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IRISH STANDARD

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**LOW-VOLTAGE ELECTRICAL
INSTALLATIONS -- PART 5-54: SELECTION
AND ERECTION OF ELECTRICAL
EQUIPMENT - EARTHING
ARRANGEMENTS, PROTECTIVE
CONDUCTORS AND PROTECTIVE
BONDING CONDUCTORS (IEC 60364-5
-54:2002 (MOD))**

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Údarás um Chaighdeán Náisiúnta na hÉireann

English version

**Low-voltage electrical installations –
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 à basse tension –
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)

Errichten von Niederspannungsanlagen –
Teil 5-54: Auswahl und Errichtung
elektrischer Betriebsmittel -
Erdungsanlagen, Schutzleiter
und Schutzpotentialausgleichsleiter
(IEC 60364-5-54:2002, modifiziert)

This Harmonization Document was approved by CENELEC on 2006-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

Up-to-date lists and bibliographical references concerning such national implementations may be obtained on application to the Central Secretariat or to any CENELEC member.

This Harmonization Document exists in three official versions (English, French, German).

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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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, was submitted to the formal vote and was approved by CENELEC as HD 60364-5-54 on 2006-06-01.

This Harmonization Document supersedes HD 384.5.54 S1:1988 + corrigendum December 2005.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 2006-12-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 2007-09-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 2009-06-01

Annexes ZA, ZB, ZC and ZD 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.

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.

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541 General

541.1 Scope

This part of HD 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.

EN 60702-1, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V - Part 1: Cables* (IEC 60702-1)

EN 61140, *Protection against electric shock - Common aspects for installation and equipment* (IEC 61140)

EN 61534-1, *Powertrack systems - General requirements* (IEC 61534-1)

HD 60364-4-41:2007, *Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock* (IEC 60364-4-41:2005, mod.)

HD 384.4.442:1997, *Electrical installations of buildings - Part 4: Protection for safety - Chapter 44: Protection against overvoltages - Section 442: Protection of low-voltage installations against faults between high-voltage systems and earth* (IEC 60364-4-442:1993 + A1:1995, related)

HD 384.5.51 S2:1996, *Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Chapter 51: Common rules* (IEC 60364-5-51:1994, mod.)

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

IEC 60050-826, *International Electrotechnical Vocabulary (IEV) - Part 826: Electrical installations*

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

R064-004:1999, *Electrical installations of buildings - Protection against electromagnetic interferences (EMI) in installations of buildings* (IEC 60364-4-444:1996, mod.)

541.3 Terms and definitions

For the purposes of this part of HD 60364, the definitions of EN 61140, together with the following definitions taken from IEC 60050-195 and IEC 60050-826, 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 HD 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]

541.3.8**foundation earth electrode**

conductive part buried in the soil under a building foundation or, preferably, embedded in concrete of a building foundation, generally in form of a closed loop

[IEV 826-13-08]

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, an earth electrode shall be connected to the main earthing terminal by an earthing conductor.

542.1.3 Where the supply to an installation is at high voltage, protection against faults between the high voltage supply 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 and appropriate robustness against corrosion in respect to estimated external influences (see HD 384.5.51).
- 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 new buildings, the erection of a foundation earth electrode is strongly recommended. Where this electrode is embedded in concrete to avoid corrosion a certain quality of the concrete and a distance of at least 5 cm between the electrode and the surface of the concrete is also recommended.

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, EN 62305-1 applies.

Table 54.1 – 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 electrode with horizontal extension	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 electrode with horizontal extension		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 Suitable also 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.



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