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AMENDMENT 1
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Amendment 1

Electrical installations of buildings –

Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

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FOREWORD

This amendment has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

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

FDIS	Report on voting
64/1303/FDIS	64/1329/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

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CONTENTS

Replace the title of annex B by the following new title:

Annex B (informative) Guidance for overvoltage control by SPDs applied to overhead lines

Add, after annex C, the following new title:

Annex D (normative) Determination of the conventional length, *d*

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Add, after figure 44P, the following new title

Figure 44Q – Examples of how to apply d_1, d_2, d_3 for the determination of *d*

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440 Introduction

Replace the fifth paragraph (together with the note) which begins "Clause 443 is intended to describe … " by the following:

Clause 443 is intended to describe the means by which transient voltages can be limited to reduce the risk to an acceptable level of failure in the installation and in electrical equipment connected to it. This approach is in line with the principles of insulation co-ordination contained in IEC 60664-1. IEC 60664-1 requires technical committees to specify an appropriate impulse withstand category (overvoltage category) for their equipment; that means a minimum impulse withstand voltage for the equipment, according to its application and the related impulse withstand categories.

NOTE In accordance with 2.2.2.1.1 of IEC 60664-1, technical committees should specify the relevant information. It is recommended to indicate the rated impulse withstand voltage applicable to the equipment and the way this is provided.

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440.2 Normative references

Add, on page 15, the following new references:

IEC 61643 (all parts), *Surge protective devices connected to low-voltage power distribution systems*

IEC 61662:1995, *Assessment of the risk of damage due to lightning*
Amendment 1 (1996)

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443 Protection against overvoltages of atmospheric origin or due to switching

Replace the existing text of clause 443 by the following:

443.1 General

This clause of IEC 60364-4-44 deals with protection of electrical installations against transient overvoltages of atmospheric origin transmitted by the supply distribution system and against switching overvoltages.

In general, switching overvoltages are lower than overvoltages of atmospheric origin and therefore the requirements regarding protection against overvoltages of atmospheric origin normally cover protection against switching overvoltages.

NOTE 1 Statistical evaluations of measurements have shown that there is a low risk of switching overvoltages higher than the level of overvoltage category II. See 443.2.

Consideration shall be given to the overvoltages which can appear at the origin of an installation, to the expected keraunic level and to the location and characteristics of surge protective devices, so that the probability of incidents due to overvoltage stresses is reduced to an acceptable level for the safety of persons and property, as well as for the continuity of service desired.

The values of transient overvoltages depend on the nature of the supply distribution system (underground or overhead) and the possible existence of a surge protective device upstream of the origin of the installation and the voltage level of the supply system.

This clause provides guidance where protection against overvoltages is covered by inherent control or assured by protective control. If the protection according to this clause is not provided, insulation co-ordination is not assured and the risk due to overvoltages shall be evaluated.

This clause does not apply in case of overvoltages due to direct or nearby lightning. For protection against transient overvoltages due to direct lightning, the standards of the IEC 61024, IEC 61312 and IEC 61643 series are applicable. This clause does not cover overvoltage through data-transmission systems.

NOTE 2 As regards transient atmospheric overvoltages, no distinction is made between earthed and unearthed systems.

NOTE 3 Switching overvoltages generated outside the installation and transmitted by the supply network are under consideration.

NOTE 4 The risk due to overvoltages is considered in IEC 61662 and its amendment 1.

443.2 Classification of impulse withstand voltages (overvoltage categories)

443.2.1 Purpose of classification of impulse withstand voltages (overvoltage categories)

NOTE 1 Overvoltage categories are defined within electrical installations for the purpose of insulation co-ordination and a related classification of equipment with impulse withstand voltages is provided, see table 44B.

NOTE 2 The rated impulse withstand voltage is an impulse withstand voltage assigned by the manufacturer to the equipment or to a part of it, characterizing the specified withstand capability of its insulation against overvoltages (in accordance with 1.3.9.2 of IEC 60664-1).

The impulse withstand voltage (overvoltage category) is used to classify equipment energized directly from the mains.

Impulse withstand voltages for equipment selected according to the nominal voltage are provided to distinguish different levels of availability of equipment with regard to continuity of service and an acceptable risk of failure. By selection of equipment with a classified impulse withstand voltage, insulation co-ordination can be achieved in the whole installation, reducing the risk of failure to an acceptable level.

NOTE 3 Transient overvoltages transmitted by the supply distribution system are not significantly attenuated downstream in most installations.

443.2.2 Relationship between impulse withstand voltages of equipment and overvoltage categories

Equipment with an impulse withstand voltage corresponding to overvoltage category IV is suitable for use at, or in the proximity of, the origin of the installation, for example upstream of the main distribution board. Equipment of category IV has a very high impulse withstand capability providing the required high degree of reliability.

NOTE 1 Examples of such equipment are electricity meters, primary overcurrent protection devices and ripple control units.

Equipment with an impulse withstand voltage corresponding to overvoltage category III is for use in the fixed installation downstream of, and including the main distribution board, providing a high degree of availability.

NOTE 2 Examples of such equipment are distribution boards, circuit-breakers, wiring systems (see IEC 60050(826), definition 826-06-01), including cables, bus-bars, junction boxes, switches, socket-outlets) in the fixed installation, and equipment for industrial use and some other equipment, e.g. stationary motors with permanent connection to the fixed installation.

Equipment with an impulse withstand voltage corresponding to overvoltage category II is suitable for connection to the fixed electrical installation, providing a normal degree of availability normally required for current-using equipment.

NOTE 3 Examples of such equipment are household appliances and similar loads.

Equipment with an impulse withstand voltage corresponding to overvoltage category I is only suitable for use in the fixed installation of buildings where protective means are applied outside the equipment – to limit transient overvoltages to the specified level.

NOTE 4 Examples of such equipment are those containing electronic circuits like computers, appliances with electronic programmes, etc.

Equipment with an impulse withstand voltage corresponding to overvoltage category I shall not have direct connection to a public supply system.

443.3 Arrangements for overvoltage control

Overvoltage control is arranged in accordance with the following requirements.

443.3.1 Inherent overvoltage control

This subclause does not apply when a risk assessment according to 443.3.2.2 is used.

Where an installation is supplied by a completely buried low-voltage system and does not include overhead lines, the impulse withstand voltage of equipment in accordance with table 44B is sufficient and no specific protection against overvoltages of atmospheric origin is necessary.

NOTE 1 A suspended cable having insulated conductors with earthed metallic screen is considered as equivalent to an underground cable.

Where an installation is supplied by or includes a low-voltage overhead line and the keraunic level is lower than or equal to 25 days per year (AQ 1), no specific protection against over-voltages of atmospheric origin is required.

NOTE 2 Irrespective of the AQ value, protection against overvoltages may be necessary in applications where a higher reliability or higher risks (e.g. fire) are expected.

In both cases, consideration regarding protection against transient overvoltages shall be given to equipment with an impulse withstand voltage according to overvoltage category I (see 443.2.2).

443.3.2 Protective overvoltage control

The decision as to which of the following methods are applied in a country with regard to the provision of surge protective devices (SPDs) is left to the national committee based on the local conditions.

In all cases, consideration regarding protection against transient overvoltages shall be given to equipment with an impulse withstand voltage according to overvoltage category I (see 443.2.2).

443.3.2.1 Protective overvoltage control based on conditions of external influences

Where an installation is supplied by, or includes, an overhead line, and the keraunic level of the location is greater than 25 days per year (AQ 2), protection against overvoltages of atmospheric origin is required. The protection level of the protective device shall not be higher than the level of overvoltage category II, given in table 44B.

NOTE 1 The overvoltage level may be controlled by surge protective devices applied close to the origin of the installation, either in the overhead lines (see annex B) or in the building installation.

NOTE 2 According to IEC 61024-1, 25 thunderstorm days per year are equivalent to a value of 2,24 flashes per km^2 per year. This is derived from the formula

$$N_g = 0{,}04\ T_d^{1{,}25}$$

where

N_g is the frequency of flashes per km^2 per year;

T_d is the number of thunderstorm days per year (keraunic level).

443.3.2.2 Protective overvoltage control based on risk assessment

NOTE 1 A method of general risk assessment is described in IEC 61662. As far as clause 443 is concerned, an essential simplification of this method has been accepted. It is based on the critical length d_c of the incoming lines and the level of consequences as described below.

The following are different consequential levels of protection:

a) consequences related to human life, e.g. safety services, medical equipment in hospitals;

b) consequences related to public services, e.g. loss of public services, IT centres, museums;

c) consequences to commercial or industrial activity, e.g. hotels, banks, industries, commercial markets, farms;

d) consequences to groups of individuals, e.g. large residential buildings, churches, offices, schools;

e) consequences to individuals, e.g. residential buildings, small offices.

For levels of consequences a) to c), protection against overvoltage shall be provided.

NOTE 2 There is no need to perform a risk assessment calculation according to annex D for levels of consequences a) to c) because this calculation always leads to the result that the protection is required.

For levels of consequences d) and e), requirement for protection depends on the result of a calculation. The calculation shall be carried out using the formula in annex D for the determination of the length d, which is based on a convention and called conventional length.

Protection is required if:

$$d > d_c$$

where

d is the conventional length in km of the supply line of the considered structure with a maximum value of 1 km;

d_c is the critical length;