

Električne inštalacije zgradb – 5-54. del: Izbira in namestitve električne opreme – Ozemljitve in zaščitni vezni vodniki

Electrical installations of buildings – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors and protective bonding conductors

HARMONIZATION DOCUMENT

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DOCUMENT D'HARMONISATION

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Will supersede HD 384.5:54, S1:1988

English version

Electrical installations of buildings
Part 5-54: Selection and erection of electrical equipment -
Earthing arrangements, protective conductors and protective
bonding conductors
(IEC 60364-5-54:2002, modified)

Installations électriques des bâtiments
Partie 5-54: Choix et mise en oeuvre des
matériels électriques - Mises à la terre,
conducteurs de protection et conducteurs
d'équipotentialité de protection
(CEI 60364-5-54:2002, modifiée)

Elektrische Anlagen von Gebäuden
Teil 5-54: Auswahl und Errichtung
elektrischer Betriebsmittel -
Erdungsanlagen, Schutzleiter und
Potentialausgleich
(IEC 60364-5-54:2002, modifiziert)

This draft Harmonization Document is submitted to CENELEC members for CENELEC enquiry.
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The text of this draft consists of the text of IEC 60364-5-54:2002 with common modifications prepared by SC 64A of Technical Committee CENELEC TC 64.

If this draft becomes a Harmonization Document, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

This draft Harmonization Document was established by CENELEC in three official versions (English, French, German).

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CENELEC

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Foreword

The text of the International Standard IEC 60364-5-54:2002, prepared by IEC TC 64, Electrical installations and protection against electric shock, together with the common modifications prepared by SC 64A, Electrical Installations and protection against electric shock, of Technical Committee CENELEC TC 64, Electrical installations of buildings, is submitted to CENELEC enquiry.

When ratified this HD 60364-5-54 will supersede HD 384.5.54 S1:1988.

Annexes ZA, ZB and ZC have been added by CENELEC.

In this standard, the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

Draft for Enquiry

INTRODUCTION

Clause numbering is sequential, preceded by the number of this part (e.g. 541). Numbering of figures and tables takes the number of this part followed by a sequential number, i.e. Table 54.1, 54.2, etc. Numbering of figures and tables in annexes takes the letter of the annex, followed by the number of the part, followed by a sequential number, e.g. A.54.1, A.54.2, etc.

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 60364-5-54 are prefixed 'Z'.

Draft for Enquiry

Text of prHD 60364-5-54**541 General****541.1 Scope**

This part of IEC 60364 addresses the earthing arrangements, protective conductors and protective bonding conductors in order to satisfy the safety of the electrical installation.

541.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-195, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60287-1-1, *Electric cables – Calculation of the current rating – Part 1-1: Current rating equations (100 % load factor) and calculation of losses – General*

IEC 60364-4-41, *Electrical installations of buildings – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-43, *Electrical installations of buildings – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-4-44, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-5-52, *Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60724, *Short-circuit temperature limits of electric cables with rated voltages of 1 kV ($U_m = 1,2$ kV) and 3 kV ($U_m = 3,6$ kV)*

IEC 60853-2, *Calculation of the cyclic and emergency current rating of cables – Part 2: Cyclic rating of cables greater than 18/30 (36) kV and emergency ratings for cables of all voltages*

IEC 60909-0, *Short-circuit currents in three-phase a.c. systems – Part 0: Calculation of currents*

IEC 60949, *Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects*

IEC 61024-1, *Protection of structures against lightning – Part 1: General principles*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC Guide 104, *The preparation of safety publications and the use of basic safety publications and group safety publications*

541.3 Definitions

For the purposes of this part of IEC 60364, the definitions of IEC 61140, together with the following definitions taken from IEC 60050-195, apply.

Definitions used for earthing arrangements, protective conductors and protective bonding conductors are illustrated in Annex B and listed here as follows:

541.3.1

exposed-conductive-part

conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails

[IEV 195-06-10]

541.3.2

main earthing terminal

(main earthing busbar)

terminal or busbar which is part of the earthing arrangement of an installation enabling the electric connection of a number of conductors for earthing purposes

[IEV 195-02-33]

541.3.3

earth electrode

conductive part, which may be embedded in a specific conductive medium, e.g. concrete in electric contact with the earth

[IEV 195-02-01]

541.3.4

protective conductor

conductor provided for purposes of safety, for example protection against electric shock

[IEV 195-02-09]

541.3.5

protective bonding conductor

protective conductor provided for protective equipotential-bonding

[IEV 195-02-10]

541.3.6

earthing conductor

conductor which provides a conductive path, or part of the conductive path, between a given point in a system or in an installation or in equipment and an earth electrode

[IEV 195-02-03]

NOTE For the purposes of this part of IEC 60364, an earthing conductor is the conductor which connects the earth electrode to a point in the equipotential bonding system, usually the main earthing terminal.

541.3.7

extraneous-conductive-part

conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth

[IEV 195-06-11]

542 Earthing arrangements

542.1 General requirements

542.1.1 The earthing arrangements may be used jointly or separately for protective and functional purposes according to the requirements of the electrical installation. The requirements for protective purposes shall always take precedence.

542.1.2 Where provided, earth electrodes within an installation shall be connected to the main earthing terminal using an earthing conductor.

Where a supply is taken at high voltage protection arising from faults between the high voltage system and earth shall be provided in accordance with HD 384.4.442.

542.1.4 The requirements for earthing arrangements are intended to provide a connection to earth:

- which is reliable and suitable for the protective requirements of the installation;
- which can carry earth fault currents and protective conductor currents to earth without danger from thermal, thermo-mechanical and electromechanical stresses and from electric shock arising from these currents;
- which provides the robustness or mechanical protection in respect to estimated external influences (see HD 384.5.512).
- which, if relevant, is also suitable for functional requirements.

542.2 Earth electrodes

542.2.1 Materials and dimensions of the earth electrodes shall be selected to withstand corrosion and to have adequate mechanical strength.

For commonly used materials, the common minimum sizes from the point of view of corrosion and mechanical strength for earth electrodes where embedded in the soil are given in Table 54.1.

NOTE If a lightning protection system (LPS) is present, the IEC 61024-1 applies.

Table 54.1 – Common minimum sizes for earth electrodes of commonly used material from the point of view of corrosion and mechanical strength where embedded in the soil

Material	Surface	Shape	Minimum size				
			Diameter mm	Cross-sectional area mm ²	Thickness mm	Thickness of coating/sheathing	
						Individual value µm	Average value µm
Steel	Hot-dip galvanized ^a or Stainless ^{a, b}	Strip ^c		90	3	63	70
		Sections		90	3	63	70
		Round rod for deep earth electrodes	16			63	70
		Round wire for surface electrode ^g	10				50 ^e
		Pipe	25		2	47	55
	Copper- sheathed	Round rod for deep earth electrode	15			2 000	
	With electro- deposited copper coating	Round rod for deep earth electrode	14			90	100
Copper	Bare ^a	Strip		50	2		
		Round wire for surface electrode ^g		25 ^f			
		Rope	1,8 for individual strands of wire	25			
		Pipe	20		2		
	Tin-coated	Rope	1,8 for individual strands of wire	25		1	5
	Zinc-coated	Strip ^d		50	2	20	40

^a Can also be used for electrodes to be embedded in concrete.
^b No coating applied.
^c As rolled strip or slit strip with rounded edges.
^d Strip with rounded edges.
^e In the case of continuous bath coating, only 50 µm thickness is technically feasible at present.
^f Where experience shows that the risk of corrosion and mechanical damage is extremely low, 16 mm² can be used.
^g An earth electrode is considered to be a surface electrode when installed at a depth not exceeding 0,5 m.

542.2.2 The efficacy of any earth electrode depends upon local soil conditions. One or more earth electrodes suitable for the soil conditions and the value of resistance to earth required, shall be selected.

542.2.3 The following are examples of earth electrodes which may be used:

- underground structural networks embedded in foundations (foundation earthing);
- plates;
- metal reinforcement of concrete (except pre-stressed concrete) embedded in the earth;
- rods or pipes;
- tapes or wires;
- metal sheaths and other metal coverings of cables according to local conditions or requirements;
- other suitable underground metalwork according to local conditions or requirements.

NOTE 1 In Austria, Belgium, Finland, France, Germany, Spain, Sweden, Switzerland and the UK, water pipes are not permitted as earth electrodes.

NOTE 2 In Denmark, Netherlands, Slovenia and Italy it is permitted to use a water pipe system, but only with the consent of the water distributor.

542.2.4 When selecting type and embedded depth of earth electrode, consideration shall be given to local conditions and regulations so that soil drying and freezing will be unlikely to increase the earth resistance of the earth electrode to such a value that would impair the protective measures against electric shock (see IEC 60364-4-41).

NOTE In Germany, there is an obligation to erect in every new building a foundation earth electrode according to National Standard DIN 18014.

542.2.5 Consideration shall be given to electrolytic corrosion when using different materials in an earthing arrangement.

542.2.6 A metallic pipe for flammable liquids or gases shall not be used as an earth electrode.

NOTE This requirement does not preclude the protective bonding of such pipes for compliance with IEC 60364-4-41.

542.2.21 Underground structural networks embedded in foundation and metal reinforcement of concrete that are used as earth electrodes shall be connected soundly between the point of connection of the earth conductor and the bottom of the underground structural network or metal reinforcement. The connection shall be by welding or suitable mechanical connectors.

The point of connection of the earth conductor shall be accessible

542.2.22 Earth electrodes shall not be made of one metallic piece simply immersed in water. They shall not be erected in water pieces or in rivers.

NOTE Earth electrodes directly in water may lead to the following risks:

- drying out;
- people coming into contact with the water during an electric fault.