

INTERNATIONAL STANDARD

IEC 62305-3

First edition
2006-01

Protection against lightning –

Part 3: Physical damage to structures and life hazard

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROTECTION AGAINST LIGHTNING –

Part 3: Physical damage to structures and life hazard

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC national committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes international standards, technical specifications, technical reports, publicly available specifications (PAS) and guides (hereafter referred to as "IEC publication(s)"). Their preparation is entrusted to technical committees; any IEC national committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International standard IEC 62305-3 has been prepared by IEC technical committee 81: Lightning protection.

The IEC 62305 series (Parts 1 to 5), is produced in accordance with the new Publications' Plan, approved by National Committees (81/171/RQ (2001-06-29)), which restructures in a more simple and rational form and updates the Publications of the IEC 61024 series, the IEC 61312 series and the IEC 61663 series.

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC website "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be:

- 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