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Inženiring opreme (EE) – Ozemljitev in povezave telekomunikacijske opreme v telekomunikacijskih centrih

Equipment Engineering (EE); Earthing and bonding of telecommunication equipment in telecommunication centres

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Equipment Engineering (EE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS has been produced within the framework of the following considerations:

a) centralized telecommunication equipment is generally installed in telecommunication centres and held in racks, cabinets or other mechanical structures;

b) the existing CCITT and CCIR Recommendations and CENELEC standards in such matters do not ensure the required standardization at the equipment level;

c) network operators and equipment providers agreed to standardize on a bonding configuration that facilitates:

- compliance with functional requirements including Electromagnetic Compatibility (EMC) aspects of emission and immunity;
- compatible building and equipment provisions;
- installation of new telecommunication centres as well as expansion or replacement of installations in existing telecommunication centres with equipment coming from different suppliers;
- a structured installation practice;
- simple maintenance rules;
- contracting on a common basis;
- cost effectiveness in development, manufacturing, installation and operation.

Transposition dates	
Date of latest announcement of this ETS (doa):	30 April 1995
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 October 1995
Date of withdrawal of any conflicting National Standard (dow):	31 October 1995

Introduction

This ETS addresses earthing and bonding of telecommunication equipment in telecommunication centres in relation to safety, functional performance and EMC.

Information regarding the general principles on earthing for telecommunication sites has been published by the CCITT in the handbook on "Earthing of telecommunication installations" (see annex C). CCITT Recommendation K.27 deals with bonding configurations and earthing inside a telecommunication building. One bonding configuration only is selected from CCITT Recommendation K.27 and tailored to this ETS.

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1 Scope

This European Telecommunication Standard (ETS) applies in telecommunication centres and similar installations to the bonding network of the building, the bonding network of the equipment, and the interconnection between these two networks. It contributes to the standardization of telecommunication equipment and co-ordinates with the pre-requirements of installation conditions to achieve the following targets:

- safety from electrical hazards;
- reliable signal reference;
- satisfactory Electromagnetic Compatibility (EMC) performance.

A defined bonding configuration down to the equipment level shall facilitate the installation, operation and maintenance of telecommunication centres in telecommunication buildings or similar installations independent of the equipment supplier.

The specification of telecommunication equipment and of the pre-requirements of installation are subject to agreement of the parties (e.g. the supplier and the purchaser). Annex A can be used in the procedure to achieve agreement.

This ETS does not apply to telecommunication equipment not intended to be installed inside telecommunication centres, e.g.:

- smaller telecommunication equipment inside a subscriber's building;
- subscriber line terminal equipment.

NOTE: A separate ETS about earthing and bonding of telecommunication equipment inside a subscriber's building is under consideration.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] CENELEC HD 384.4.41: "Electrical installation of buildings; Part 4: Protection for safety; Chapter 41: Protection against electric shock".

[2] CENELEC HD 384.5.54: "Electrical installation of buildings; Part 5: Selection and erection of electrical equipment; Chapter 54: Earthing arrangements and protective conductors".

[3] CENELEC EN 60950: "Safety of information technology equipment including electrical business equipment" (as correspondent to IEC 950).

[4] CENELEC EN 41003: "Particular safety requirements for equipment to be connected to telecommunication networks".

[5] IEC 50: "International Electrotechnical Vocabulary".

[6] IEC 50 (604): "International Electrotechnical Vocabulary; Chapter 604: Generation, transmission and distribution of electricity - Operation".

[7] IEC 50 (826): "International Electrotechnical Vocabulary; Chapter 826: Electrical installations of buildings".

3 Abbreviations and definitions

3.1 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AC	Alternating Current
BN	Bonding Network
CBN	Common Bonding Network
DC	Direct Current
EMC	Electromagnetic Compatibility
LPS	Lightning Protection System
MESH-BN	Meshed Bonding Network
MESH-IBN	Meshed Isolated Bonding Network
N	Neutral conductor
PE	Protective conductor
PEN	combined Protective conductor and Neutral conductor
RF	Radio Frequency
SRPP	System Reference Potential Plane

3.2 Definitions

The following definitions with respect to earthing and bonding are introduced by the IEC 50 [5] and are used within this ETS to maintain conformity.

3.2.1 IEC definitions (by IEC 50 numbers)

NOTE: IEC 50 [5] references are given in parentheses (see IEC 50 (604) [6] and IEC 50 (826) [7]).

earth (826-04-01): The conductive mass of earth, whose electric potential at any point is conventionally taken as equal to zero.

earth electrode (826-04-02): A conductive part or a group of conductive parts in intimate contact with and providing an electrical connection with earth.

earthing network (604-04-07): The part of an earthing installation that is restricted to the earth electrodes and their interconnections.

earthing conductor (826-04-07): A protective conductor connecting the main earthing terminal or bar to the earth electrode.

main earthing terminal (826-04-08): A terminal or bar provided for the connection of protective conductors, including equipotential bonding conductors and conductors for functional earthing if any, to the means of earthing.

equipotential bonding (826-04-09): Electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential.

equipotential bonding conductor (826-04-10): A protective conductor for ensuring equipotential bonding.

Protective conductor (PE) (826-04-05): A conductor required by some measures for protection against electric shock by electrically connecting any of the following parts:

- exposed conductive parts;
- extraneous conductive parts;
- main earthing terminal;
- earth electrode;

- earthed point of the source or artificial neutral.

Neutral conductor (N) (826-01-03): A conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy.

PEN conductor (826-04-06): An earthed conductor combining the functions of both protective conductor and neutral conductor.

IT: See IEC Standard 364-3.

TN-C: See IEC Standard 364-3.

TN-S: See IEC Standard 364-3.

TT: See IEC Standard 364-3.

3.2.2 Telecommunication definitions

The following definitions, specific to telecommunication installations and not covered by the IEC 50 [5], are used within this ETS. Correspondence to CCITT Recommendation K.27 (see annex C) is indicated as appropriate.

Bonding Network (BN), (CCITT Recommendation K.27): A set of interconnected conductive structures that provides an "electromagnetic shield" for electronic systems and personnel at frequencies from Direct Current (DC) to low Radio Frequency (RF). The term "electromagnetic shield" denotes any structure used to divert, block or impede the passage of electromagnetic energy. In general, a BN need not be connected to earth but all BNs considered in this ETS will have an earth connection.

Common Bonding Network (CBN), (CCITT Recommendation K.27): The CBN is the principal means for effective bonding and earthing inside a telecommunication building. It is the set of metallic components that are intentionally or incidentally interconnected to form the principal BN in a building. These components include: structural steel or reinforcing rods, metallic plumbing, Alternating Current (AC) power conduit, PE conductors, cable racks and bonding conductors. The CBN always has a mesh topology and is connected to the earthing network.

Meshed Bonding Network (MESH-BN), (CCITT Recommendation K.27): A bonding network in which all associated equipment frames, racks and cabinets and usually the DC power return conductor, are bonded together as well as at multiple points to the CBN. Consequently, the MESH-BN augments the CBN (see figure 1).

Meshed Isolated Bonding Network (MESH-IBN), (CCITT Recommendation K.27): A type of IBN in which the components of the IBN (e.g. equipment frames) are interconnected to form a mesh-like structure. This may, for example, be achieved by multiple interconnections between cabinet rows, or by connecting all equipment frames to a metallic grid (a "bonding mat") extending beneath the equipment. The bonding mat is, of course, insulated from the adjacent CBN. If necessary the bonding mat could include vertical extensions, resulting in an approximation to a Faraday cage. The spacing of the grid is chosen according to the frequency range of the electromagnetic environment.

system: A regularly interacting or interdependent group of items forming a unified whole.

system block: A functional group of equipment depending in its operation and performance on its connection to the same system reference potential plane, inherent to a MESH-BN.

System Reference Potential Plane (SRPP): A conductive solid plane, as an ideal goal in potential equalising, is approached in practice by horizontal or vertical meshes. The mesh width thereof is adapted to the frequency range to be considered. Horizontal and vertical meshes may be interconnected to form a grid structure approximating to a Faraday cage.

The SRPP facilitates signalling with reference to a common potential.