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

Blitzschutz - Teil 3: Schutz von baulichen Anlagen und Personen

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

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TITLE:

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

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2 CONTENTS

3		
4	FOREWORD.....	8
5	INTRODUCTION.....	10
6	1 Scope.....	11
7	2 Normative references	11
8	3 Terms and definitions	12
9	4 Lightning protection system (LPS)	17
10	4.1 Class of LPS.....	17
11	4.2 Design of the LPS.....	18
12	5 External lightning protection system	18
13	5.1 General.....	18
14	5.1.1 Application of an external LPS.....	18
15	5.1.2 Application of an isolated LPS or an electrically insulated LPS	18
16	5.1.3 Use of natural components	19
17	5.2 Air-termination systems	19
18	5.2.1 General	19
19	5.2.2 Positioning.....	19
20	5.2.3 Air terminations against flashes to the side of tall structures	23
21	5.2.4 Construction	24
22	5.2.5 Natural components.....	24
23	5.3 Down-conductor systems	27
24	5.3.1 General	27
25	5.3.2 Positioning of an isolated LPS	27
26	5.3.3 Positioning of an attached LPS	27
27	5.3.4 Construction	28
28	5.3.5 Natural components.....	29
29	5.3.6 Test joints and test points.....	30
30	5.4 Earth-termination system	31
31	5.4.1 General	31
32	5.4.2 Earthing arrangement in general conditions	31
33	5.4.3 Installation of earth electrodes.....	33
34	5.4.4 Natural earth electrodes	34
35	5.5 Components	34
36	5.5.1 General	34
37	5.5.2 Fixing	35
38	5.5.3 Connections	35
39	5.5.4 Insulating components.....	36
40	5.6 Materials and dimensions	36
41	5.6.1 Materials	36
42	5.6.2 Dimensions.....	36
43	6 Internal lightning protection system	39
44	6.1 General.....	39
45	6.2 Lightning equipotential bonding.....	39
46	6.2.1 General	39
47	6.2.2 Lightning equipotential bonding for metal installations	40

48	6.2.3	Lightning equipotential bonding for external conductive parts	41
49	6.2.4	Lightning equipotential bonding for internal systems	41
50	6.2.5	Lightning equipotential bonding for lines connected to the structure to	
51		be protected	42
52	6.3	Separation distance	42
53	6.3.1	General approach	42
54	6.3.2	Simplified approach	44
55	7	Maintenance and inspection of an LPS	44
56	7.1	General.....	44
57	7.2	Maintenance	44
58	7.3	Objective of inspections	45
59	7.4	Need for inspection.....	45
60	8	Protection measures against injury to human beings due to touch and step	
61		voltages.....	46
62	8.1	Protection measures against touch voltages	46
63	8.2	Protection measures against step voltages	46
64	Annex A (normative)	Minimum cross-section of the entering cable screen to avoid	
65		dangerous sparking	48
66	Annex B (informative)	Evaluation of the separation distance s	49
67	Annex C (normative)	Additional information for LPSs in the case of structures with a	
68		risk of explosion	55
69	C.1	General.....	55
70	C.2	Basic requirements	55
71	C.2.1	General	55
72	C.2.2	Required information	55
73	C.2.3	Earthing.....	55
74	C.2.4	Equipotential bonding	56
75	C.3	Structures containing solid explosive material.....	56
76	C.4	Structures containing hazardous areas	56
77	C.4.1	General	56
78	C.4.2	Structures containing zones 2 and 22	57
79	C.4.3	Structures containing zones 1 and 21	57
80	C.4.4	Structures containing zones 0 and 20	58
81	C.4.5	Specific applications.....	58
82	C.5	Maintenance and inspection.....	59
83	C.5.1	General	59
84	C.5.2	General requirements	59
85	C.5.3	Qualifications.....	59
86	C.5.4	Inspection requirements	59
87	C.5.5	Electrical testing requirements.....	60
88	C.5.6	Earthing resistance test methods	60
89	C.5.7	Surge protection	60
90	C.5.8	Repairs.....	61
91	C.5.9	Records and documentation	61
92	Annex D (informative)	Explanatory text concerning the design, construction,	
93		maintenance and inspection of lightning protection systems	62
94	D.1	General.....	62
95	D.2	Structure of Annex D.....	62
96	D.3	Additional information	62

97	D.4	Design of lightning protection systems (LPSs)	62
98	D.4.1	General remarks	62
99	D.4.2	Design of the LPS	64
100	D.5	External lightning protection system	68
101	D.5.1	General	68
102	D.5.2	Air-termination systems	69
103	D.5.3	Down-conductor systems	88
104	D.5.4	Earth-termination systems	108
105	D.5.5	Components	117
106	D.5.6	Materials and dimensions	117
107	D.6	Internal lightning protection system	122
108	D.6.1	General	122
109	D.6.2	Lightning equipotential bonding (EB)	122
110	D.6.3	Electrical isolation of the external LPS	128
111	D.6.4	Protection against effects of induced currents in internal systems	130
112	D.7	Maintenance and inspection of the LPS	131
113	D.7.1	General	131
114	D.7.2	Inspection	131
115	D.7.3	Testing	133
116	D.7.4	Maintenance	134
117			
118	Figure 1	– Protection angle corresponding to the class of LPS	21
119	a)	Unprotected area between air terminations	21
120	b)	Eaves of the pitched roof not protected	21
121	Figure 2	– Contacting the rolling sphere with the structure to be protected	21
122	Figure 3	– Application of the protection angle method	22
123	Figure 4	– Loop in a down conductor	28
124	Figure 5	– Minimum length l_1 of each earth electrode according to the class of LPS	32
125	Figure B.1	– Values of coefficient k_C in the case of a wire air-termination system	49
126	Figure B.2	– Values of coefficient k_C in the case of a multiple down-conductor system	50
127	Figure B.3	– Values of coefficients k_c in case of multiple down conductors with an	
128		interconnecting ring of down conductors at each level	52
129	Figure B.4	– Values of coefficient k_C in the case of a meshed air-termination system,	
130		with a multiple down-conductor system	53
131	Figure D.1	– LPS design flow diagram	63
132	Figure D.2	– Space protected by two parallel air-termination horizontal wires or two	
133		air-termination rods ($r > d/2$)	71
134	Figure D.3	– Designing the protection volume of catenary wire	72
135	Figure D.4	– Horizontal section of the protected area at a given height	73
136	Figure D.5	– Three examples of design of attached LPS air termination according to	
137		the mesh method air-termination design	75
138	Figure D.6	– Lateral protected volume constructed from the rolling sphere and the	
139		lateral protection angle methods near the height equal to the radius of the sphere	76
140	Figure D.7	– Application of the protection angle method for lateral impact with heights	
141		up to 60 m	77
142	Figure D.8	– Air termination and visually concealed conductors for buildings less than	
143		20 m high with sloping roofs	78

144	Figure D.9 – Construction of an LPS using natural components on the roof of the structure	79
146	Figure D.10 – 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	80
149	Figure D.11 – Connection of natural air-termination rod to air-termination conductor	82
150	Figure D.12 – Construction of the bridging between the segments of the metallic facade plates	83
152	Figure D.13 – Air-termination rod used for protection of a metallic roof fixture with electric power installations which are not bonded to the air-termination system	84
154	Figure D.14 – Method of achieving electrical continuity on metallic parapet capping	85
155	Figure D.15 – Examples of air termination for a house with an antenna using an attached LPS	86
157	Figure D.16 – Installation of external LPS on a structure of insulating material with different roof levels	90
159	Figure D.17 – LPS design for a cantilevered part of a structure.....	91
160	Figure D.18 – Use of a metallic facade covering as a natural down-conductor system on a structure of steel-reinforced concrete	93
162	Figure D.19 – Use of metallic facade as natural down-conductor system and connection of facade supports	94
164	Figure D.20 – Connection of the continuous strip windows to a metal facade covering.....	95
165	Figure D.21 – Measuring the overall electrical resistance of steel reinforcement.....	96
166	Figure D.22 – Equipotential bonding in a structure with a steel reinforcement	98
167	Figure D.23 – Typical methods of joining reinforcing rods in concrete (where permitted)	99
169	Figure D.24 – Examples of clamps used as joints between reinforcing rods and conductors	100
171	Figure D.25 – Examples of connection points to the reinforcement in a reinforced concrete wall	101
173	Figure D.26 – Internal down conductors in industrial structures.....	104
174	Figure D.27 – Installation of bonding conductors on plate-like prefabricated reinforced concrete parts by means of bolted or welded conductor links	106
176	Figure D.28 – Installation of bonding conductors in reinforced concrete structures and flexible bonds between two reinforced concrete parts	107
178	Figure D.29 – Combined foundation earth electrode	111
179	Figure D.30 – Construction of foundation earth ring for structures of different foundation design	113
181	Figure D.31 – Example of a type A earthing arrangement with a vertical conductor type electrode	114
183	Figure D.32 – Two examples of vertical electrodes in type A earthing arrangement	115
184	Figure D.33 – Meshed earth-termination system of a plant.....	118
185	Figure D.34 – Example of an equipotential bonding arrangement.....	124
186	Figure D.35 – Example of bonding arrangement in a structure with multiple entry points of external conductive parts using a ring electrode for interconnection of bonding bars.....	125
188	Figure D.36 – Example of bonding in the case of multiple entry points of external conductive parts and an electric power or communication line, using an internal ring conductor for interconnection of the bonding bars	126
191	Figure D.37 – Example of bonding arrangement in a structure with multiple entry points of external conductive parts entering the structure above ground level.....	127

193 Figure D.38 – Directions for calculations of the separation distance, s , for a worse
 194 case lightning interception point at a distance, l , from the reference point according to
 195 6.3 129

196

197	Table 1 – Relation between lightning protection levels (LPL) and class of LPS (see	
198	IEC 62305-1)	17
199	Table 2 – Values of rolling sphere radius, mesh size and protection angle	
200	corresponding to the class of LPS.....	20
201	Table 3 – Minimum thickness of metal sheets or metal pipes in air-termination systems	26
202	Table 4 – Maximum temperature rises ΔT (K) of inner surface and time duration t_{50} (s)	
203	for different thickness t' (mm) and long strokes according to LPL I ($Q_{LONG} = 200$ C)	26
204	Table 5 – Preferred values of the distance between down conductors by LPS	
205	according to the class of LPS.....	28
206	Table 6 – LPS materials and conditions of use ^{a, h}	34
207	Table 7 – Material, configuration and minimum cross-sectional area of air-termination	
208	conductors, air-termination rods, earth lead-in conductors ^e and down conductors ^{a, f}	37
209	Table 8 – Material, configuration and minimum dimensions of earth electrodes ^{a, e}	38
210	Table 9 – Minimum dimensions of conductors connecting different bonding bars or	
211	connecting bonding bars to the earth-termination system.....	40
212	Table 10 – Minimum dimensions of conductors connecting internal metal installations	
213	to the bonding bar.....	40
214	k_m depends on the electrical insulation material (see.....	42
215	Table 11 – Separation distance – Values of coefficient k_i	43
216	Table 12 – Separation distance – Values of coefficient k_m	43
217	k_m depends on the electrical insulation material (see.....	44
218	Table 13 – Separation distance – Approximated values of coefficient k_c	44
219	Table A.1 – Cable length to be considered according to the condition of the screen.....	48
220	Table D.1 – Suggested fixing centres.....	77

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223 INTERNATIONAL ELECTROTECHNICAL COMMISSION

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226

PROTECTION AGAINST LIGHTNING –

227

Part 3: Physical damage to structures and life hazard

228

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230

FOREWORD

231 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising
 232 all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international
 233 co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and
 234 in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports,
 235 Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their
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 260 indispensable for the correct application of this publication.

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263 IEC 62305-3 has been prepared by IEC technical committee 81: Lightning protection. It is an
 264 International Standard.

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

267 This edition includes the following significant technical changes with respect to the previous
 268 edition:

269 a) Minimum thicknesses of metal sheets or metal pipes are given in Table 4 for air-termination
 270 systems where it is necessary to prevent hot-spot problems. Maximum temperature rises
 271 ΔT (K) and time duration t_{50} (s) for different thicknesses and long strokes are also given.

272 b) Cross reference to the IEC 62561 series is made for the use of reliable, stable, safe and
 273 appropriate LPS components.

274 c) The application of two methods – general and simplified – for separation distance
 275 calculation is clarified.

276 d) Some changes to the requirements for continuity of steel reinforcement are made.

- 277 e) Annex C is revised to address comments from IEC subcommittee 31J.
- 278 f) Revision of positioning of air-termination conductors according to the three accepted
279 methods and a more precise description of the methods for positioning of the air-termination
280 systems, according to the complexity of structures to be protected, are made. The main text
281 has been simplified, Annex A has been deleted and all detailed information has been moved
282 to Annex D.
- 283 g) Information on the protection of green roofs is introduced in Annex D.
- 284 h) Information on the protection of protruding parts on facades of tall buildings is introduced in
285 Annex D.

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

Draft	Report on voting
81/XX/FDIS	81/XX/RVD

287 Full information on the voting for its approval can be found in the report on voting indicated in
288 the above table.
289

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

291 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
292 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
293 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
294 described in greater detail at www.iec.ch/publications.

295 A list of all parts in the IEC 62305 series, published under the general title *Protection against*
296 *lightning*, can be found on the IEC website.

297 The committee has decided that the contents of this document will remain unchanged until the
298 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
299 specific document. At this date, the document will be

- 300 • reconfirmed,
- 301 • withdrawn,
- 302 • replaced by a revised edition, or
- 303 • amended.

304

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305

306

307

INTRODUCTION

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

310 The main and most effective measure for protection of structures and its content against
311 physical damage is considered to be a lightning protection system (LPS). It usually consists of
312 both external and internal lightning protection measures.

313 An external LPS is intended to

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

317 NOTE The purpose of the external LPS is to protect the structure from a direct lightning strike by providing the
318 preferred attachment point, and conducting and dispersing the lightning current. It will not significantly influence the
319 attachment process between the structure and the lightning to increase or reduce the number of direct lightning
320 strikes (S1) to the structure.

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

324 Main protection measures against injury to human beings due to touch and step voltages are
325 intended to:

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

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

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

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

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

345 When safety is involved and significant changes are made to the structure or its use changes,
346 consideration of updating the lightning protection installation to the present edition of this
347 document is recommended.

348

PROTECTION AGAINST LIGHTNING –

Part 3: Physical damage to structures and life hazard

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1 Scope

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

359 This document is applicable to the:

360 a) design, installation, inspection and maintenance of an LPS for structures without limitation
361 of their height,

362 b) establishment of measures for protection against injury to human beings due to touch and
363 step voltages.

364 NOTE 1 Specific requirements for an LPS in structures dangerous to their surroundings due to the risk of explosion
365 are provided in Annex C.

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

368 NOTE 3 Specific requirements for the protection against lightning of wind turbines are reported in IEC 61400-24¹.

369 NOTE 4 Specific requirements for the protection against overvoltage of photovoltaic systems are reported in
370 IEC 61643-32^[2] and in IEC 62305-4:—, Annex F.

2 Normative references

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

376 IEC 60079-10-1:2020, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive*
377 *gas atmospheres*

378 IEC 60079-10-2:2015, *Explosive atmospheres – Part 10-2: Classification of areas – Explosive*
379 *dust atmospheres*

380 IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and*
381 *erection*

382 IEC 60364-5-53, *Low-voltage electrical installations – Part 5-53: Selection and erection of*
383 *electrical equipment – Devices for protection for safety, isolation, switching, control and*
384 *monitoring*

385 IEC 61557-4, *Electrical safety in low-voltage distribution systems up to 1 000 V AC and 1 500 V*
386 *DC – Equipment for testing, measuring or monitoring of protective measures – Part 4:*
387 *Resistance of earth connection and equipotential bonding*

¹ Numbers in square brackets refer to the Bibliography.

388 IEC 61643-11, *Low-voltage surge protective devices – Part 11: Surge protective devices*
 389 *connected to low-voltage power systems – Requirements and test methods*

390 IEC 61643-21, *Low-voltage surge protective devices – Part 21: Surge protective devices*
 391 *connected to telecommunications and signalling networks – Performance requirements and*
 392 *testing methods*

393 IEC 62305-1:—², *Protection against lightning – Part 1: General principles*

394 IEC 62305-2:—³, *Protection against lightning – Part 2: Risk management*

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

397 IEC 62561 (all parts), *Lightning protection system components (LPSC)*

398 ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles*
 399 *for safety signs and safety markings*

400 **3 Terms and definitions**

401 For the purposes of this document, the terms and definitions given in IEC 62305-1, IEC 62305-2
 402 and IEC 62305-4 and the following apply.

403 ISO and IEC maintain terminological databases for use in standardization at the following
 404 addresses:

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

407 **3.1**

408 **lightning protection system**

409 **LPS**

410 complete system used to reduce injury to human beings and physical damage due to lightning
 411 flashes to a structure and its contents

412 Note 1 to entry: A lightning protection system usually consists of external and internal lightning protection systems.
 413 To protect internal systems against the effects of LEMP, measures according to IEC 62305-4 are necessary.

414 **3.2**

415 **external lightning protection system**

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

418 **3.3**

419 **isolated LPS**

420 LPS with an air-termination system and down-conductor system positioned in such a way that
 421 the LPS has no electrical or physical contact with the structure to be protected except at ground
 422 level for equipotential bonding and that along the complete path of the lightning current the
 423 separation distance is respected

² Third edition under preparation. Stage at the time of publication IEC CDV 62305-1:2022.

³ Third edition under preparation. Stage at the time of publication IEC CDV 62305-2:2022.

⁴ Third edition under preparation. Stage at the time of publication IEC CDV 62305-4:2022.