

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Protection against lightning –
Part 3: Physical damage to structures and life hazard**

**Protection contre la foudre –
Partie 3: Dommages physiques sur les structures et risques humains**

IEC 62305-3:2006

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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	9
3 Terms and definitions	10
4 Lightning protection system (LPS)	13
4.1 Class of LPS	13
4.2 Design of the LPS	14
4.3 Continuity of steelwork in reinforced concrete structures	14
5 External lightning protection system	15
5.1 General	15
5.2 Air-termination systems	15
5.3 Down-conductor systems.....	19
5.4 Earth-termination system.....	22
5.5 Components	24
5.6 Materials and dimensions	26
6 Internal lightning protection system.....	29
6.1 General	29
6.2 Lightning equipotential bonding	29
6.3 Electrical insulation of the external LPS	32
7 Maintenance and inspection of an LPS	33
7.1 Application of inspections	33
7.2 Order of inspections	33
7.3 Maintenance.....	33
8 Protection measures against injury to living beings due to touch and step voltages	34
8.1 Protection measures against touch voltages.....	34
8.2 Protection measures against step voltages.....	34
Annex A (normative) Positioning the air-termination system.....	35
Annex B (normative) Minimum cross-section of the entering cable screen in order to avoid dangerous sparking	41
Annex C (informative) Partitioning of the lightning current amongst down-conductors	42
Annex D (informative) Additional information for LPS in the case of structures with a risk of explosion.....	46
Annex E (informative) Guidelines for the design, construction, maintenance and inspection of lightning protection systems	52
Bibliography.....	154

Figure 1 – Loop in a down-conductor	20
Figure 2 – Minimum length l_1 of each earth electrode according to the class of LPS	22
Figure A.1 – Volume protected by a vertical air-termination rod	35
Figure A.2 – Volume protected by a vertical air-termination rod	36
Figure A.3 – Volume protected by a wire air-termination system	36
Figure A.4 – Volume protected by isolated wires combined in a mesh according to the protective angle method and rolling sphere method	37
Figure A.5 – Volume protected by non-isolated wires combined in a mesh according to the mesh method and the protective angle method	38
Figure A.6 – Design of an air-termination system according to the rolling sphere method	39
Figure C.1 – Values of coefficient k_c in the case of a wire air-termination system and a type B earth-termination system.....	43
Figure C.2 – Values of coefficient k_c in the case of a mesh air-termination system and type B earth-termination system.....	44
Figure C.3 – Examples of calculation of the separation distance in the case of a meshed air-termination system, an interconnecting ring of the down-conductors at each level and a type B earth-termination system	45
Figure E.1 – LPS design flow diagram	54
Figure E.2 – Values of coefficient k_c in case of a sloped roof with air-termination on the ridge and a type B earthing system.....	61
Figure E.3 – LPS design for a cantilevered part of a structure.....	62
Figure E.4 – Equipotential bonding in a structure with a steel reinforcement	64
Figure E.5 – Welded joints of reinforcing rods in reinforced concrete, if permitted.....	65
Figure E.6 – Example of clamps used as joints between reinforcing rods and conductors.....	66
Figure E.7 – Examples for connection points to the reinforcement in a reinforced concrete wall	67
Figure E.8 – Use of metallic facade as natural down-conductor system and connection of facade supports	70
Figure E.9 – Connection of the continuous strip windows to a metal façade covering.....	72
Figure E.10 – Internal down-conductors in industrial structures.....	75
Figure E.11– Installation of bonding conductors in reinforced concrete structures and flexible bonds between two reinforced concrete parts	77
Figure E.12 – Protective angle method air-termination design for different heights according to Table 2	81
Figure E.13 – Isolated external LPS using two isolated air-termination masts designed according to the protective angle air-termination design method	82
Figure E.14 – Isolated external LPS using two isolated air-termination masts, interconnected by horizontal catenary wire	83
Figure E.15 – Example of design of an air-termination of a non-isolated LPS by air-termination rods.....	84
Figure E.16 – Example of design of an air-termination of a non isolated LPS by a horizontal wire according to the protective angle air-termination design method	85
Figure E.17 – Protected volume of an air- termination rod or mast on a sloped surface.....	86

Figure E.18 – Design of an LPS air-termination according to the rolling sphere method, protective angle method, mesh method and general arrangement of air-termination elements	88
Figure E.19 – Design of an LPS air-termination conductor network on a structure with complicated shape	89
Figure E.20 – Space protected by two parallel air-termination horizontal wires or two air-termination rods ($r > h_t$)	90
Figure E.21 – Points at which lightning will strike a building	92
Figure E.22 – Example of design of non-isolated LPS air-termination according to the mesh method air-termination design	96
Figure E.23 – Some examples of details of an LPS on a structure with sloped tiled roofs	99
Figure E.24 – Construction of an LPS using natural components on the roof of the structure	101
Figure E.25 – Positioning of the external LPS on a structure made of insulating material e.g. wood or bricks with a height up to 60 m with flat roof and with roof fixtures	102
Figure E.26 – Construction of air-termination network on a roof with conductive covering where puncturing of the covering is not acceptable	103
Figure E.27 – Construction of external LPS on a structure of steel-reinforced concrete using the reinforcement of the outer walls as natural components	104
Figure E.28 – Example of an air-termination stud used on car park roofs	105
Figure E.29 – Air-termination rod used for protection of a metallic roof fixture with electric power installations which are not bonded to the air-termination system	106
Figure E.30 – Method of achieving electrical continuity on metallic parapet cladding	107
Figure E.31 – Metallic roof fixture protected against direct lightning interception, connected to air-termination system	110
Figure E.32 – Example of construction of lightning protection of a house with a TV antenna using the mast as an air-termination rod	112
Figure E.33 – Installation of lightning protection of metallic equipment on a roof against a direct lightning flash	113
Figure E.34 – Connection of natural air-termination rod to air-termination conductor	115
Figure E.35 – Construction of the bridging between the segments of the metallic façade plates	116
Figure E.36 – Installation of external LPS on a structure of isolating material with different roof levels	118
Figure E.37 – Examples of geometry of LPS conductors	119
Figure E.38 – Construction of an LPS using only two down-conductors and foundation earth electrodes	120
Figure E.39 – Examples of connection of earth termination to the LPS of structures using natural down-conductors (girders) and detail of a test joint	124
Figure E.40 – Construction of foundation earth ring for structures of different foundation design	128
Figure E.41 – Examples of two vertical electrodes in type A earthing arrangement	130
Figure E.42 – Meshed earth termination system of a plant	134

Figure E.43 – Examples of separation distance between the LPS and metal installations	140
Figure E.44 – Directions for calculations of the separation distance s for a worst case lightning interception point at a distance l from the reference point according to 6.3	141
Figure E.45 – Example of an equipotential bonding arrangement	144
Figure E.46 – Example of bonding arrangement in a structure with multiple point entries of external conductive parts using a ring electrode for interconnection of bonding bars	145
Figure E.47 – Example of bonding in the case of multiple point entries of external conductive parts and an electric power or communication line using an internal ring conductor for interconnection of the bonding bars	146
Figure E.48 – Example of bonding arrangement in a structure with multiple point entries of external conductive parts entering the structure above ground level	147
Table 1 – Relation between lightning protection levels (LPL) and class of LPS (see IEC 62305-1)	13
Table 2 – Maximum values of rolling sphere radius, mesh size and protection angle corresponding to the class of LPS	16
Table 3 – Minimum thickness of metal sheets or metal pipes in air-termination systems	18
Table 4 – Typical values of the distance between down-conductors and between ring conductors according to the class of LPS	20
Table 5 – LPS materials and conditions of use	25
Table 6 – Material, configuration and minimum cross-sectional area of air-termination conductors, air-termination rods and down-conductors	27
Table 7 – Material, configuration and minimum dimensions of earth electrodes	28
Table 8 – Minimum dimensions of conductors connecting different bonding bars or connecting bonding bars to the earth-termination system	30
Table 9 – Minimum dimensions of conductors connecting internal metal installations to the bonding bar	30
Table 10 – Isolation of external LPS – Values of coefficient k_i	32
Table 11 – Isolation of external LPS – Values of coefficient k_c	32
Table 12 – Isolation of external LPS – Values of coefficient k_m	33
Table B.1 – Cable length to be considered according to the condition of the screen	41
Table C.1 – Values of coefficient k_c	42
Table E.1 – Suggested fixing centres	97
Table E.2 – Maximum period between inspections of an LPS	149

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROTECTION AGAINST LIGHTNING –

Part 3: Physical damage to structures and life hazard

FOREWORD

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International standard IEC 62305-3 has been prepared by IEC technical committee 81: Lightning protection.

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The text of this first edition of IEC 62305-3 is compiled from and replaces

- IEC 61024-1, first edition (1990).
- IEC 61024-1-2, first edition (1998).

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

FDIS	Report on voting
81/264/FDIS	81/269/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.

This publication has been drafted, as close as possible, in accordance with the ISO/IEC Directives, Part 2.

IEC 62305 consists of the following parts, under the general title *Protection against lightning*:

Part 1: General principles

Part 2: Risk management

Part 3: Physical damage to structures and life hazard

Part 4: Electrical and electronic systems within structures

Part 5: Services¹

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- reconfirmed;
- withdrawn;
- replaced by a revised edition; or
- amended.

In the United States, based on the requirements of NFPA 780: Standard for the Installation of Lightning Protection Systems 2004 Edition and practical experience in the use of horizontal earth electrodes, the minimum length of horizontal earth electrodes is not required to be twice that required for vertical electrodes.

In France, Portugal and Spain:

- natural components cannot substitute as lightning protection components but may be used to complete/enhance the LPS;
- aluminium solid round diameters should be extended from 8 mm to 10 mm;
- stranded conductors cannot be used as down-conductors;
- diameter of solid round conductors should be extended from 16 mm to 18 mm;
- hot dip galvanized steel solid tape thickness should be extended from 2 mm to 3,5 mm.

¹ To be published

INTRODUCTION

This part of IEC 62305 deals with the protection, in and around a structure, against physical damage and injury to living beings due to touch and step voltages.

The main and most effective measure for protection of structures against physical damage is considered to be the lightning protection system (LPS). It usually consists of both external and internal lightning protection systems.

An external LPS is intended to:

- a) intercept a lightning flash to the structure (with an air-termination system);
- b) conduct the lightning current safely towards earth (using a down-conductor system);
- c) disperse the lightning current into the earth (using an earth-termination system).

An internal LPS prevents dangerous sparking within the structure using either equipotential bonding or a separation distance (and hence electrical insulation) between the external LPS (as defined in 3.2) components and other electrically conducting elements internal to the structure.

Main protection measures against injury to living beings due to touch and step voltages are intended to:

- 1) reduce the dangerous current flowing through bodies by insulating exposed conductive parts, and/or by increasing the surface soil resistivity;
- 2) reduce the occurrence of dangerous touch and step voltages by physical restrictions and/or warning notices.

The type and location of an LPS should be carefully considered in the initial design of a new structure, thereby enabling maximum advantage to be taken of the electrically conductive parts of the structure. By doing so, design and construction of an integrated installation is made easier, the overall aesthetic aspects can be improved, and the effectiveness of the LPS can be increased at minimum cost and effort.

Access to the ground and the proper use of foundation steelwork for the purpose of forming an effective earth termination may well be impossible once construction work on a site has commenced. Therefore, soil resistivity and the nature of the earth should be considered at the earliest possible stage of a project. This information is fundamental to the design of an earth-termination system and may influence the foundation design work for the structure.

Regular consultation between LPS designers and installers, architects and builders is essential in order to achieve the best result at minimum cost.

If lightning protection is to be added to an existing structure, every effort should be made to ensure that it conforms to the principles of this standard. The design of the type and location of an LPS should take into account the features of the existing structure.

PROTECTION AGAINST LIGHTNING –

Part 3: Physical damage to structures and life hazard

1 Scope

This part of IEC 62305 provides the requirements for protection of a structure against physical damage by means of a lightning protection system (LPS), and for protection against injury to living beings due to touch and step voltages in the vicinity of an LPS (see IEC 62305-1).

This standard is applicable to:

- a) design, installation, inspection and maintenance of an LPS for structures without limitation of their height;
- b) establishment of measures for protection against injury to living beings due to touch and step voltages.

NOTE 1 Specific requirements for an LPS in structures dangerous to their surroundings due to the risk of explosion are under consideration. Additional information is provided in Annex D for use in the interim.

NOTE 2 This part of IEC 62305 is not intended to provide protection against failures of electrical and electronic systems due to overvoltages. Specific requirements for such cases are provided in IEC 62305-4.

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 60079-10:2002, *Electrical apparatus for explosive gas atmospheres – Part 10: Classification of hazardous areas*

IEC 60079-14:2002, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installations in hazardous areas (other than mines)*

IEC 61241-10:2004, *Electrical apparatus for use in the presence of combustible dust – Part 10: Classification of areas where combustible dusts are or may be present*

IEC 61241-14:2004, *Electrical apparatus for use in the presence of combustible dust – Part 14: Selection and installation*

IEC 61643-12:2002, *Low-voltage surge protective devices – Part 12: Surge protective devices connected to low voltage power distribution systems – Selection and application principles*

IEC 62305-1, *Protection against lightning – Part 1: General principles*

IEC 62305-2, *Protection against lightning – Part 2: Risk management*

IEC 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures*

IEC 62305-5, *Protection against lightning – Part 5: Services*¹

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*

3 Terms and definitions

For the purposes of this document, the following terms and definitions, some of which have already been cited in Part 1 but are repeated here for ease of reference, as well as those given in other parts of IEC 62305, apply.

3.1 lightning protection system LPS

complete system used to reduce physical damage due to lightning flashes to a structure

NOTE It consists of both external and internal lightning protection systems.

3.2 external lightning protection system

part of the LPS consisting of an air-termination system, a down-conductor system and an earth-termination system

3.3 external LPS isolated from the structure to be protected

LPS with an air-termination system and down-conductor system positioned in such a way that the path of the lightning current has no contact with the structure to be protected

NOTE In an isolated LPS, dangerous sparks between the LPS and the structure are avoided.

3.4 external LPS not isolated from the structure to be protected

LPS with an air-termination system and down-conductor system positioned in such a way that the path of the lightning current can be in contact with the structure to be protected

3.5 internal lightning protection system

part of the LPS consisting of lightning equipotential bonding and/or electrical insulation of external LPS

3.6 air-termination system

part of an external LPS using metallic elements such as rods, mesh conductors or catenary wires intended to intercept lightning flashes

3.7 down-conductor system

part of an external LPS intended to conduct lightning current from the air-termination system to the earth-termination system

¹ To be published

3.8**ring conductor**

conductor forming a loop around the structure and interconnecting the down-conductors for distribution of lightning current among them

3.9**earth-termination system**

part of an external LPS which is intended to conduct and disperse lightning current into the earth

3.10**earthing electrode**

part or a group of parts of the earth-termination system which provides direct electrical contact with the earth and disperses the lightning current into the earth

3.11**ring earthing electrode**

earthing electrode forming a closed loop around the structure below or on the surface of the earth

3.12**foundation earthing electrode**

reinforcing steel of foundation or additional conductor embedded in the concrete foundation of a structure and used as an earthing electrode

3.13**conventional earth impedance**

ratio of the peak values of the earth-termination voltage and the earth-termination current which, in general, do not occur simultaneously

3.14**earth-termination voltage**

potential difference between the earth-termination system and the remote earth

3.15**natural component of LPS**

conductive component installed not specifically for lightning protection which can be used in addition to the LPS or in some cases could provide the function of one or more parts of the LPS

NOTE Examples of the use of this term include:

- natural air-termination;
- natural down-conductor;
- natural earthing electrode.

3.16**connecting component**

part of an external LPS which is used for the connection of conductors to each other or to metallic installations

3.17**fixing component**

part of an external LPS which is used to fix the elements of the LPS to the structure to be protected

3.18

metal installations

extended metal items in the structure to be protected which may form a path for lightning current, such as pipework, staircases, elevator guide rails, ventilation, heating and air-conditioning ducts, and interconnected reinforcing steel

3.19

external conductive parts

extended metal items entering or leaving the structure to be protected such as pipework, metallic cable elements, metal ducts, etc. which may carry a part of the lightning current

3.20

electrical system

system incorporating low voltage power supply components and possibly electronic components

3.21

electronic system

system incorporating sensitive electronic components such as communication equipment, computer, control and instrumentation systems, radio systems, power electronic installations

3.22

internal systems

electrical and electronic systems within a structure

3.23

lightning equipotential bonding

EB

bonding to the LPS of separated conductive parts, by direct connections or via surge protective devices, to reduce potential differences caused by lightning current

3.24

bonding bar

metal bar on which metal installations, external conductive parts, electric power and telecommunication lines, and other cables can be bonded to an LPS

3.25

bonding conductor

conductor connecting separated conductive parts to LPS

3.26

interconnected reinforcing steel

steelwork within a concrete structure which is considered electrically continuous

3.27

dangerous sparking

electrical discharge due to lightning which causes physical damage in the structure to be protected

3.28

separation distance

distance between two conductive parts at which no dangerous sparking can occur