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Zaščita pred delovanjem strele - 2. del: Vodenje rizika

Protection against lightning - Part 2: Risk management

Blitzschutz - Teil 2: Risiko-Management

Protection contre la foudre - Partie 2: Evaluation des risques

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TITLE:

Protection against lightning - Part 2: Risk management

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250

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PROTECTION AGAINST LIGHTNING

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255

Part 2: Risk management

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258

FOREWORD

259 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising
260 all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international
261 co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and
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291 IEC 62305-2 has been prepared by IEC technical committee 81: Lightning protection. It is an
292 International Standard.

293 This third edition cancels and replaces the second edition, published in 2010. This edition
294 constitutes a technical revision.

295 This edition includes the following significant technical changes with respect to the previous
296 edition:

297 a) The concept of a single risk, to combine loss of human life and loss due to fire, has been
298 introduced.

299 b) The concept of frequency of damage that may impair the availability of the internal
300 systems within the structure has been introduced.

301 c) The lightning ground strike-point density N_{SG} has been introduced replacing the lightning
302 flash density N_G in the evaluation of expected average annual number of dangerous
303 events.

304 d) Risk components reduction by the use of preventive temporary measures activated by
 305 means of a thunderstorm warning system (TWS) compliant with IEC 62793. The risk of
 306 direct strike to people at open areas is introduced in this edition, considering the reduction
 307 of that risk using TWS.

308 The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

309
 310 Full information on the voting for its approval can be found in the report on voting indicated in
 311 the above table.

312 The language used for the development of this International Standard is English.

313 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
 314 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
 315 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
 316 described in greater detail at www.iec.ch/standardsdev/publications.

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

- 320 • reconfirmed,
- 321 • withdrawn,
- 322 • replaced by a revised edition, or
- 323 • amended.

324 <https://standards.iteh.ai/catalog/standards/sist/40fd317f-fb43-472d-943d-4fbb33ff7a74/osist-pren-iec-62305-2-2023>

325 In Germany, value of $r_p = 1$ for all cases. For the risk components R_B , R_C , R_M , R_V , R_W and R_Z $P_{TWS} =$
 326 1 is assumed. The following values both for L_{F1} and L_{F2} are used: 0,1 / 0,05 / 0,02 / 0,01.

327 In the USA, the ground flash density values from the National Lightning Detection Network map shall
 328 be used in the calculation of the number of dangerous events until the safety factors in the values of
 329 P_x and L_x are reduced accordingly.

330

INTRODUCTION

331

332 Lightning flashes to earth may be hazardous to structures and to lines supplying the structure.

333 These hazards can result in:

- 334 – damage to the structure and to its contents,
- 335 – failure of associated electrical and electronic systems,
- 336 – injury to living beings in or close to the structure.

337 Consequential effects of the damage and failures may be extended to the surroundings of the
338 structure or may involve its environment. Moreover, regardless of the amount of loss, the
339 availability of the structure and its internal systems may be unacceptably impaired if the
340 frequency of damage is high.

341 To reduce the frequency of damage and the loss due to lightning, protection measures may be
342 required. Whether they are needed, and to what extent, should be determined by frequency of
343 damage and risk assessment.

344 NOTE 1 The decision to provide lightning protection may be taken regardless of the outcome of frequency of
345 damage or risk assessment where there is a desire that there be no avoidable damages.

346 NOTE 2 IEC 60364-4-44 always requires installation of SPD at power line entrance in the structure when the
347 consequence caused by overvoltages affects:

- 348 – care of human life, e.g. safety services, medical care facilities,
- 349 – public services and cultural heritage, e.g. loss of public services, IT centres, museums,
- 350 – commercial or industrial activity, e.g. hotels, banks, industries, commercial markets, farms.

351 The frequency of damage, defined in this part of IEC 62305 as the annual number of damages
352 in a structure due to lightning flashes, depends on:

- 353 – the annual number of lightning flashes influencing the structure;³
- 354 – the probability of damaging events by one of the influencing lightning flashes.

355 The risk, defined in this part of IEC 62305 as the probable average annual loss in a structure
356 due to lightning flashes, depends on:

- 357 – the frequency of damage;
- 358 – the mean amount of consequential loss.

359 Lightning flashes influencing the structure may be divided into

- 360 – flashes terminating on the structure,
- 361 – flashes terminating near the structure, direct to connected lines (power, telecom-
362 munication lines,) or near the lines.

363 Flashes to the structure or a connected line may cause physical damage and life hazards.
364 Flashes near the structure or line as well as flashes to the structure or line may cause failure
365 of electrical and electronic systems due to overvoltages resulting from resistive and inductive
366 coupling of these systems with the lightning current.

367 Moreover, failures caused by lightning overvoltages in users' installations and in power supply
368 lines may also generate voltage switching overvoltages in the installations.

369 NOTE 3 Malfunctioning of electrical and electronic systems is not covered by the IEC 62305 series. Reference
370 should be made to IEC 61 000-4-5 ^[1] ¹.

¹ Figures in square brackets refer to the bibliography.

371 The number of lightning flashes influencing the structure depends on the dimensions and the
372 characteristics of the structure and of the connected lines, on the environmental characteristics
373 of the structure and the lines, as well as on lightning ground strike-point density in the region
374 where the structure and the lines are located. Guidance on the assessment of number of
375 lightning flashes influencing the structure is given in the informative Annex A.

376 The probability of damage depends on the structure, the connected lines, and the lightning
377 current characteristics, as well as on the type and efficiency of applied protection measures.
378 Guidance on the assessment of probability of damage is given in the informative Annex B.

379 The annual mean amount of the consequential loss depends on the extent of damage and the
380 consequential effects which may occur as result of a lightning flash. Guidance on the
381 assessment of consequential loss is given in the informative Annex C.

382 The effect of protection measures results from the characteristics of each protection measure
383 and may reduce the damage probabilities.

384 NOTE 4 It has to be ensured, that the protective provisions are realized certainly in the necessary quality and the
385 protection measures are complying with standards IEC 62305-3, IEC 62305-4, IEC 62561 and IEC 62793, as
386 applicable.

387 NOTE 5 For complex structures (such as petrochemical plants, large industrial plants, etc.) the factors reported in
388 the Annexes of this standard may require more detailed evaluation of the characteristics of the structure.

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PROTECTION AGAINST LIGHTNING –

Part 2: Risk management

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Scope

397 This part of IEC 62305 is applicable to risk management of a structure due to lightning flashes
398 to earth.

399 Its purpose is to provide a procedure for the evaluation of such a risk. Once an upper tolerable
400 limit for the risk has been selected, this procedure allows the selection of appropriate protection
401 measures to be adopted to reduce the risk to or below the tolerable limit.

402 Risk management also includes the evaluation of frequency of damage of internal systems
403 caused by surges due to lightning flashes to earth. Once an upper tolerable limit for the
404 frequency of damage has been selected, this procedure allows the selection of appropriate
405 protection measures to be adopted to reduce the frequency of damage to or below the tolerable
406 limit.

Normative references

408 The following documents are referred to in the text in such a way that some or all of their content
409 constitutes requirements of this document. For dated references, only the edition cited applies.
410 For undated references, the latest edition of the referenced document (including any
411 amendments) applies.

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

413 IEC 62305-3, Protection against lightning – Part 3: Physical damage to structures and life
414 hazard

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

417 IEC 62793, Protection against lightning - Thunderstorm warning systems

418 IEC 62858, Lightning density based on lightning location systems (LLS) - General principles

419 IEC 60364-4-44, Low-voltage electrical installations – Part 4-44: Protection for safety –
420 Protection against voltage disturbances and electromagnetic disturbances

421 IEC 61643 series of standard

Terms and definitions

423 For the purposes of this document, the following terms and definitions apply.

424 ISO and IEC maintain terminological databases for use in standardization at the following
425 addresses:

- 426 • IEC Electropedia: available at <http://www.electropedia.org/>
- 427 • ISO Online browsing platform: available at <http://www.iso.org/obp>

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- 429 **3.1**
430 **structure to be protected**
431 structure for which protection is required against the effects of lightning in accordance with
432 this standard
- 433 Note 1 to entry: A structure to be protected may be part of a larger structure.
- 434 **3.2**
435 **structures with risk of explosion**
436 structures containing solid explosives materials or hazardous zones as determined in
437 accordance with IEC 60079-10-1 [2] and IEC 60079-10-2 [3]
- 438 **3.3**
439 **structures dangerous to the environment**
440 structures which may cause biological, chemical or radioactive emission as a consequence of
441 lightning (such as chemical, petrochemical plants)
- 442 **3.4**
443 **urban environment**
444 area with a high density of buildings or densely populated communities with tall buildings
- 445 Note 1 to entry: 'Town centre' is an example of an urban environment.
- 446 **3.5**
447 **suburban environment**
448 area with a medium density of buildings
- 449 Note 1 to entry: 'Town outskirts and residential communities' are examples of a suburban environment.
- 450 **3.6**
451 **rural environment**
452 area with a low density of buildings
- 453 Note 1 to entry: 'Countryside' is an example of a rural environment.
- 454 **3.7**
455 **rated impulse withstand voltage U_w**
456 impulse withstand voltage value assigned by the manufacturer to the equipment or to a part of
457 it, characterizing the specified withstand capability of its insulation against overvoltages.
- 458 [IEC 60664-1:2007, definition 3.9.2, modified] [4]
- 459 Note 1 to entry: For the purposes of this part of IEC 62305, only the withstand voltage between live conductors and
460 earth is considered.
- 461 **3.8**
462 **electrical system**
463 system incorporating low voltage power supply components
- 464 **3.9**
465 **electronic system**
466 system incorporating sensitive electronic components such as telecommunication equipment,
467 computer, control and instrumentation systems, radio systems, power electronic installations
- 468 **3.10**
469 **internal systems**
470 electrical and electronic systems of a structure
- 471 **3.11**
472 **lines**
473 power lines or telecommunication lines connected to the structure to be protected