Lumex

CALCULATION STANDARD

IEC 62305-2 Edition 3.0 (2024)

LIGHTNING RISK ASSESSMENT REPORT

Abstract of risk assessment to identify and implement actions that lessen the impact of lightning, per IEC 62305-2.

Sample site

PROJECT CODE: SAMPLE-001

CREATION DATE

19-Sep-2026

CLIENT

Sample Engineering Ltd

New Delhi, India

Content Index

Executive Summary

PROTECTION REQUIRED

The risk of injury to people and physical damage exceeds the tolerable limit. Protection measures are required.

This is a calculated result, not a certification. A competent person, qualified where the structure is located, must review the inputs and this assessment before it is relied on or acted on.

This assessment evaluates the risk of injury to people and physical damage (**R**) for **Sample site** against the tolerable risk $\mathbf{R_T}$ = 1×10^{-5}, in accordance with IEC 62305-2 Edition 3.0 (2024).

Risk R, structure as assessed	Risk R with the additional protection proposed	Tolerable risk RT
4.45×10^{-3}	7×10^{-4}	1×10^{-5}

Protection already in place

- **LPS class** : P_LPS = 0.05 (reduces: RAT, RAD, RB, RC, RM, RU, RV)
- **SPD system, power** : P_SPD = 0.03, zone 1 (reduces: RC, RM, RW, RZ)
- **SPD system, telecom** : P_SPD = 0.05, zone 1 (reduces: RC, RM, RW, RZ)
- **Fire protection** : r_p = 0.2, zone 1 (reduces: RB, RV)
- **Equipotential bonding** : P_EB = 0.05, low-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : P_EB = 0.05, high-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : SPD to LPL IV; P_EB = 0.05, telecom line (reduces: RAT, RB, RU, RV)

Additional protection proposed

- **LPS class** : P_LPS = 0.02 (reduces: RAT, RAD, RB, RC, RM, RU, RV)
- **Thunderstorm warning system** : P_TWS = 0.1 (reduces: RAT, RAD, RC, RM, RU, RV, RW, RZ)
- **Equipotential bonding** : P_EB = 0.01, low-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : P_EB = 0.01, high-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : P_EB = 0.01, telecom line (reduces: RAT, RB, RU, RV)

With these measures installed the risk R would still exceed the tolerable value R_T; further or stronger measures are needed (IEC 62305-2:2024 (Ed.3) clause 7.3 NOTE 5).

This report shows the structure in two states. The first is the structure as assessed, carrying the protection measures already installed on it, and the verdict above is taken there: clause 7.3 compares the calculated risk R with the tolerable risk R_T for the structure as it stands, and a measure that is not installed protects nobody. The second is that same structure recalculated with the additional measures proposed here, which is the re-calculation step of Figure 1. Those recalculated figures are informative and carry no verdict.

Scope: this assessment evaluates the risk of injury to people and physical damage, $R = R_{L1} + R_{L2}$ (clause 6.3.2), against the tolerable risk R_T (clause 7.3), and the frequency of damage to internal systems F (clause 9) against the tolerable frequency F_T. Edition 3.0 assesses one risk R and one frequency F; the four separate risks R1 to R4 of Edition 2 do not exist in this edition.

Sample site

Dominant risk drivers

Failure of systems, nearby line strike (RZ); Injury to living beings, direct strike (RAD)

Risk Assessment (Sample site)

Environmental Data

MEASURES	SYMBOL	VALUE	IEC REF.
Lightning ground strike point density (strike point/km²/year)	N_{SG}	4.2	Clause A.1
Geo Coordinates	L_{at},L_{on}	28.610°N, 77.210°E	-

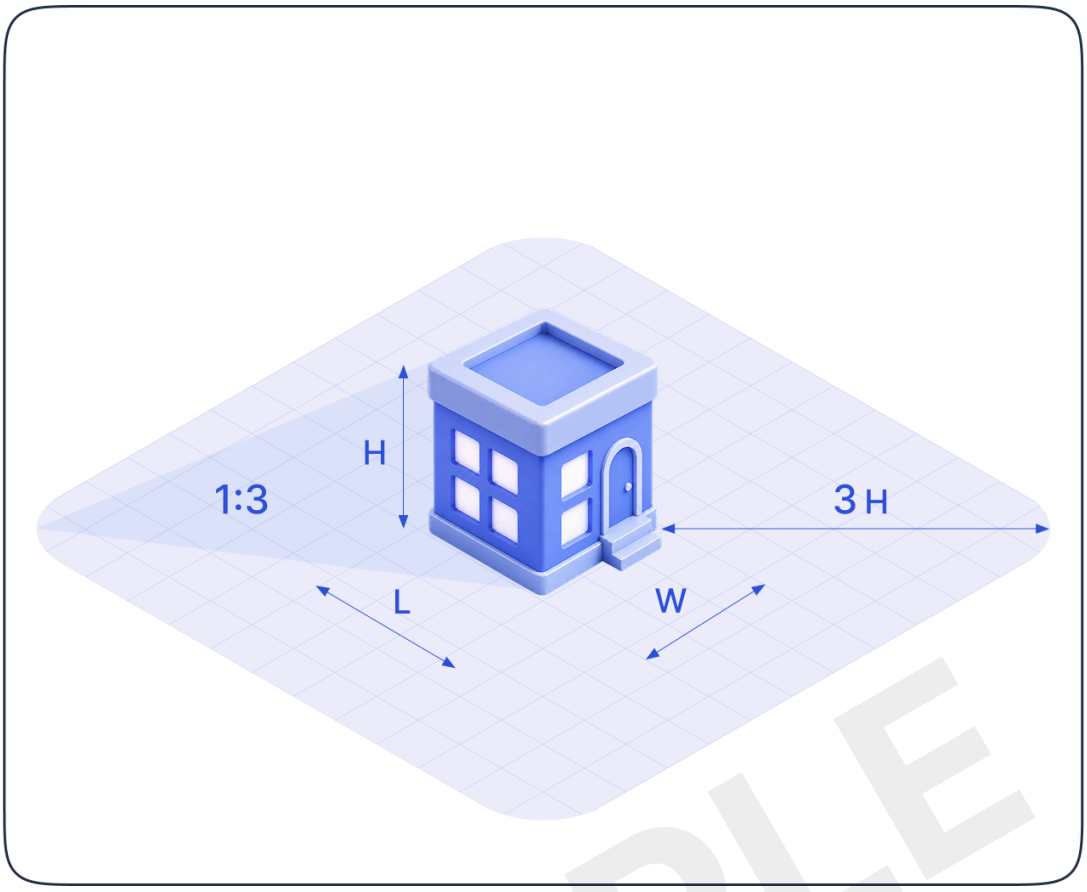
A hyphen means nothing was recorded, or the quantity does not apply here.

> *All clause, equation and table references cite IEC 62305-2 Edition 3.0 (2024).*
>
> *Ground strike-point density N_SG was declared by the assessing engineer rather than taken from the lightning-climatology lookup. The assessment records neither why the value was declared nor which of the clause A.1 derivations it was taken from. The factor k relating N_G and N_SG (clause A.1) was applied as k = 2, in the reverse direction to obtain N_G from N_SG and as the 1/k term of N_M and N_I. Whether that value was supplied by the national lightning location system data provider or is the value clause A.1 NOTE 1 permits to be assumed is not recorded.*

Dimension Parameters Of Structure

PARAMETER	SYMBOL	VALUE	IEC REF.
Length	**L**	60 m	eq. (A.3)
Width	**W**	30 m	eq. (A.3)
Height	**H**	18 m	eq. (A.3)
Highest point	H_P	20 m	Fig. A.2, eq. (A.4)

Sample site



This results in a calculated collection area for direct lightning strikes of **A_D 20680.884 m²**, for the roof protrusion of **$A_{D'}$ 11309.734 m²** and for indirect lightning strikes (near the structure) of **A_M 213042.267 m²**. The calculation uses the greater of A_D and $A_{D'}$ (clause A.2.1.3).

Structure Characteristics

PARAMETER	SYMBOL	VALUE	IEC REF.
Location factor of structure	C_D	0.5	Table A.1
Construction Material	P_S	1	Table B.4
Structure shielding	K_{S1}	0.3	Clause B.6, eq. (B.8)
Environmental factor	C_E	0.5	Table A.4
LPS	P_{LPS}	0.05	Table B.3
TWS	P_{TWS}	1	Clause B.1

Power Line Data

Various parameters related to the power lines associated with the **Sample site**. It includes factors such as the total length, installation method, line type, dielectric strength of equipment, and other relevant parameters that could affect the overall risk analysis.

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
Length(m)	Line Length	L_L	500	eq. (A.10)
Line type	HV power, HV/LV transformer with separated windings	C_T	0.2	Table A.3
Installation factor	0.5	C_I	0.5	Table A.2
Environmental factor	Suburban	C_E	0.5	Table A.4
Shielding, grounding, isolation	No protection assumed	C_{LD}	1	Table B.9
Shielding, grounding, isolation (induced)	No protection assumed	C_{LI}	1	Table B.9
Equipotential bonding	Protection applied	P_{EB}	0.05	Table B.13
Failure of internal systems	No protection assumed	P_{LD}	1	Tables B.11, B.12

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
Length(m)	Line Length	L_L	1000	eq. (A.10)
Line type	LV power, telecommunication or data line	C_T	1	Table A.3
Installation factor		C_I	0.5	Table A.2
Environmental factor		C_E	0.5	Table A.4
Line shielding		R_S	1	Tables B.11/ B.12
Shielding, grounding, isolation		C_{LD}	1	Table B.9
Shielding, grounding, isolation		C_{LI}	1	Table B.9
Withstand of internal system (kV)	-	U_W	0	Clause A.3, Clause A.5, Tables B.11, B.12

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
SPD Protection		P_{EB}	0.05	Table B.13
Conductors (n')	Conductors of this service	n_P	4	Table B.7 footnote b, Annex D
Adjacent structure length	Structure this line connects to	L_J	20 m	clause A.2.5, eq. (A.6)
Adjacent structure width	-	W_J	15 m	clause A.2.5, eq. (A.6)
Adjacent structure height	-	H_J	10 m	clause A.2.5, eq. (A.6)
Adjacent structure location	Location factor of the adjacent structure	C_{DJ}	0.5	Table A.1

A hyphen means nothing was recorded, or the quantity does not apply here.

Communication Line

Various parameters related to the telecommunication lines associated with **Sample site**. It includes factors such as the total length, installation method, line type, dielectric strength of equipment, and other relevant parameters that could affect the overall risk analysis.

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
Length(m)	-	L_L	800	eq. (A.10)
Line type	LV power, telecommunication or data line	C_T	1	Table A.3
Installation factor	Buried	C_I	0.5	Table A.2
Environmental factor	Suburban	C_E	0.5	Table A.4
Line shielding	-	R_S	-	Tables B. 11/B.12
Shielding, grounding, isolation	Unshielded	C_{LD}	1	Table B.9
Shielding, grounding, isolation	Unshielded	C_{LI}	1	Table B.9
Withstand of internal system (kV)	-	U_W	2.5	Clause A.3, Clause A.5, Tables B. 11, B.12
SPD Protection	SPD to LPL IV	P_{EB}	0.05	Table B.13
Conductors (n')	Conductors of this service	n_T	4	Table B.7 footnote b, Annex D

A hyphen means nothing was recorded, or the quantity does not apply here.

Zone Valid Factor 1

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
Surface type		r_t	0.01	Table B.2
Shock protection		P_{am}	1	Table B.1
Persons in the exposed area		P_O	1	Clause B.3
Risk of fire		r_f	0.01	Table B.6
Person potentially in danger in the zone	-	t_z	8760	eq. (B.14)
Equipment potentially in danger in the zone	-	t_e	8760	eq. (B.15)
Fire protection	. Fire mitigation measures are applied	r_p	0.2	Table B.5

PARAMETER	COMMENT	SYMBOL	VALUE	IEC REF.
	in this calculation, so r_p is below 1 (clause B.4).			
Spatial shield	Grid-like spatial shield, 2 m mesh width	K_{S2}	0.24	Clause B.6, eq. (B.9)
Internal power systems	Yes	K_{S3P}	1	Table B.10
Withstand of internal system (kV)	-	U_W	2.5	Clause A.3, Clause A.5, Tables B. 11, B.12
SPD Protection, power system		P_{SPD}	0.03	Table B.7
Internal telecom systems	Yes	K_{S3T}	1	Table B.10
SPD Protection, telecom system	-	P_{SPD}	0.05	Table B.8
Loss by touch and step voltages	-	L_T	0.01	Table C.2
Loss by direct stroke	-	L_D	0.01	Table C.2
Loss by fire, human life	-	L_{F1}	0.1	Table C.2
Loss by fire, structure	-	L_{F2}	0.5	Table C.2
Loss by internal system failure, human life	-	L_{O1}	0.01	Table C.2
Loss by internal system failure, structure	-	L_{O2}	0.1	Table C.2
Induced voltage within withstand (power), declared	Probability that the induced voltage is not higher than the withstand voltage of the power system, from IEC 62305-4:2024 Annex A, worked evaluation	C_{LD}	0.02	clause B.5 NOTE 7
Induced voltage within withstand (telecom), declared	Probability that the induced voltage is not higher than the withstand voltage of the telecommunication system, from IEC 62305-4:2024 Annex A, worked evaluation	C_{LD}	0.04	clause B.5 NOTE 7
Evacuation credit applied	Thunderstorm warning system allows evacuation of this zone; t_z is multiplied by P_TWS in P_P	-	Applied	eq. (B.14) NOTE 2

A hyphen means nothing was recorded, or the quantity does not apply here.

Assessment of collection areas Ax

SYMBOL	AREA (M^2)	IEC REF.
A_D	20,681	eq. (A.3)
$A_{D'}$	11,310	eq. (A.4)
A_{DJ}	5,227	eq. (A.3)
A_M	213,042	eq. (A.8)
A_{LT}	32,000	eq. (A.10)
A_{LP}	60,000	eq. (A.10)
A_{IT}	614,976	eq. (A.12)
A_{IP}	1,152,000	eq. (A.12)

Assessment Of Annual Number Nx Of Dangerous Events

SYMBOL	VALUE	IEC REF.
N_D	4.34×10^{-2}	eq. (A.5)
N_{DJ}	1.1×10^{-2}	eq. (A.6)
N_M	4.47×10^{-1}	eq. (A.7)
N_{LP}	4.62×10^{-2}	eq. (A.9)
N_{LT}	3.36×10^{-2}	eq. (A.9)
N_{IP}	4.44×10^{-1}	eq. (A.11)
N_{IT}	3.23×10^{-1}	eq. (A.11)

Assessment of Risk Component Rx

Calculated risk **R** compared with the tolerable risk $\mathbf{R_T = 1 \times 10^{-5}}$ (clause 7.3)

Each component follows Table 3: $R_X = N_X \times P_X \times L_X$, equation (9). The zone total R(cal) sums the components per clause 8.5.3.

Assessed under IEC 62305-2 Edition 3.0 (2024) with no national departures.

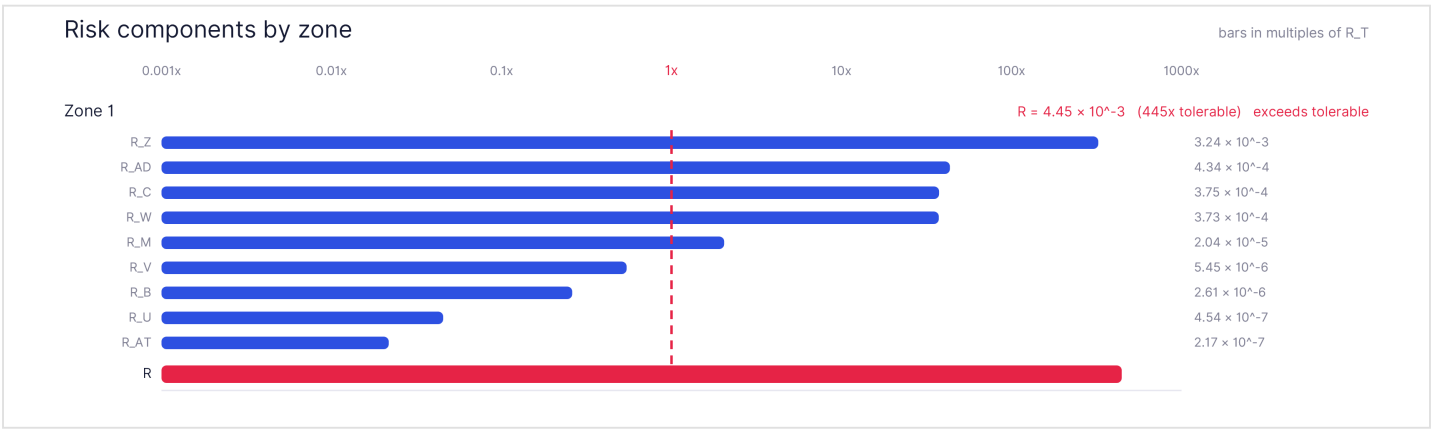
R = R_L1 + R_L2 (clause 6.3.2). R_L1 = 8.01 × 10^-4, R_L2 = 3.65 × 10^-3. Dominated by physical damage (R_L2) at 82 % of the total.

Key: R_{AD}/R_{AT} shock hazard, R_B physical damage, R_C/R_M internal system failure. $R_U/R_V/R_W/R_Z$ *the same, for sources connected by a line. Full definitions and the source/loss mapping: Appendix D, Table 3 (clause 8.5.3).*

Observation of Calculated Risk, Structure As Assessed

RISK	Z1
R_{AD}	4.34×10^{-4}
R_{AT}	2.17×10^{-7}
R_B	2.61×10^{-6}
R_C	3.75×10^{-4}
R_M	2.04×10^{-5}
R_U	4.54×10^{-7}
R_V	5.45×10^{-6}
R_W	3.73×10^{-4}
R_Z	3.24×10^{-3}
R(cal)	4.45×10^{-3}

Additional risk to surroundings (Annex E): **≈ 0**. *Reported separately, and not included in R or the compliance check.*



Therefore protection measures need to be imposed.

Risk with the additional protection proposed

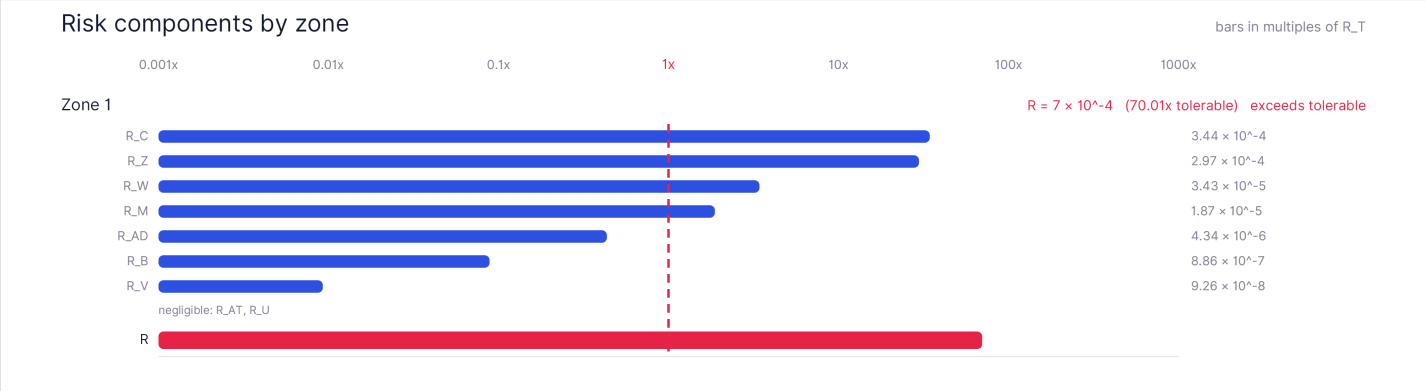
The risk was recalculated with the additional protection measures proposed below installed on top of those already in place, and nothing else changed. This is the re-calculation step of Figure 1, and the recalculated figures are shown against the tolerable value. These measures are not installed, so the compliance verdict for this structure remains the one taken on the structure as assessed. This selection of protection measures is part of the risk assessment for the **Sample site** and is only valid in connection with this object.

Additional protection measures proposed in this assessment:

- **LPS class** : P_LPS = 0.02 (reduces: RAT, RAD, RB, RC, RM, RU, RV)
- **Thunderstorm warning system** : P_TWS = 0.1 (reduces: RAT, RAD, RC, RM, RU, RV, RW, RZ)
- **Equipotential bonding** : P_EB = 0.01, low-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : P_EB = 0.01, high-voltage line 1 (reduces: RAT, RB, RU, RV)
- **Equipotential bonding** : P_EB = 0.01, telecom line (reduces: RAT, RB, RU, RV)

Observation of Calculated Risk, With the Proposed Protection

RISK	Z1
R_{AD}	4.34×10^{-6}
R_{AT}	8.69×10^{-10}
R_B	8.86×10^{-7}
R_C	3.44×10^{-4}
R_M	1.87×10^{-5}
R_U	9.08×10^{-10}
R_V	9.26×10^{-8}
R_W	3.43×10^{-5}
R_Z	2.97×10^{-4}
R(cal)	7×10^{-4}



With these measures installed the risk R would still exceed the tolerable value R_T; further or stronger measures are needed (IEC 62305-2:2024 (Ed.3) clause 7.3 NOTE 5).

Assessment of frequency components Fx

Calculated frequency **F** compared with the tolerable frequency of damage $\mathbf{F_T}$ (clause 9.3, each zone against its own F_T).

> Each component follows Table 4: $F_X = N_X \times P_X$, equation (13). The zone total F(cal) follows equation (12).
>
> Key: F_C direct flash, F_M nearby flash, F_W flash to a connected line, F_Z *flash near a connected line, each a failure of internal systems, clause 9. Full definitions: Appendix F, Table 4 (clause 9.3).*

Observation of Calculated Frequency, Structure As Assessed

FREQUENCY	Z1
$\mathbf{F_C}$	3.41×10^{-3}
$\mathbf{F_M}$	1.86×10^{-4}
$\mathbf{F_W}$	3.4×10^{-3}
$\mathbf{F_Z}$	2.94×10^{-2}
$\mathbf{F_T}$	0.05
F(cal)	3.64×10^{-2}

Therefore protection measures need not be imposed.

Frequency with the additional protection proposed

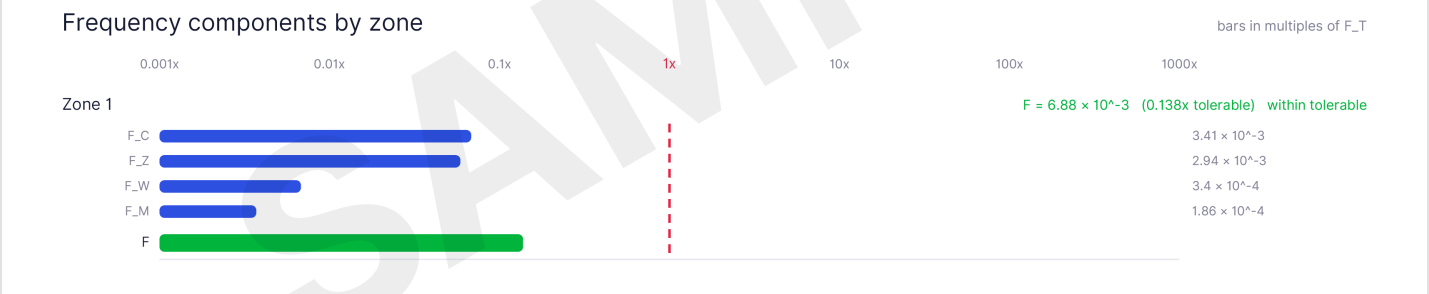
The frequency of damage was recalculated with the additional protection measures proposed below installed, against the tolerable frequency F_T of each zone. These measures are not installed, so the frequency stated for this structure remains the one on the preceding page. This selection of protection measures is part of the risk assessment for the **Sample site** and is only valid in connection with this object.

Proposed measures that change the frequency of damage, included in this recalculation:

- **Thunderstorm warning system** : P_TWS = 0.1 (reduces: RAT, RAD, RC, RM, RU, RV, RW, RZ)

Observation of Calculated Frequency, With the Proposed Protection

FREQUENCY	Z1
F_C	3.41×10^{-3}
F_M	1.86×10^{-4}
F_W	3.4×10^{-4}
F_Z	2.94×10^{-3}
F_T	0.05
F(cal)	6.88×10^{-3}



Protection Specification

The risk calculation decided how much protection this structure needs. This section states that decision as a design an installer can build and an inspector can check: the class of lightning protection system, the parameters the class fixes, where surge protective devices belong, and how much voltage they may let through.

The class of lightning protection system

This assessment proposes a class I lightning protection system. It is not installed, so the structure is to be brought to this class. IEC 62305-3:2024 (Ed.3) Table 1 maps lightning protection level I to IV onto class of LPS I to IV, one for one, so the protection level the risk calculation worked with is what fixes the class, and the class fixes everything in the table below.

What the class fixes

PARAMETER	VALUE	REFERENCE
Rolling sphere radius r	20 m	IEC 62305-3:2024 (Ed.3) Table 2
Mesh cell size w_m	5 m	IEC 62305-3:2024 (Ed.3) Table 2
Preferred distance between down conductors	10 m	IEC 62305-3:2024 (Ed.3) Table 5
Protection angle	A curve against the height of the air termination, not one value per class	IEC 62305-3:2024 (Ed.3) Figure 1
Minimum length of an earth electrode	A curve against the class, not one value per class	IEC 62305-3:2024 (Ed.3) Figure 5

Lightning equipotential bonding takes an SPD at **LPL I**, the tier this class brings with it. Table B.13 gives P_EB = 0.01 for it, the probability of dangerous sparking despite the bonding.

Where the surge protective devices go

IEC 62305-4:2024 (Ed.3) clause 7 puts an SPD where each line enters the structure and at each step into a further lightning protection zone. Annex C.2.2 then fixes the test class from what can reach that point. The IEC wording names the test the device passed; the bracketed term is what the same device is called in a supplier's catalogue.

LOCATION	SPD	WHY THIS ONE
Where high-voltage line 1 enters the structure	**class I test (Type 1)**	The structure has an LPS, so a partial lightning current can flow in this line: IEC 62305-4:2024 (Ed.3) Annex C.2.2 requires a class I test SPD.
Where low-voltage line 1 enters the structure	**class I test (Type 1)**	The structure has an LPS, so a partial lightning current can flow in this line: IEC 62305-4:2024 (Ed.3) Annex C.2.2 requires a class I test SPD.
Where telecommunication line 1 enters the structure	**class I test (Type 1)**	The structure has an LPS, so a partial lightning current can flow in this line: IEC 62305-4:2024 (Ed.3) Annex C.2.2 requires a class I test SPD.

How much voltage the devices may let through

The voltage protection level U_p of every SPD protecting a zone must stay at or under that zone's figure. IEC 62305-4:2024 (Ed.3) clause C.2.3.1.1 sets the ceiling at the equipment's own rated impulse withstand voltage U_W.

ZONE	LIGHTNING PROTECTION ZONE	POWER SYSTEM, U_p AT MOST	TELECOM SYSTEM, U_p AT MOST
Z1	LPZ 2	2.5 kV	1.5 kV

What this report does not decide

The air-termination method and the element are the engineer's choice: IEC 62305-3:2024 (Ed.3) clause 5.2.1 lists rods, catenary wires and meshed conductors and ranks none of them, and Part 3 credits only the real physical dimensions of an air-termination system when the protected volume is worked out.

The earth-termination arrangement is the engineer's choice too: IEC 62305-3:2024 (Ed.3) clause 5.4.2 defines the Type A and Type B arrangements, and clause 5.4.1 recommends Type B for a structure with extensive electronic systems or a high risk of fire without requiring it.

A lightning arrester in Indian regulation is not an air terminal: the CEA (Measures relating to Safety and Electric Supply) Regulations, 2023 define it at definition (zn) as a device that diverts a surge to earth, and regulation 77 asks the owner of an exposed overhead line, substation or generating station to provide one as per relevant standards. That device sits on the supply, outside this assessment.

Legal Obligations

The Lumex lightning risk assessment platform calculates risks in accordance with IEC 62305-2. The edition applied to this assessment is stated on the cover.
The risk analysis of possible threats from lightning strike/effects for the said structure/building is conducted based on inputs provided by the building's operator and/or owner, or by an expert. This information has been assumed, assessed.

This RA document will no longer hold true in case of any alteration /changes at site which would lead to difference in inputs effective for this RA.

This assessment is computed from the inputs recorded in it. It does not certify the structure, and it does not replace the judgement of the competent person who signs it.

This report is a computer-generated risk assessment produced by applying the IEC 62305-2 methodology to data supplied by the user. It is a decision-support aid, not a certified engineering design, a professional opinion, or a statement of code compliance, and its results depend entirely on the accuracy and completeness of the inputs provided. This report must be reviewed, validated, and approved by a competent lightning-protection professional before it is relied upon or acted upon. To the maximum extent permitted by law, Webority Technologies Private Limited (the platform operator) accepts no liability for any loss, damage, injury, or cost arising from the use of, or reliance on, this report or its calculations, which are governed by the platform's Terms & Conditions.

Date: _____ Signature: _____

Place: _____ Stamp: _____

Reference Standard

The IEC 62305 standard series consists of the following parts:

IEC 62305-1:2024 Ed3

PROTECTION AGAINST LIGHTNING
Part 1: General principles

IEC 62305-2 Edition 3.0 (2024)

PROTECTION AGAINST LIGHTNING
Part 2: Risk Management

IEC 62305-3:2024 Ed3

PROTECTION AGAINST LIGHTNING
Part 3: Physical damage to structures and life hazard

IEC 62305-4:2024 Ed3

PROTECTION AGAINST LIGHTNING
Part 4: Electrical and electronic systems within structures

APPENDIX B

Table of Abbreviations

Symbols follow IEC 62305-2:2024 (Ed.3) clause 4. An entry carrying its own reference is one clause 4 does not index.

A	Ground area around the structure where a flash to it is collected	A_D
	Collection area of a raised part of the roof	$A_{D'}$
	Collection area of a neighbouring structure	A_{DJ}
	Ground area where a flash near this power line is collected (eq. (A.12))	A_{IP}
	Ground area where a flash near this telecom line is collected (eq. (A.12))	A_{IT}
	Ground area where a flash to a line is collected	A_L
	Ground area where a flash to this power line is collected (eq. (A.10))	A_{LP}
	Ground area where a flash to this telecom line is collected (eq. (A.10))	A_{LT}
	Ground area where a flash near the structure is collected	A_M
C	Factor for how exposed the structure's position is	C_D
	Location factor of a neighbouring structure	C_{DJ}
	Factor for the surroundings a line runs through	C_E
	Factor for how the line is installed	C_I
	Line shielding, earthing and isolation factor for a flash to the line	C_{LD}
	Line shielding, earthing and isolation factor for a flash near the line	C_{LI}
	Factor for an HV/LV transformer on the line	C_T
D	Electric shock to a person the flash strikes directly	D_{1D}
	Electric shock to a person through resistive and inductive coupling	D_{1T}
	Dangerous sparking inside the structure	D_2
	Surges that make internal systems fail	D_3
F	How often damage is expected, per year	F
	Damage per year from a flash to the structure, source S1	F_C
	Damage per year from a flash near the structure, source S2	F_M
	Highest frequency of damage treated as acceptable	F_T

	Damage per year from a flash to a line, source S3	F_W
	Frequency of damage of the component named by X (clause 9.2)	F_X
	Damage per year from a flash near a line, source S4	F_Z
H	Structure height	H
	Height of the neighbouring structure (clause A.2.5, eq. (A.6))	H_J
	Height of the highest point of the structure (eq. (A.4))	H_P
k	Factor linking ground flash density to strike-point density	k
K	Screening factor of the structure itself	K_{S1}
	Screening factor of shields inside the structure	K_{S2}
	Wiring factor of the power system in this zone (Table B.10)	K_{S3P}
	Wiring factor of the telecom system in this zone (Table B.10)	K_{S3T}
L	Structure length	L
	Loss from injury to people, death included	L_1
	Loss from physical damage to the structure and its contents	L_2
	Loss from failure of electrical and electronic systems	L_3
	Latitude of the structure, as entered (Lumex)	L_{at}
	Share of the people in the zone injured by a direct stroke, per event	L_D
	Share of the people in the zone injured by fire or explosion, per event	L_{F1}
	Share of the zone physically damaged by fire or explosion, per event	L_{F2}
	Length of the neighbouring structure (clause A.2.5, eq. (A.6))	L_J
	Length of this line section	L_L
	Share of the people in the zone injured by internal system failure, per event	L_{O1}
	Share of the zone damaged by internal system failure, per event	L_{O2}
	Longitude of the structure, as entered (Lumex)	L_{on}
	Share of the people in the zone injured by touch and step voltage, per event	L_T
	Loss that follows the damage, for the component named by X	L_X
n	Conductors of this power service (Table B.7 footnote b)	n_P

Conductors of this telecom service (Table B.7 footnote b)	n_T

N

Dangerous events per year from flashes to the structure	N_D
Dangerous events per year from flashes to a neighbouring structure	N_{DJ}
Flashes to ground per square kilometre per year	N_G
Dangerous events per year from flashes near a line	N_I
Dangerous events per year from flashes near this power line (eq. (A.11))	N_{IP}
Dangerous events per year from flashes near this telecom line (eq. (A.11))	N_{IT}
Dangerous events per year from flashes to this power line (eq. (A.9))	N_{LP}
Dangerous events per year from flashes to this telecom line (eq. (A.9))	N_{LT}
Dangerous events per year from flashes near the structure	N_M
Ground strike points per square kilometre per year	N_{SG}
Total flashes to ground per square kilometre per year, before halving (eq. (A.2))	N_T
Dangerous events per year, for the component named by X	N_X

P Probability Factors

Injury from touch and step voltage after a flash to the structure	P_{am}
Internal systems fail after a flash to the structure	P_C
The equipment is exposed to the damaging event	P_e
Sparking despite equipotential bonding	P_{EB}
Reduction from the line characteristics and the equipment withstand voltage	P_{LD}
Set by the lightning protection level of the LPS	P_{LPS}
Internal systems fail after a flash near the structure	P_M
Factor for where a person stands in the exposed area	P_O
A person is in the dangerous place	P_P
A person outside the structure is exposed to the damaging event (Annex E)	P_{PE}
SPD current charge exceeds what the SPD tolerates (Annex D)	P_Q
Dangerous sparking after a flash to the structure	P_S
Equipment is damaged despite a coordinated SPD system	P_{SPD}
A thunderstorm warning system misses an event	P_{TWS}
SPD residual voltage exceeds the required protection level (Annex D)	P_{Up}
Probability of damage of the component named by X	P_X
Internal systems fail after a flash near a connected line	P_Z

r	Radius of the rolling sphere that sizes the air termination (IEC 62305-3:2024 (Ed.3) Table 2)	r
	Loss reduction factor for the fire risk	r_f
	Loss reduction factor for fire protection measures	r_p
	Loss reduction factor for the surface type	r_t

R	Expected yearly loss from lightning	R
	Direct flash to a person exposed on the structure	R_{AD}
	Direct flash to the structure causing touch and step voltages	R_{AT}
	Direct flash to the structure causing dangerous sparking and fire	R_B
	Direct flash to the structure causing sparking and fire, counted in loss L1 (clause 6.3)	R_{B1}
	Direct flash to the structure causing sparking and fire, counted in loss L2 (clause 6.3)	R_{B2}
	Direct flash to the structure causing internal system failure	R_C
	Direct flash to the structure failing internal systems, counted in loss L1 (clause 6.3)	R_{C1}
	Direct flash to the structure failing internal systems, counted in loss L2 (clause 6.3)	R_{C2}
	Total risk to human life, the sum of the L1 components (eq. (7))	R_{L1}
	Total risk of physical damage, the sum of the L2 components (eq. (8))	R_{L2}
	Nearby flash inducing failure of internal systems	R_M
	Nearby flash failing internal systems, counted in loss L1 (clause 6.3)	R_{M1}
	Nearby flash failing internal systems, counted in loss L2 (clause 6.3)	R_{M2}
	Shield resistance of this line, per kilometre	R_S
	Risk from flashes to the structure, source S1 (eq. (2))	R_{S1}
	Risk from flashes near the structure, source S2 (eq. (3))	R_{S2}
	Risk from flashes to a connected line, source S3 (eq. (4))	R_{S3}
	Risk from flashes near a connected line, source S4 (eq. (5))	R_{S4}
	Highest risk accepted for this structure	R_T
	Flash to a connected line causing touch voltage indoors	R_U
	Flash to a connected line causing fire or explosion	R_V
	Flash to a connected line causing fire or explosion, counted in loss L1 (clause 6.3)	R_{V1}
	Flash to a connected line causing fire or explosion, counted in loss L2 (clause 6.3)	R_{V2}
	Flash to a connected line causing internal system failure	R_W
	Flash to a connected line failing internal systems, counted in loss L1 (clause 6.3)	R_{W1}
	Flash to a connected line failing internal systems, counted in loss L2 (clause 6.3)	R_{W2}

	Risk component named by X	R_X
	Flash near a connected line inducing internal system failure	R_Z
	Flash near a connected line failing internal systems, counted in loss L1 (clause 6.3)	R_{Z1}
	Flash near a connected line failing internal systems, counted in loss L2 (clause 6.3)	R_{Z2}
ρ	Soil resistivity along this line's buried run (clause A.4 NOTE 3)	ρ
S	Source of damage: a flash to the structure	S1
	Source of damage: a flash near the structure	S2
	Source of damage: a flash to a connected line	S3
	Source of damage: a flash near a connected line	S4
t	Hours per year the equipment is exposed to the damaging event (clause B.4, equation (B.15); not in the clause 4 index)	t_e
	Hours per year people are present in the dangerous place	t_z
U	Voltage a surge protective device lets through (IEC 62305-4:2024 (Ed.3) clause C.2.3.1.1)	U_p
	Impulse voltage the system is rated to withstand	U_W
w	Mesh cell size of the air termination (IEC 62305-3:2024 (Ed.3) Table 2)	w_m
W	Structure width	W
	Width of the neighbouring structure (clause A.2.5, eq. (A.6))	W_J

APPENDIX C

Source of Damage

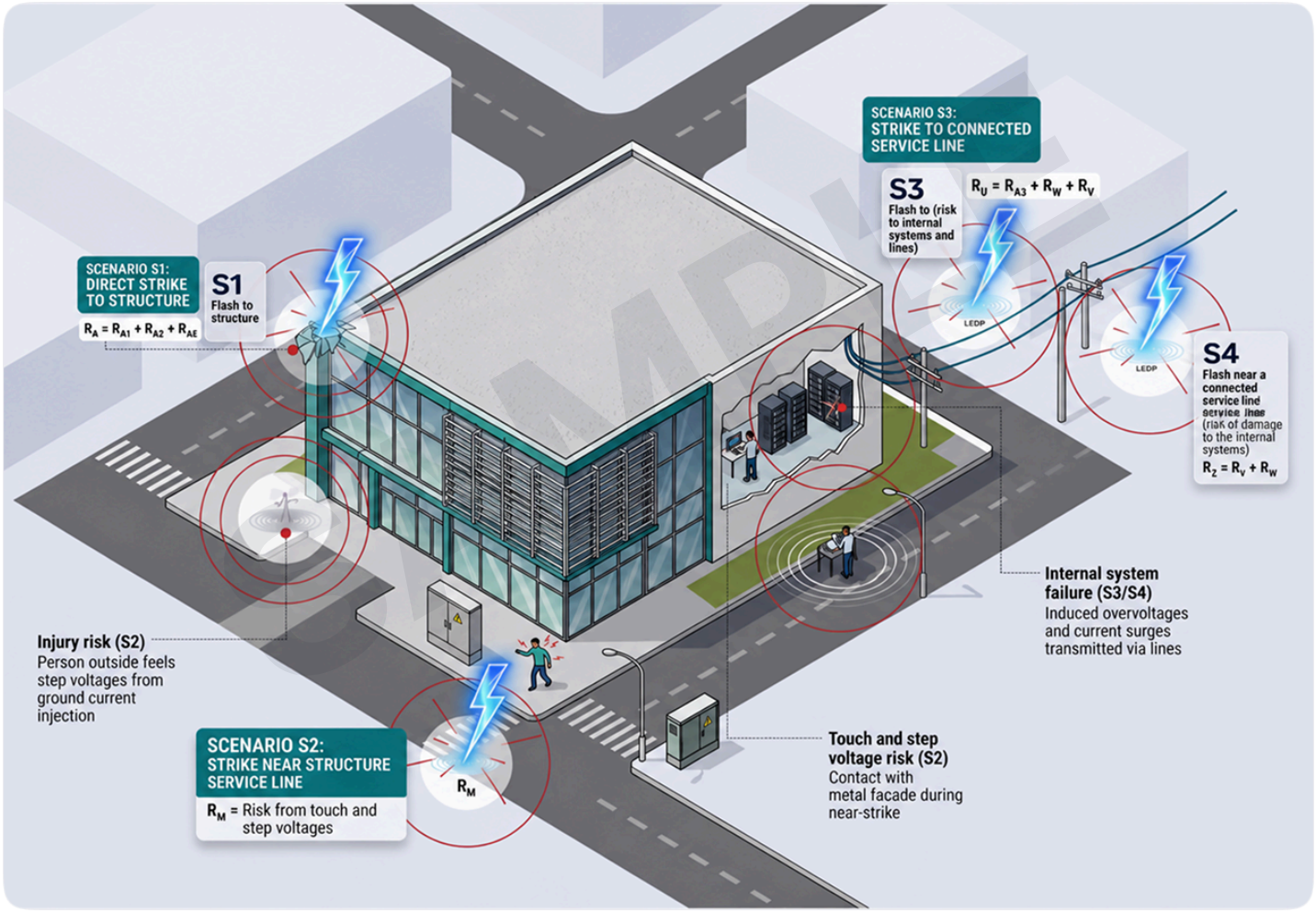
The lightning current does the damage, and where the flash lands decides which source of damage applies (clause 5.1):

S1 : Strikes the structure.

S2 : Strikes near the structure.

S3 : Strikes a line connected to the structure.

S4 : Strikes near a line connected to the structure.



Risk components related to source of damage

Cause of damage

How a flash damages a structure depends on how it is built, what it holds and what it is used for, which services enter it, and what protection it already has.

Four causes of damage follow from that (clause 5.2):

- **D_{1D} :** Electric shock to a person the flash strikes directly.
- **D_{1T} :** Electric shock to a person through resistive and inductive coupling.
- **D_2 :** Dangerous sparking inside the structure, setting off fire or explosion, mechanical and chemical effects, or both, and possibly harming the environment.
- **D_3 :** Surges from any source of damage that make internal systems fail.

Type of Loss

A lightning flash can cause more than one type of loss at once, and which ones apply depends on the structure. The three types below follow IEC 62305-2:2024 (Ed.3) clause 5.3.

- **L_1 :** Loss from injury to people, death included, caused by damage D_{1D}, D_{1T} or D_2, and by D_3 where a failed internal system puts life at risk.
- **L_2 :** Loss from physical damage to the structure and its contents, from damage D_2 or D_3.
- **L_3 :** Loss from failure of internal systems, from damage D_3.

APPENDIX D

Risk and its components

Risk components from source S1 (clause 6.2.1)

R_{AT} : Direct flash to the structure causing touch and step voltages inside it, and outside within 3 m of a down conductor. It contributes to loss L_1.

R_{AD} : Direct flash to a person exposed on the structure. It contributes to loss L_1.

R_B : Direct flash to the structure causing dangerous sparking and fire. It contributes to losses L_1 and L_2.

R_C : Direct flash to the structure causing internal system failure. It contributes to losses L_1 and L_2.

Risk component from source S2 (clause 6.2.2)

R_M : Nearby flash inducing failure of internal systems. It contributes to losses L_1 and L_2.

Risk components from source S3 (clause 6.2.3)

R_U : Flash to a connected line causing touch voltage indoors. It contributes to loss L_1.

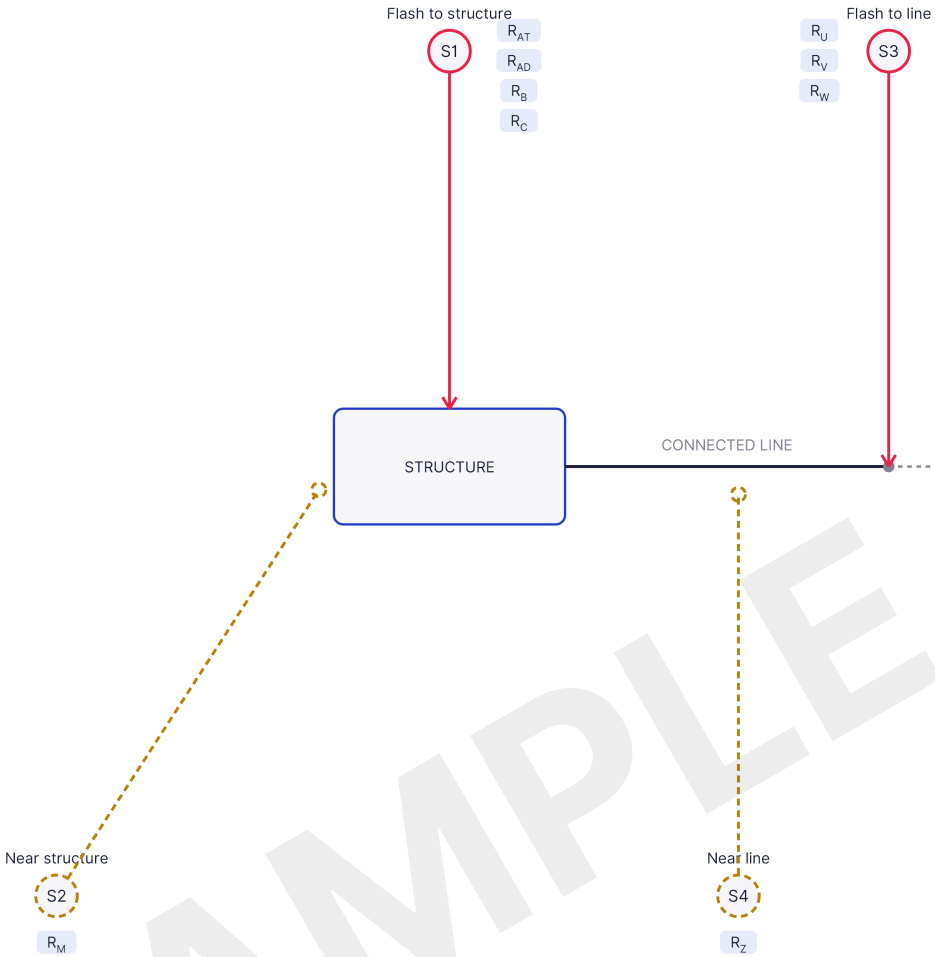
R_V : Flash to a connected line causing fire or explosion via the service. It contributes to losses L_1 and L_2.

R_W : Flash to a connected line causing internal system failure. It contributes to losses L_1 and L_2.

Risk components from source S4 (clause 6.2.4)

R_Z : Flash near a connected line inducing internal system failure. It contributes to losses L_1 and L_2.

Sources of damage and the risk components computed for this structure



Component definitions per IEC 62305-2:2024 (Ed.3) Table 3.

APPENDIX E

Identification of risk components

R adds up its risk components, grouped either by source of damage or by type of loss (clause 6.3).

Grouped by source of damage:

$$R = R_{S1} + R_{S2} + R_{S3} + R_{S4}$$

where,

$$R_{S1} = R_{AT} + R_{AD} + R_{B1} + R_{B2} + R_{C1*} + R_{C2*}$$

$$R_{S2} = R_{M1*} + R_{M2*}$$

$$R_{S3} = R_{U} + R_{V1} + R_{V2} + R_{W1*} + R_{W2*}$$

$$R_{S4} = R_{Z1*} + R_{Z2*}$$

1* Generally applies where a failed internal system can injure people or harm the environment. Structures at risk of explosion and hospitals with life-saving equipment are the usual cases (clause 6.3).

2* Generally applies where the structure has a risk of explosion.

Risk components grouped by type of loss

$$R = R_{L1} + R_{L2}$$

where,

$$R_{L1} = R_{AT} + R_{AD} + R_{B1} + R_{C1*} + R_{M1*} + R_{U} + R_{V1} + R_{W1*} + R_{Z1*}$$

$$R_{L2} = R_{B2} + R_{C2*} + R_{M2*} + R_{V2} + R_{W2*} + R_{Z2*}$$

1* Generally applies where a failed internal system can injure people or harm the environment. Structures at risk of explosion and hospitals with life-saving equipment are the usual cases (clause 6.3).

2* Generally applies where the structure has a risk of explosion.

Assessment of risk components

Each risk component R_{AT}, R_{AD}, R_B, R_C, R_M, R_U, R_V, R_W and R_Z is computed from one general equation (clause 8.1):

Where,

$$R_X = N_X \times P_X \times L_X$$

- N_x is how many dangerous events happen per year
- P_x is the probability that such an event does damage.
- L_x is how much loss that damage causes

Lightning protection is needed for this structure when the risk R computed for it is above the tolerable risk R_T (clause 7.3):

$$R > R_T$$

Protection measures are then chosen to bring R to R_T or below:

$$R \leq R_T$$

The tolerable risk applied in this assessment is $R_T = 1 \times 10^{-5}$ per year. **IEC 62305-2** clause 7.3 NOTE 1 gives 1×10^{-5} per year as a representative value; national or local regulation may fix a different one. The value above is the one applied, resolved from the jurisdiction stated in this assessment.

APPENDIX F

Frequency of damage and its components

F counts the damaging events that the sources of damage cause in the systems of the structure being assessed (clause 9.1).
It adds up one partial frequency per source of damage:

$$F = F_C + F_M + F_W + F_Z$$

Where,

- F_C Damage per year from a flash to the structure, source S1.
- F_M Damage per year from a flash near the structure, source S2.
- F_W Damage per year from a flash to a line, source S3.
- F_Z Damage per year from a flash near a line, source S4.

Assessment of partial frequency of damage

Each partial frequency of damage comes from one general equation (clause 9.2):

$$F_X = N_X \times P_X$$

Where,

- N_x is how many dangerous events happen per year.
- P_x is the probability that such an event does damage.

When protection is needed on the frequency of damage F

Lightning protection is needed for a zone when its frequency of damage F is above that zone's tolerable frequency F_T (clause 9.3):

$$F > F_T$$

Protection measures are then chosen to bring that zone's F to F_T or below:

$$F \leq F_T$$

The tolerable frequency of damage applied in this assessment is F_T = **0.05** per year; the value compared against each zone is shown in the table above. **IEC 62305-2 Edition 3.0 (2024)** permits national or local regulation to fix F_T.

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