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Electrical installations of buildings. Part 7: Requirements for special installations or locations. Section 707: Earthing requirements for the installation of data processing equipment

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Installations électriques des bâtiments. Septième partie: Règles pour les installations et emplacements spéciaux. Section 707: Mise à la terre des installations de matériel de traitement de l'information

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Septième partie: Règles pour les installations et emplacements spéciaux

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Electrical installations of buildings

Part 7: Requirements for special installations or locations

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS OF BUILDINGS

Part 7: Requirements for special installations or locations

Section 707 — Earthing requirements for the installation
of data processing equipment

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

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PREFACE

This standard has been prepared by IEC Technical Committee No. 64: Electrical Installations of Buildings.

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

Six Months' Rule	Report on Voting
64(CO)133	64(CO)144

Further information can be found in the Report on Voting indicated in the table above.

The following IEC publications are quoted in this standard:

- Publication Nos. 83 (1975): Plugs and Socket-outlets for Domestic and Similar General Use. Standards.
 309-1 (1979): Plugs, Socket-outlets and Couplers for Industrial Purposes. Part 1: General Requirements.
 435 (1983): Safety of Data Processing Equipment.
 614-2-1 (1982): Specification for Conduits for Electrical Installations. Part 2: Particular Specifications for Conduits. Section One — Metal Conduits.

ELECTRICAL INSTALLATIONS OF BUILDINGS

Part 7: Requirements for special installations or locations

Section 707 — Earthing requirements for the installation of data processing equipment

700.1 Introduction

The requirements of Part 7 supplement, modify or replace the general requirements of the other parts of IEC Publication 364.

The numbers following the particular number of section of Part 7 are those of the corresponding parts, chapters, sections or clauses of IEC Publication 364.

The absence of reference to a chapter, a section or a clause means that the corresponding general requirements are applicable.

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707. EARTHING REQUIREMENTS FOR THE INSTALLATION OF DATA PROCESSING EQUIPMENT

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707.1 Scope

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Note. — Radio-frequency interference suppression filters fitted to data processing equipment may produce high earth leakage current. In such cases failure of continuity in the protective earth connection may cause a dangerous touch voltage. The main purpose of this section is to prevent this hazard.

The particular requirements of this section apply to the connection of data processing equipment to the electrical power installation of buildings, where the data processing equipment:

- has earth leakage current exceeding the limit specified in IEC Publication 435: Safety of Data Processing Equipment, for equipment connected via a plug and socket complying with IEC Publication 83: Plugs and Socket-outlets for Domestic and Similar General Use. Standards, or similar;
- complies with those requirements of IEC Publication 435 which cover leakage current.

The requirements of this section apply to the installation up to the point of connection of the equipment (see Figure A1, page 17).

These requirements may also be applied where installations, other than data processing, such as those for industrial control and telecommunications equipment carry high leakage current due to radio-frequency interference suppression filtering requirements.

707.2 Definitions

707.201 *Data processing equipment*

Electrically operated machine units that, separately or assembled in systems, accumulate, process and store data. Acceptance and divulgence of data may or may not be by electronic means.

707.202 *Low noise earth*

An earth connection in which the level of conducted interference from external sources does not produce an unacceptable incidence of malfunction in the data processing or similar equipment to which it is connected.

Note. — The susceptibility in terms of amplitude/frequency characteristics varies depending on the type of equipment.

707.203 *High leakage current*

Earth leakage current exceeding the limit specified in and measured in accordance with IEC Publication 435 for equipment connected via a plug and socket complying with IEC Publication 83 or similar.

707.4 Protection for safety

707.471.3 *Additional protection against electric shock for equipment with high leakage current*

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707.471.3.1 The requirements of this clause apply where equipment having high leakage current is connected to any type of power system. These requirements apply to the installation as shown in Figure A4.1.

Additional requirements are given for TT and IT systems in Sub-clauses 707.471.4 and 707.471.5 respectively.

Notes 1. — On TN-C systems where the neutral and protective conductors are contained in a single conductor (PEN conductor) up to the equipment terminals, leakage current may be treated as load current.

2. — Equipment normally having high earth leakage current may not be compatible with installations incorporating residual current protective devices. As well as the standing residual current due to leakage current, the possibility of nuisance tripping due to capacitor charging currents at switch-on shall be considered.

707.471.3.2 Equipment shall be:

- stationary, and
- either permanently connected to the building wiring installation or connected via industrial plugs and sockets.

Notes 1. — Plugs and sockets complying with IEC Publication 309-1: Plugs, Socket-outlets and Couplers for Industrial Purposes. Part 1: General Requirements, are examples of suitable plugs and sockets. Plugs and sockets for general use, such as those conforming to IEC Publication 83, are not suitable.

2. — It is particularly important for equipment with high leakage current, that earth continuity should be checked, as required by Chapter 61 (under consideration), at the time it is installed and after any modification to the installation.
It is also recommended that earth continuity be checked thereafter at regular intervals.

707.471.3.3 Further requirements for leakage currents exceeding 10 mA

Where leakage current measured in accordance with IEC Publication 435 exceeds 10 mA, equipment shall be connected in accordance with one of the three alternative requirements detailed in Sub-clauses 707.471.3.3.1, 707.471.3.3.2 and 707.471.3.3.3.

Note. — Leakage current measurements prescribed by IEC Publication 435 include likely undetected fault conditions within the equipment.

707.471.3.3.1 High-integrity protective (earth) circuits

Note. — The aim of these requirements is to provide high-integrity protective circuits by using robust or duplicate conductors in association with permanent connections or robust connectors.

Protective conductors shall have the greater cross-sectional area resulting from compliance with Section 543 or the following:

a) Where independent protective conductors are used there shall be one conductor with a cross-sectional area of not less than 10 mm² or two conductors with independent terminations, each having a cross-sectional area of not less than 4 mm².

Note. — Conductors of 10 mm² or greater cross-sectional area may be aluminium.

b) When incorporated in a multicore cable together with the supply conductors, the sum total cross-sectional area of all the conductors shall be not less than 10 mm².

c) Where the protective conductor is installed in, and connected in parallel with a rigid or flexible metal conduit having electrical continuity in accordance with IEC Publication 614-2-1: Specification for Conduits for Electrical Installations. Part 2: Particular Specifications for Conduits. Section One — Metal Conduits, a conductor of not less than 2.5 mm² shall be used.

d) Rigid and flexible metallic conduits, metallic trunking and ducting and metallic screens and armouring which meet the requirements of Sub-clause 543.2.1.

Each conductor specified in Items a), b), c) and d) shall meet the other requirements of Section 543.

707.471.3.3.2 Earth continuity monitoring

Note. — The aim of these requirements is to monitor the continuity of the protective earth connection and provide means of automatic supply disconnection in case of failure.

A device or devices shall be provided which will disconnect the equipment in the event of a discontinuity occurring in the protective conductor in accordance with the requirements of Clause 413.1.

The protective conductor shall comply with Section 543.

707.471.3.3.3 Use of double wound transformer

Note. — The aim of these requirements is to localize the path of the leakage current, and minimize the possibility of a break in continuity in this path.

Where equipment is connected to the supply via a double wound transformer or other units in which the input and output circuits are separated, such as motor-alternator sets, the secondary circuit should preferably be connected as TN-system but an IT-system may be used where required for specific applications.

The earth connections between the equipment and the transformer shall comply with the requirements of Sub-clauses 707.471.3.3.1 or 707.471.3.3.2.

707.471.4 *Additional requirements for TT-system*

707.471.4.1 Where the circuit is protected by a residual current protective device, the total leakage current I_l (in amperes), the resistance of the earth electrode R_A (in ohms) and the rated operating residual current of the protective device $I_{\Delta n}$ (in amperes) shall be related as follows:

$$I_l \leq \frac{I_{\Delta n}}{2} \leq \frac{U_L}{2R_A}$$

707.471.4.2 If the requirement of Sub-clause 707.471.4.1 cannot be met the requirements of Sub-clause 707.471.3.3.3 shall apply.

707.471.5 *Additional requirements for IT systems*

707.471.5.1 It is preferred that equipment with high-leakage current is not connected directly to IT systems because of the difficulty of satisfying touch voltage requirements after a first fault.

Where possible the equipment should be supplied by a TN-system derived from the IT-mains supply by means of a double wound transformer.

Where it is possible to comply with Sub-clause 413.1.5.3 the equipment may be connected directly to the IT system. This may be facilitated by connecting all protective earth connections directly to the power system earth electrode.

707.471.5.2 Before making direct connection to an IT system, installers shall ensure that equipment is suitable for connection to IT systems in accordance with the declaration of the manufacturer.

707.5 *Selection and erection of equipment*

707.545.2 *Safety requirement for low noise earthing arrangements*

Note. — It may be found that the electrical noise levels on the protective earthing system of building installations cause an unacceptable incidence of malfunction on data processing equipment connected to it.

707.545.2.1 Exposed conductive parts of data processing equipment shall be connected to the main earthing terminal.

Note. — Clause 413.1 forbids the use of separate earth electrodes for simultaneously accessible exposed conductive parts.

This requirement shall also apply to metallic enclosures of Class II and Class III equipment and to FELV circuits when these are earthed for functional reasons.

Earth conductors which serve functional purposes only need not comply with Section 543.