.

Steady state voltages up to 42,4 V peak, or 60 V d.c., are not generally regarded as hazardous under dry conditions for an area of contact equivalent to a human hand. Bare parts which have to be touched or handled should be at earth potential or properly insulated.

Some equipment will be connected to telephone and other external networks. Some TELECOMMUNICATION NETWORKS operate with signals such as voice and ringing superimposed on a steady DC VOLTAGE; the total may exceed the values given above for steady-state voltages. It is common practice for the SERVICE PERSONNEL of telephone companies to handle parts of such circuits bare-handed. This has not caused serious injury, because of the use of cadenced ringing and because there are limited areas of contact with bare conductors normally handled by SERVICE PERSONNEL. However, the area of contact of a part accessible to the USER, and the likelihood of the part being touched, should be further limited (e.g. by the shape and location of the part).

It is normal to provide two levels of protection for USERS to prevent electric shock. Therefore, the operation of equipment under normal conditions and after a single fault, including any consequential faults, should not create a shock hazard. However, provision of additional protective measures, such as protective earthing or SUPPLEMENTARY INSULATION, is not considered a substitute for, or a relief from, properly designed BASIC INSULATION.

Hazards may result from:	**Examples of measures to reduce hazards:**
Contact with bare parts normally at HAZARDOUS VOLTAGES.	Prevent USER access to parts at HAZARDOUS VOLTAGES by fixed or locked covers, SAFETY INTERLOCKS, etc. Discharge accessible capacitors that are at HAZARDOUS VOLTAGES.
Breakdown of insulation between parts normally at HAZARDOUS VOLTAGES and accessible conductive parts.	Provide BASIC INSULATION and connect the accessible conductive parts and circuits to earth so that exposure to the voltage which can develop is limited because overcurrent protection will disconnect the parts having low impedance faults within a specified time; or provide a metal screen connected to protective earth between the parts, or provide DOUBLE or REINFORCED INSULATION between the parts, so that breakdown to the accessible part is not likely to occur.
Contact with circuits connected to TELECOMMUNICATION NETWORKS which exceed 42,4 V peak or 60 V d.c.	Limit the accessibility and area of contact of such circuits, and separate them from unearthed parts to which access is not limited.
Breakdown of USER-accessible insulation.	Insulation which is accessible to the USER should have adequate mechanical and electrical strength to reduce the likelihood of contact with HAZARDOUS VOLTAGES.

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Hazards may result from:	Examples of measures to reduce hazards:
TOUCH CURRENT (leakage current) flowing from parts at HAZARDOUS VOLTAGES to accessible parts, or failure of a protective earthing connection. TOUCH CURRENT may include current due to EMC filter components connected between PRIMARY CIRCUITS and accessible parts.	Limit TOUCH CURRENT to a specified value, or provide a high integrity protective earthing connection.

0.2.2 Energy related hazards

Hazards may result from a short circuit between adjacent poles of high current supplies or high capacitance circuits, causing:

– burns;

– arcing;

– ejection of molten metal.

Even circuits whose voltages are safe to touch may be hazardous in this respect.

Examples of measures to reduce such hazards include:

– separation;

– shielding;

– provision of safety interlocks.

0.2.3 Fire

Hazards may result from excessive temperatures either under normal operating conditions or due to overload, component failure, insulation breakdown or loose connections. Fires originating within the equipment should not spread beyond the immediate vicinity of the source of the fire, nor cause damage to the surroundings of the equipment.

Examples of measures to reduce such hazards include:

– providing overcurrent protection;

– using constructional materials having appropriate flammability properties for their purpose;

– selection of parts, components and consumable materials to avoid high temperature which might cause ignition;

– limiting the quantity of combustible materials used;

– shielding or separating combustible materials from likely ignition sources;

– using ENCLOSURES or barriers to limit the spread of fire within the equipment;

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– using suitable materials for ENCLOSURES so as to reduce the likelihood of fire spreading from the equipment.

0.2.4 Heat related hazards

Hazards may result from high temperatures under normal operating conditions, causing:

– burns due to contact with hot accessible parts;

– degradation of insulation and of safety-critical components;

– ignition of flammable liquids.

Examples of measures to reduce such hazards include:

– taking steps to avoid high temperature of accessible parts;

– avoiding temperatures above the ignition point of liquids;

– provision of markings to warn USERS where access to hot parts is unavoidable.

0.2.5 Mechanical hazards

Hazards may result from:

– sharp edges and corners;

– moving parts which have the potential to cause injury;

– equipment instability;

– flying particles from imploding cathode ray tubes and exploding high pressure lamps.

Examples of measures to reduce such hazards include:

– rounding of sharp edges and corners;

– guarding;

– provision of SAFETY INTERLOCKS;

– providing sufficient stability to free-standing equipment;

– selecting cathode ray tubes and high pressure lamps that are resistant to implosion and explosion respectively;

– provision of markings to warn USERS where access is unavoidable.

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0.2.6 Radiation

Hazards to USERS and to SERVICE PERSONNEL may result from some forms of radiation emitted by equipment. Examples are sonic (acoustic), radio frequency, infra-red, ultraviolet and ionizing radiation, and high intensity visible and coherent light (lasers).

Examples of measures to reduce such hazards include:

– limiting the energy level of potential radiation sources;

– screening radiation sources;

– provision of SAFETY INTERLOCKS;

– provision of markings to warn USERS where exposure to the radiation hazard is unavoidable.

0.2.7 Chemical hazards

Hazards may result from contact with some chemicals or from inhalation of their vapours and fumes.

Examples of measures to reduce such hazards include:

– avoiding the use of constructional and consumable materials likely to cause injury by contact or inhalation during intended and normal conditions of use;

– avoiding conditions likely to cause leakage or vaporization;

– provision of markings to warn USERS about the hazards.

0.3 Materials and components

Materials and components used in the construction of equipment should be so selected and arranged that they can be expected to perform in a reliable manner for the anticipated life of the equipment without creating a hazard, and would not contribute significantly to the development of a serious fire hazard. Components should be selected so that they remain within their manufacturers' ratings under normal operating conditions, and do not create a hazard under fault conditions.

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SAFETY OF INFORMATION TECHNOLOGY EQUIPMENT –

1 General

1.1 Scope

1.1.1 Equipment covered by this standard

NAA
NAE

This standard is applicable to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a RATED VOLTAGE not exceeding 600 V and designed to be installed in accordance with the Canadian Electrical Code, Part I, CSA C22.1; CSA C22.2 No. 0; and the National Electrical Code, NFPA 70. D1 D1 D1

The standard is also applicable to equipment, unless otherwise identified by a marking or instructions, designed to be installed in accordance with Article 645 of the National Electrical Code, NFPA 70, and the Standard for the Protection of Electronic Computer Data-Processing Equipment, NFPA 75. D1 D1 D1 D1

See annex NAE for examples of and references to regulatory requirements that may apply to this equipment. D1 D1

This standard is also applicable to such information technology equipment designed and intended to be connected directly to a TELECOMMUNICATION NETWORK, regardless of the source of power.

It is also applicable to such information technology equipment designed to use the AC MAINS SUPPLY as a telecommunication transmission medium (see note 4 of clause 6).

This standard specifies requirements intended to reduce risks of fire, electric shock or injury for the OPERATOR and layman who may come into contact with the equipment and, where specifically stated, for SERVICE PERSONNEL.

This standard is intended to reduce such risks with respect to installed equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

Examples of equipment which is in the scope of this standard are:

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accounting machines
bookkeeping machines
calculators
cash registers
copying machines
data circuit terminating equipment
data preparation equipment
data processing equipment
data terminal equipment
dictation equipment
document shredding machines
duplicators
electrically operated drawing machines
erasers
facsimile equipment
key telephone systems
magnetic tape handlers
mail processing machines
micrographic office equipment
modems
monetary processing machines including automated teller (cash dispensing) machines
motor operated files
PABX's
paper jogging machines
paper trimmers (punchers cutting machines, separators)
pencil sharpeners
personal computers
photoprinting equipment
plotters
point of sale terminals including associated electronic scales
postage machines
public information terminals
staplers
telephone answering machines
telephone sets
text processing equipment
typewriters
visual display units

This list is not intended to be comprehensive, and equipment that is not listed is not necessarily excluded from the scope.

Equipment complying with the relevant requirements in this standard is considered suitable for use with process control equipment, automatic test equipment and similar systems requiring information processing facilities. However, this standard does not include requirements for performance or functional characteristics of equipment.

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1.1.2 Additional requirements

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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 or vibration; flammable gases; and corrosive or explosive atmospheres;

– electromedical applications with physical connections to the patient;

– equipment intended to be used in vehicles, on board ships or aircraft, in tropical countries, or at altitudes greater than 2 000 m;

– equipment intended for use where ingress of water is possible; for guidance on such requirements and on relevant testing, see annex T.

NOTE – Attention is drawn to the fact that authorities of some countries impose additional requirements.

1.1.3 Exclusions

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This standard does not apply to:

– support equipment, such as air conditioning, fire detection or fire extinguishing systems;

– power supply systems, such as motor-generator sets, battery backup systems and transformers, which are not an integral part of the equipment;

– building installation wiring;

– devices requiring no electrical power.

1.2 Definitions

For the purpose of this International Standard the following definitions apply. Where the terms ″voltage″ and ″current″ are used they imply the r.m.s. values, unless otherwise specified.

Definitions in alphabetical order of nouns

AREA, OPERATOR ACCESS	1.2.7.1
AREA, SERVICE ACCESS	1.2.7.2
BODY	1.2.7.5
CABLE, INTERCONNECTING	1.2.11.6
CIRCUIT, ELV	1.2.8.5
CIRCUIT, LIMITED CURRENT	1.2.8.7
CIRCUIT, PRIMARY	1.2.8.2
CIRCUIT, SECONDARY	1.2.8.3
CIRCUIT, SELV	1.2.8.6
CIRCUIT, TNV	1.2.8.9
CIRCUIT, TNV-1	1.2.8.10
CIRCUIT, TNV-2	1.2.8.11
CIRCUIT, TNV-3	1.2.8.12
CLEARANCE	1.2.10.1
CONDUCTOR, PROTECTIVE BONDING	1.2.13.11

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