LIGHTNING RISK ASSESSMENT CALCULATIONS (AS PER IEC 62305-2)

Building / Installation : Location ESIC Hospital Main Block (Zone-1 general hospital areas) Thirippur, Tamil Nadu

ENVIRONMENT AND STRUCTURE CHARACTERISTICS

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Lightning Density	N _G =	4		$N_{\rm g} \approx 0.1 {\rm T_{\rm b}} (Eq.A.1)$
Length of structure	L=	85	m	
Width of structure	W=	66	m	
Length of perimeter of structure	L=	85	m	
Width of perimeter of structure	W=	66	m	
Height of structure	H=	13	m	$A_{DI} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ (Eq.A.2)
Chimney/Tower height	T=		m	$A_{D2} = 9 \times \pi \times T^2 \ (Eq.A.3)$
Collection area by graphical method	A _{D3} =		m²	
, 3 1	03			
Location factor of structure	$C_{\scriptscriptstyle D}$	Isolated struct	ture: no	other objects in the vicinity
LPS	P_{B}	Structure prot	ected b	by LPS (Class II)
Equipotential bonding	P _{EB}	II .		,
Mesh width of external spatial shield	w _{m1} =	10	m	Use 10 if not provided
Mesh width of external spatial shield	** m1	10	""	ose to IT hot provided
Structure location factor	C _D =	1		Table A.1
Probability that a flash to a structure will cause physical damage	P _B =	0.05		Table B.2
Probability as a function of LPL for which SPDs are designed	P _{EB} =	0.02		Table B.7
Screening effectiveness of the structure, LPS or other shields at boundary LPZ 0/1	K ₅₁ =	1		$K_{S1} = 0.12 \times W_{m1} (Eq.B.5)$
Collection area for flashes to structure	A _D =	22166	m²	$A_{D} = Max(A_{D1}, A_{D2}, A_{D3})$
Collection area for flashes near structure	A _M =	936398	m²	$A_{M} = 2 \times 500 \times (L+W) + \pi \times 500^{2} (Eq.A.7)$
Number of dangerous events for flashes to structure	N _D =	0.088665		$N_D = N_G \times A_D \times C_D \times 10^{-6} $ (Eq.A.4)
Number of dangerous events for flashes near structure	N _M =	3.745593		$N_{\rm M} = N_{\rm G} \times A_{\rm M} \times 10^{-6} \ (Eq.A.6)$

POWER LINE

Line type		Power lines					
Line installation factor	C_{I}	Buried	Buried				
Line type factor	$C_{\scriptscriptstyle extsf{T}}$	LV power, telec	communi	cation or data line			
Line environmental factor	$\mathcal{C}_{\scriptscriptstyleE}$	Suburban					
Shield of line	R_s	Shielded aerial or buried whose shield bonded to the same bonding bar as Equipment (5 Ω /km < RS \le 20 Ω /km)					
Shielding, grounding, isolation	$C_{\rm LD}, C_{\rm LI}$	Shielded buried line (power or TLC) (Shield bonded to the same bonding bar as equipment)					
Withstand voltage of internal system (kV)	U_w	2.5					
Location factor of adjacent structure	$\mathcal{C}_{ exttt{DJ}}$	Isolated structure: no other objects in the vicinity					
Line Length	L_{L}	150	m	Use 1000m if unknown			
Length of adjacent structure	L=		m				
Width of adjacent structure	W=		m				
Height of adjacent structure	H=		m	A_{DI} = $(L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ (Eq.A.2)			
Chimney/Tower height	T=		m	$A_{D2} = 9 \times \pi \times T^2 \ (Eq.A.3)$			
Collection area by graphical method	A _{DJ3} =		m²				

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Line installation factor	<i>C</i> ₁ =	0.5		Table A.2		
Line type factor	C _⊤ =	1		Table A.3		
Line environmental factor	C _E =	0.5		Table A.4		
Shielding, grounding, isolation	C_{LD} =	1		Table B.4		
Smorting, grounding, columbia	C_{LI} =	0		Table B.4		
Structure location factor	$C_{\text{DJ}}=$	1		Table A.1		
Factor for impulse withstand voltage of the system to be protected.	K ₅₄ =	0.40		$K_{S4} = 1/U_W (Eq.B.7)$		
Probability of failure of internal systems due to a flash to the connected line	P _{LD} =	0.95		Table B.8		
Probability of failure of internal systems due to a flash near the connected line	P _{LI} =	0.3		Table B.9		
Collection area for flashes to adjacent structure	A _{DJ} =	0	m²	$A_{D} = Max(A_{DJI}, A_{DJ2}, A_{DJ3})$		
Collection area for flashes to line	A ,=	6000	m²	$A_{i} = 40 \times L_{i} (Eq. A.9)$		
Collection area for flashes near line	A _T =	600000		$A_{\tau} = 4000 \times L_{\tau} \text{ (Eq.A.11)}$		
	1			1		
Number of dangerous events for flashes to adjacent structure	N _{DJ} =	0.000000		$N_{DJ} = N_e \times A_{DJ} \times C_{DJ} \times C_T \times 10^{-6} $ (Eq.A.5)		
Number of dangerous events for flashes to line	N _L =	0.006000		$N_L = N_G \times A_L \times C_I \times C_E \times C_T \times 10^{-6} $ (Eq.A.8)		
Number of dangerous events for flashes near line	N _I =	0.600000		$N_{I} = N_{G} \times A_{I} \times C_{I} \times C_{E} \times C_{T} \times 10^{-6} (Eq. A.10)$		
TELECOM LINE						
Line type		TLC lines				
Line installation factor	$C_{_{\mathrm{I}}}$	Buried				
Line type factor	$C_{\scriptscriptstyle m T}$	LV power, telecommunication or data line				
Line environmental factor	$C_{\rm E}$	Suburban		and the second s		
Line environmental factor	Œ	Shielded aerial or buried whose shield bonded to the same				
Shield of line	R_s					
Shield of line Shielding, grounding, isolation		bonding bar as Shielded buried	Equipme d line (po	nt (5 Ω /km < RS \le 20 Ω /km) wer or TLC) (Shield bonded to the same		
Shielding, grounding, isolation	$C_{\text{LD}}, C_{\text{LI}}$	bonding bar as Shielded buried bonding bar as	Equipme d line (po	nt (5 Ω /km < RS \le 20 Ω /km) wer or TLC) (Shield bonded to the same		
Shielding, grounding, isolation Withstand voltage of internal system (kV)	C_{LD}, C_{LI} U_{W}	bonding bar as Shielded buried bonding bar as 1.5	Equipme d line (po equipmen	nt (5Ω/km < RS ≤ 20Ω/km) ower or TLC) (Shield bonded to the same nt)		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure	$C_{\text{LD}}, C_{\text{LI}}$ C_{W} C_{DJ}	bonding bar as Shielded buried bonding bar as 1.5	Equipme d line (po equipme cure: no o	nt $(5\Omega/\text{km} < RS \le 20\Omega/\text{km})$ ower or TLC) (Shield bonded to the same ant)		
Shielding, grounding, isolation Withstand voltage of internal system (kV)	C_{LD}, C_{LI} U_{W}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme cure: no o	nt (5Ω/km < RS ≤ 20Ω/km) ower or TLC) (Shield bonded to the same nt)		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length	C_{LD}, C_{LI} U_{W} C_{DJ} L_{L}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipmen rure: no o m	nt $(5\Omega/\text{km} < RS \le 20\Omega/\text{km})$ ower or TLC) (Shield bonded to the same ant)		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure	C_{Lb}, C_{LI} U_{w} C_{bJ} L_{L}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipmen rure: no o m	nt $(5\Omega/\text{km} < RS \le 20\Omega/\text{km})$ ower or TLC) (Shield bonded to the same ant)		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure	C_{LD}, C_{LI} U_{W} C_{DJ} L_{L} U_{E}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme rure: no o m m	ant $(5\Omega/\text{km} < RS \le 20\Omega/\text{km})$ ower or TLC) (Shield bonded to the same ant) other objects in the vicinity Use 1000m if unknown $A_{DI} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure	$C_{\text{Lb}}, C_{\text{LI}}$ U_{W} C_{DJ} L_{L} L W H	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the same of TLC (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq.A.2)$		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height	$C_{\rm Lb}, C_{\rm LI}$ $U_{\rm W}$ $C_{\rm bJ}$ $L_{\rm L}$ $L=$ $W=$ $H=$ $T=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the same of TLC (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq.A.2)$		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor	$C_{\text{LD}}, C_{\text{LI}}$ U_{W} C_{DJ} L_{L} L H T A_{DJ3} C_{r} C_{r}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme) rure: no o m m m m	ant $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ where or TLC) (Shield bonded to the same ont) with the objects in the vicinity of the objects in the objects in the objects in the vicinity of t		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor	$C_{\rm LD}, C_{\rm LI}$ $U_{\rm W}$ $C_{\rm DJ}$ $L_{\rm L}$ $W=$ $H=$ $T=$ $A_{\rm DJ3}=$ $C_{\rm T}=$ $C_{\rm T}=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the inverse of TLC) (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq.A.2)$ $A_{\text{DZ}} = 9 \times \pi \times T^2$ $(Eq.A.3)$ Table A.2 Table A.3		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor	$C_{\text{LD}}, C_{\text{LI}}$ U_{W} C_{DJ} L_{L} $L^{\text{=}}$ $W^{\text{=}}$ $H^{\text{=}}$ $C_{\text{T}}^{\text{=}}$ $C_{\text{T}}^{\text{=}}$ $C_{\text{E}}^{\text{=}}$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < RS \le 20\Omega/\text{km})$ In the row of TLC) (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{DI} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^{2}$ (Eq.A.2) $A_{D2} = 9 \times \pi \times T^{2}$ (Eq.A.3) Table A.2 Table A.3 Table A.4		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor	$C_{\rm LD}, C_{\rm LI}$ $U_{\rm W}$ $C_{\rm DJ}$ $L_{\rm L}$ $H=$ $T=$ $A_{\rm DJ3}=$ $C_{\rm T}=$ $C_{\rm T}=$ $C_{\rm E}=$ $C_{\rm LD}=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5 1	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the inverse of TLC) (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq.A.2)$ $A_{\text{D2}} = 9 \times \pi \times T^2 (Eq.A.3)$ Table A.2 Table A.3 Table A.4 Table B.4		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor Line environmental factor Shielding, grounding, isolation	$C_{\rm LD}, C_{\rm LT}$ $U_{\rm W}$ $C_{\rm DJ}$ $L_{\rm L}$ $H=$ $T=$ $A_{\rm DJ3}=$ $C_{\rm T}=$ $C_{\rm T}=$ $C_{\rm E}=$ $C_{\rm LD}=$ $C_{\rm LT}=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5 1 0.5	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the row of TLC) (Shield bonded to the same ont) In the row objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq. A.2)$ $A_{\text{D2}} = 9 \times \pi \times T^2 (Eq. A.3)$ Table A.2 Table A.3 Table A.4 Table B.4 Table B.4		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor Line environmental factor Shielding, grounding, isolation Structure location factor Factor for impulse withstand voltage of the system to	$C_{\rm LD}, C_{\rm LI}$ $U_{\rm W}$ $C_{\rm DJ}$ $L_{\rm L}$ $H=$ $T=$ $A_{\rm DJ3}=$ $C_{\rm T}=$ $C_{\rm T}=$ $C_{\rm E}=$ $C_{\rm LD}=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5 1	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the inverse of TLC) (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ $(Eq.A.2)$ $A_{\text{D2}} = 9 \times \pi \times T^2 (Eq.A.3)$ Table A.2 Table A.3 Table A.4 Table B.4		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor Shielding, grounding, isolation Structure location factor	$C_{\rm LD}, C_{\rm LI}$ $U_{\rm W}$ $C_{\rm DJ}$ $L_{\rm L}$ $W=$ $H=$ $T=$ $A_{\rm DJ3}=$ $C_{\rm T}=$ $C_{\rm C}=$ $C_{\rm LD}=$ $C_{\rm LD}=$ $C_{\rm DJ}=$	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5 1 0 1	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ In the or TLC) (Shield bonded to the same ont) In the objects in the vicinity Use 1000m if unknown $A_{\text{DI}} = (L \times W) + 6 \times H \times (L + W) + 9 \times \pi \times H^2$ (Eq. A.2) $A_{\text{D2}} = 9 \times \pi \times T^2 \text{ (Eq. A.3)}$ Table A.2 Table A.3 Table A.4 Table B.4 Table B.4 Table B.4 Table A.1		
Shielding, grounding, isolation Withstand voltage of internal system (kV) Location factor of adjacent structure Line Length Length of adjacent structure Width of adjacent structure Height of adjacent structure Chimney/Tower height Collection area by graphical method Line installation factor Line type factor Line environmental factor Shielding, grounding, isolation Structure location factor Factor for impulse withstand voltage of the system to be protected. Probability of failure of internal systems due to a flash	C_{LD}, C_{LI} U_{W} C_{DJ} L_{L} U_{H} U_{SJ} U_{SJ} U_{C}	bonding bar as Shielded buried bonding bar as 1.5 Isolated struct 1000 0.5 1 0.5 1 0.67	Equipme d line (po equipme) rure: no o m m m m	Int $(5\Omega/\text{km} < \text{RS} \le 20\Omega/\text{km})$ Integrated from the same of		

	Collection area for flashes to line	A,=	40000 m²	$A_{i} = 40 \times L_{i} (Eq. A.9)$		
	Collection area for flashes near line	Λ _L =	400000 m ²	$A_{\tau} = 4000 \times L_{L} (Eq.A.11)$		
	concernor area for plasmes hear line	1	1000000 111			
Number of c	langerous events for flashes to adjacent structure	N _{DJ} =	0.000000	$N_{\rm bJ} = N_{\rm G} \times A_{\rm bJ} \times C_{\rm DJ} \times C_{\rm T} \times 10^{-6} \ (Eq.A.5)$		
Number	r of dangerous events for flashes to line	N _L =	0.040000	$N_L = N_G \times A_L \times C_I \times C_E \times C_T \times 10^{-6} $ (Eq.A.8)		
Number o	f dangerous events for flashes near line	N _I =	4.000000	$N_{_{\rm I}} = N_{_{\rm G}} \times A_{_{\rm I}} \times C_{_{\rm I}} \times C_{_{\rm E}} \times C_{_{\rm T}} \times 10^{-6} \ (Eq.A.10)$		
ZONE 1: BUILD	DING GENERAL					
	Type of floor	$\mathbf{r}_{_{\dagger}}$	Marble, ceramic			
Prot	ection against shock (flash to structure)	P_{TA}	No protection measu	res		
	Protection against shock (flash to line)	P_{TU}	No protection measu	res		
	Risk of fire	\mathbf{r}_{f}	Ordinary			
	Fire protection	$\mathbf{r}_{_{\mathrm{p}}}$	One of the following provisions: fixed automatic ally operated extinguishing installations; automatic a alarm installations			
Power Line	Internal wiring	K_{s3}	Unshielded cable - routing precaution in order to avoid large loops (loop area of the order of 10m2)			
	Coordinated SPDs	P_{SPD}	II			
Telecom Line	Internal wiring	K_{s3}	Unshielded cable - routing precaution in order to avoid loops (loop area < 10m2)			
	Coordinated SPDs	P_{SPD}	II			
	Special hazard	h _z	Difficulty of evacuat hospitals)	ion (e.g. structures with immobile persons,		
L1: Loss of human life	D1: due to touch and step voltage	L_{\scriptscriptstyleT}	All types			
naman ny s	D2: due to physical damage	L_{\scriptscriptstyleF}	Hospital, hotel, school	ol, civic building		
	D3: due to failure of internal systems	L_o	Other parts of hospi	tal		
L2: Unacceptable loss of service	D2: due to physical damage, D3: due to failure of internal systems	L _{F2} ,L _{O2}	No loss of service			
L3: Loss of irreplaceable cultural heritage	D2: due to physical damage	L _{F3}	Others			
	D1: due to touch and step voltage	L_{T4}	All types where only	animals are present		
L4: Economic	D2: due to physical damage	$L_{\rm F4}$	Hospital, industrial, r	nuseum, agricultural		
loss	D3: due to failure of internal systems	L ₀₄	Hospital, industrial, c	office, hotel, commercial		
	Number of persons in the zone	$\mathbf{n}_{\mathbf{z}}$	470			
	Total number of persons in the structure	$\mathbf{n}_{_{\dagger}}$	500			
Time per year	for which the persons are present in the zone	† _Z	4380 hrs			
	Value of cultural heritage in the zone	C _z	0 \$			
Total value	of building and content of the structure (sum over all zones)	$\mathbf{c}_{\scriptscriptstyle{\dagger}}$	1 \$			
	Mesh width of internal spatial shield	w _{m1} =	10 m	Use 10 if not provided		
Reduction facto	r as a function of the type of surface of soil or floor	r,=	0.001	Table C.3		
•	at a flash to a structure will cause shock beings due to dangerous touch and step voltages	P _{TA} =	1	Table B.1		
	that a flash to an entering line will cause g beings due to dangerous touch voltages	P _{TU} =	1	Table B.6		
Reducti	on factor as a function of risk of fire or explosion of structure	r _f =	0.01	Table C.5		

Reduction fa	ctor as a function of provisions taken to reduce the consequences of fire	r _p =	0.2	Table C.4
	effectiveness of shields internal to the tructure at boundary LPZ X/Y (X>0, Y>1)	K ₅₂	1	$K_{S2} = 0.12 \times w_{m2} (Eq.B.6)$
	Internal wiring	K ₅₃	0.2	Table B.5
Power	Probability as a function of LPL for which SPDs are designed	P_{SPD}	0.02	Table B.3
	Factor for internal wiring	K_{s3}	0.01	Table B.5
Telecom	Probability as a function of LPL for which SPDs are designed	P_{SPD}	0.02	Table B.3
	Factor for increasing the relative amount of loss in presence of a special hazard	h _z	5	Table C.6
L1: Loss of human life	D1 - Injury to living beings by electric shock	L_{T1}	0.01	Table C.2
	D2 - Physical damage	$L_{\rm F1}$	0.1	Table C.2
	D3 - Failure of electrical and electronic systems	L_{o1}	0.001	Table C.2
L2:	D2 - Physical damage	$L_{\rm F2}$	0	Table C.8
Unacceptable loss of service	D3 - Failure of electrical and electronic systems	L _{o2}	0	Table C.8
L3: Loss of irreplaceable cultural heritage	D2 - Physical damage	L _{F3}	0	Table C.10
	D1 - Injury to living beings by electric shock	L_{T4}	0.01	Table C.12
L4: Economic loss	D2 - Physical damage	$L_{_{F^4}}$	0.5	Table C.12
1055	D3 - Failure of electrical and electronic systems	L ₀₄	0.01	Table C.12
	PROBABILITY OF DAMAGE			
D1	S1 - Lightning flash to a structure	P _A =	0.0500	$P_A = P_{TA} \times P_B $ (Eq.B.1)
Injury to living beings by	53 - Lightning flash to an incoming line	P _{U/P} =	0.0190	$P_{_{U}} = P_{_{TU}} \times P_{_{EB}} \times P_{_{LD}} \times C_{_{LD}}$ (Eq.B.8)
electric shock	53 - Lightning flash to an incoming line	P _{U/T} =	0.0200	$P_{_{\!U}} = P_{_{\!$
D2	S1 - Lightning flash to a structure	P _B =	0.0500	Table B.2
Physical	53 - Lightning flash to an incoming line	$P_{V/P}$ =	0.0190	$P_{V} = P_{EB} \times P_{LD} \times C_{LD} (Eq.B.9)$
Damage	53 - Lightning flash to an incoming line	$P_{V/T}=$	0.0200	$P_{V} = P_{EB} \times P_{LD} \times C_{LD} (Eq.B.9)$
	S1 - Lightning flash to a structure	$P_{C/P}$ =	0.0200	$P_c = P_{SPD} \times C_{LD}$ (Eq.B.2)
	S1 - Lightning flash to a structure	$P_{C/T}$ =	0.0200	$P_c = P_{SPD} \times C_{LD}$ (Eq.B.2)
	S1 - Lightning flash to a structure	P_c =	0.0396	$P_c = 1 - (1 - P_{C/P}) \times (1 - P_{C/T})$ (Eq.14)
D3	52 - Lightning flash near a structure	$P_{M/P}=$	0.0001	$P_{MS} = P_{SPD} \times (K_{S1} \times K_{S2} \times K_{S3} \times K_{S4})^2 (Eq.B.3)$
Failure of electrical and	52 - Lightning flash near a structure	$P_{M/T}=$	0.0000	$P_{MS} = P_{SPD} \times (K_{S1} \times K_{S2} \times K_{S3} \times K_{S4})^2 (Eq.B.3)$
electrical and	52 - Lightning flash near a structure	P _M =	0.0001	$P_{M} = 1 - (1 - P_{M/P}) \times (1 - P_{M/T}) (Eq.15)$
systems	53 - Lightning flash to an incoming line	$P_{W/P}=$	0.0190	$P_W = P_{SPD} \times P_{LD} \times C_{LD}$ (Eq.B.10)
	53 - Lightning flash to an incoming line	$P_{W/T}$ =	0.0200	$P_W = P_{SPD} \times P_{LD} \times C_{LD}$ (Eq.B.10)
	S4 - Lightning flash near a line	$P_{Z/P}=$	0.0000	$P_Z = P_{SPD} \times P_{LI} \times C_{LI}$ (Eq.B.11)
	54 - Lightning flash near a line	$P_{Z/T}$ =	0.0000	$P_Z = P_{SPD} \times P_{LI} \times C_{LI}$ (Eq.B.11)
	CONSEQUENT LOSS			
	Factor for persons in zone	$\mathbf{k}_{_{1}}$	0.47	$n_z / n_t \times t_z / 8760$
	D1 - Injury to living beings by electric shock	L_{A1}	4.700E-06	$r_{t} \times L_{\tau_{1}} \times k_{1}$ (Eq.C.1)
L1: Loss of human life	D1 - Injury to living beings by electric shock	L _{U1}	4.700E-06	$r_{\rm t} \times L_{\rm TI} \times k_{\rm I} \ (Eq.C.2)$
	D2 - Physical damage	L_{B1}, L_{V1}	4.700E-04	$r_p \times r_f \times h_z \times L_{F1} \times k_1$ (Eq.C.3)

	D3 - Failure of electrical and		4.700E-04	$L_{o1} \times k_1$ (Eq.C.4)
	electronic systems	W1,L _{Z1}	0.0005.00	V = V = (= (= (= (= (= (= (= (=
L2: Unacceptable	D2 - Physical damage	L _{B1} ,L _{V1}	0.000E+00	$r_p \times r_f \times L_{F2} \times n_Z / n_t $ (Eq.C.8)
loss of service	D3 - Failure of electrical and electronic systems	L _{C1} ,L _{M1} ,L W1,L ₇₁	0.000E+00	$L_{o2} \times n_z / n_t $ (Eq.C.8)
L3: Loss of		W17-21		
irreplaceable cultural heritage	D2 - Physical damage	L_{B2} , L_{V2}	0.000E+00	$r_p \times r_f \times L_{F3} \times c_Z / c_t$ (Eq.C.9)
	D1 - Injury to living beings by electric shock	$L_{_{A4}}$	1.000E-05	$r_{\rm t} \times L_{\rm T4} \times c_a / c_{\rm t}$ (Eq.C.10)
L4: Economic	D1 - Injury to living beings by electric shock	$L_{\scriptscriptstyleU4}$	1.000E-05	$r_{\rm t} \times L_{\rm T4} \times c_a / c_{\rm t} $ (Eq.C.12)
loss	D2 - Physical damage	$L_{\rm B4},L_{\rm V4}$	1.000E-03	$r_p \times r_f \times L_{F4} \times (c_a + c_b + c_c + c_s) / c_t$ (Eq.C.13)
	D3 - Failure of electrical and electronic systems	L _{C4} ,L _{M4} ,L _{W4} ,L _{Z4}	1.000E-02	$L_{O4} \times c_s / c_t$ (Eq.C.14)
	RISK OF LOSS OF HUMAN LIFE			
D1	S1 - Lightning flash to a structure	R _{A1} =	0.0021 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi} (Eq.5)$
Injury to living beings by	S3 - Lightning flash to an incoming line	R _{U1/P} =	0.0001 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X (Eq.5)$
electric shock	53 - Lightning flash to an incoming line	R _{U1/T} =	0.0004 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D2	S1 - Lightning flash to a structure	R _{B1} =	0.2084 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi} $ (Eq.5)
Physical	53 - Lightning flash to an incoming line	R _{V1/P} =	0.0054 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Damage	53 - Lightning flash to an incoming line	R _{V1/T} =	0.0376 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S1 - Lightning flash to a structure	R _{c1} =	0.1650 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
D3	52 - Lightning flash near a structure	R _{M1} =	0.0227 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Failure of electrical and	53 - Lightning flash to an incoming line	R _{W1/P} =	0.0054 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electronic	53 - Lightning flash to an incoming line	$R_{W1/T}$ =	0.0376 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
systems	54 - Lightning flash near a line	$R_{Z1/P}$ =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
	54 - Lightning flash near a line	$R_{Z1/T}$ =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
		R ₁ =	0.48 ×10 ⁻⁵	$R_1 = \Sigma R_{\chi_1}$
RISK OF U	NACCEPTABLE LOSS OF SERVICE TO THE PUBLIC			
	S1 - Lightning flash to a structure	R _{B2} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
D2 Physical	53 - Lightning flash to an incoming line	R _{V2/P} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
Damage	53 - Lightning flash to an incoming line	R _{V2/T} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
	S1 - Lightning flash to a structure	R_{c2} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
D3	S2 - Lightning flash near a structure	R _{M2} =	0.0000 ×10 ⁻⁵	$R_{x} = N_{x} \times P_{x} \times L_{x} (Eq.5)$ $R_{x} = N_{x} \times P_{x} \times L_{x} (Eq.5)$
Failure of	53 - Lightning flash to an incoming line	R _{w2/P} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
electrical and	53 - Lightning flash to an incoming line	***	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
electronic systems	54 - Lightning flash near a line	R _{Z2/P} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
,	S4 - Lightning flash near a line		0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
	2 - 2 gg ,	R ₂ =	0.00 ×10 ⁻⁵	$R_2 = \Sigma R_{\chi_2}$
LOSS OF T	DDEDI ACEADI E CHI TUDAL LICATTACE			
	RREPLACEABLE CULTURAL HERITAGE 51 - Lightning flash to a structure	R =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
D2 Physical	S1 - Lightning flash to a structure	R _{B3} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x (Eq.5)$ $R_x = N_x \times P_x \times L_x (Eq.5)$
Damage	53 - Lightning flash to an incoming line	R _{V3/P} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x$ (Eq.5)
•	S3 - Lightning flash to an incoming line	R _{v3/T} = R ₃ =	0.000 × 10 ⁻⁵	$R_{\chi} = N_{\chi} \wedge P_{\chi} \wedge L_{\chi} (Eq.9)$ $R_{3} = \Sigma R_{\gamma 3}$
		-3-	J.00 ×10 °	-3 X3
	ECONOMIC LOSS			
D1	S1 - Lightning flash to a structure	R _{A4} =	0.0044 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)

Injury to living beings by	S3 - Lightning flash to an incoming line	R _{U4/P} =	0.0001 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electric shock	S3 - Lightning flash to an incoming line	$R_{U4/T}=$	0.0008 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
D2	S1 - Lightning flash to a structure	R _{B4} =	0.4433 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
Physical	53 - Lightning flash to an incoming line	R _{V4/P} =	0.0114 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Damage	53 - Lightning flash to an incoming line	R _{V4/T} =	0.0800 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S1 - Lightning flash to a structure	R _{C4} =	3.5112 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D3	52 - Lightning flash near a structure	R _{M4} =	0.4828 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Failure of electrical and	53 - Lightning flash to an incoming line	$R_{W4/P}$ =	0.1140 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electronic	53 - Lightning flash to an incoming line	$R_{W4/T}$ =	0.8000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
systems	54 - Lightning flash near a line	$R_{Z4/P}=$	0.0000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
	S4 - Lightning flash near a line	$R_{Z4/T}$ =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
		R ₄ =	5.45 ×10 ⁻⁵	$R_1 = \Sigma R_{\chi_1}$

ZONE 2: HIGH DEPENDENCY AREAS

	DEPENDENCY AREAS				
	Type of floor	$\mathbf{r}_{_{\dagger}}$	Marble, ceramic		
Prot	ection against shock (flash to structure)	P_{TA}	No protection measures		
	Protection against shock (flash to line)	$P_{\tau \cup}$	No protection measures		
	Risk of fire	\mathbf{r}_{f}	Low		
	Fire protection	$\mathbf{r}_{_{\mathrm{p}}}$	One of the following provisions: fixed automatic ally operated extinguishing installations; automatic a alarm installations		
Power Line	Internal wiring	K ₅₃	Unshielded cable - routing precaution in order to avoid large loops (loop area of the order of 10m2)		
	Coordinated SPDs	P_{SPD}	п		
Telecom Line	Internal wiring	K_{s3}	Unshielded cable - routing precaution in order to avoid loops (loop area < 10m2)		
	Coordinated SPDs	P_{SPD}	II		
11.1	Special hazard	h _z	Difficulty of evacuation (e.g. structures with immobile persons hospitals)		
L1: Loss of human life	D1: due to touch and step voltage	L_{\scriptscriptstyleT}	All types		
	D2: due to physical damage	L_{F}	Hospital, hotel, school, civic building		
	D3: due to failure of internal systems	L_{o}	Intensive care unit and operation block of hospital		
L2: Unacceptable loss of service	D2: due to physical damage, D3: due to failure of internal systems	L _{F2} ,L _{O2}	No loss of service		
L3: Loss of irreplaceable cultural heritage	D2: due to physical damage	L _{F3}	Others		
	D1: due to touch and step voltage	L_{T4}	All types where only animals are present		
L4: Economic	D2: due to physical damage	L_{F4}	Hospital, industrial, museum, agricultural		
loss	D3: due to failure of internal systems	L_{o4}	Hospital, industrial, office, hotel, commercial		
	Number of persons in the zone	n _z	30		
٦	Total number of persons in the structure	$\mathbf{n}_{\scriptscriptstyle{\dagger}}$	500		
Time per year	for which the persons are present in the zone	† _z	6132 hrs		
	Value of cultural heritage in the zone	c_z	O \$		
Total value	of building and content of the structure (sum over all zones)	c,	1 \$		
	Mesh width of internal spatial shield	\mathbf{w}_{m1} =	10 m Use 10 if not provided		
Reduction facto	r as a function of the type of surface of soil or floor	r _t =	0.001 Table C.3		

•	at a flash to a structure will cause shock beings due to dangerous touch and step voltages	P _{TA} =	1	Table B.1
	that a flash to an entering line will cause beings due to dangerous touch voltages	P _{TU} =	1	Table B.6
Reductio	on factor as a function of risk of fire or explosion of structure	r _f =	0.001	Table C.5
Reduction fa	ctor as a function of provisions taken to reduce the consequences of fire	r _p =	0.2	Table C.4
_	effectiveness of shields internal to the tructure at boundary LPZ X/Y (X>0, Y>1)	K ₅₂	1	$K_{S2} = 0.12 \times w_{m2} (Eq.B.6)$
	Internal wiring	K_{s3}	0.2	Table B.5
Power	Probability as a function of LPL for which SPDs are designed	P_{SPD}	0.02	Table B.3
	Factor for internal wiring	K_{s3}	0.01	Table B.5
Telecom	Probability as a function of LPL for which SPDs are designed	P_{SPD}	0.02	Table B.3
	Factor for increasing the relative amount of loss in presence of a special hazard	h _z	5	Table C.6
L1: Loss of human life	D1 - Injury to living beings by electric shock	L_{τ_1}	0.01	Table C.2
	D2 - Physical damage	$L_{\scriptscriptstyle{F1}}$	0.1	Table C.2
	D3 - Failure of electrical and electronic systems	L_{o1}	0.01	Table C.2
L2:	D2 - Physical damage	L_{F2}	0	Table C.8
Unacceptable loss of service	D3 - Failure of electrical and electronic systems	L _{o2}	0	Table C.8
L3: Loss of irreplaceable cultural heritage	D2 - Physical damage	L_{F3}	0	Table C.10
	D1 - Injury to living beings by electric shock	$L_{\scriptscriptstyle T4}$	0.01	Table C.12
L4: Economic loss	D2 - Physical damage	$L_{\scriptscriptstyle{F4}}$	0.5	Table C.12
1033	D3 - Failure of electrical and electronic systems	L ₀₄	0.01	Table C.12
	PROBABILITY OF DAMAGE			
D1	51 - Lightning flash to a structure	P _A =	0.0500	$P_A = P_{TA} \times P_B (Eq.B.1)$
Injury to living beings by	53 - Lightning flash to an incoming line	P _{U/P} =	0.0190	$P_U = P_{TU} \times P_{EB} \times P_{LD} \times C_{LD}$ (Eq.B.8)
electric shock	53 - Lightning flash to an incoming line	P _{U/T} =	0.0200	$P_{_U} = P_{_{TU}} \times P_{_{EB}} \times P_{_{LD}} \times C_{_{LD}}$ (Eq.B.8)
D2	S1 - Lightning flash to a structure	P _B =	0.0500	Table B.2
Physical	S3 - Lightning flash to an incoming line	$P_{V/P}$ =	0.0190	$P_{_{V}} = P_{_{EB}} \times P_{_{LD}} \times C_{_{LD}} (Eq.B.9)$
Damage	S3 - Lightning flash to an incoming line	P _{v/T} =	0.0200	$P_{V} = P_{EB} \times P_{LD} \times C_{LD} $ (Eq.B.9)
	S1 - Lightning flash to a structure	$P_{C/P}$ =	0.0200	$P_c = P_{SPD} \times C_{LD}$ (Eq.B.2)
	51 - Lightning flash to a structure	$P_{C/T}$ =	0.0200	$P_c = P_{SPD} \times C_{LD}$ (Eq.B.2)
	51 - Lightning flash to a structure	P_c =	0.0396	$P_c = 1 - (1 - P_{c/P}) \times (1 - P_{c/T})$ (Eq.14)
D3	S2 - Lightning flash near a structure	P _{M/P} =	0.0001	$P_{MS} = P_{SPD} \times (K_{S1} \times K_{S2} \times K_{S3} \times K_{S4})^2$ (Eq.B.3)
Failure of	S2 - Lightning flash near a structure	$P_{M/T}=$	0.0000	$P_{MS} = P_{SPD} \times (K_{S1} \times K_{S2} \times K_{S3} \times K_{S4})^2$ (Eq.B.3)
electrical and electronic	52 - Lightning flash near a structure	P _M =	0.0001	$P_{M} = 1 - (1 - P_{M/P}) \times (1 - P_{M/T}) $ (Eq.15)
systems	53 - Lightning flash to an incoming line	$P_{W/P}$ =	0.0190	$P_{W} = P_{SPD} \times P_{LD} \times C_{LD}$ (Eq.B.10)
	53 - Lightning flash to an incoming line	$P_{W/T}$ =	0.0200	$P_W = P_{SPD} \times P_{LD} \times C_{LD}$ (Eq.B.10)
	54 - Lightning flash near a line	$P_{Z/P}$ =	0.0000	$P_Z = P_{SPD} \times P_{LI} \times C_{LI}$ (Eq.B.11)
	54 - Lightning flash near a line	P _{Z/T} =	0.0000	$P_Z = P_{SPD} \times P_{LI} \times C_{LI}$ (Eq.B.11)

	CONSEQUENT LOSS			
	Factor for persons in zone	$\mathbf{k}_{\scriptscriptstyle 1}$	0.04	$n_z / n_t \times t_z / 8760$
	D1 - Injury to living beings by electric shock	L _{A1}	4.200E-07	$r_{\rm t} \times L_{\rm TI} \times k_{\rm I}$ (Eq.C.1)
L1: Loss of	D1 - Injury to living beings by electric shock	$L_{_{\mathrm{U1}}}$	4.200E-07	$r_{\rm t} \times L_{\rm TI} \times k_{\rm I} \ (Eq.C.2)$
human life	D2 - Physical damage	$L_{\rm B1},L_{\rm V1}$	4.200E-06	$r_p \times r_f \times h_z \times L_{F1} \times k_1$ (Eq.C.3)
	D3 - Failure of electrical and electronic systems	L_{C1} , L_{M1} , L_{W1} , L_{Z1}	4.200E-04	$L_{O1} \times k_1$ (Eq.C.4)
L2:	D2 - Physical damage	L_{B1} , L_{V1}	0.000E+00	$r_p \times r_f \times L_{F2} \times n_Z / n_t$ (Eq.C.8)
Unacceptable loss of service	D3 - Failure of electrical and electronic systems	L_{c_1} , L_{M_1} , L_{W_1} , L_{Z_1}	0.000E+00	$L_{O2} \times n_z / n_t $ (Eq.C.8)
L3: Loss of irreplaceable cultural heritage	D2 - Physical damage	L_{B2} , L_{V2}	0.000E+00	$r_p \times r_f \times L_{F3} \times c_Z / c_t$ (Eq.C.9)
	D1 - Injury to living beings by electric shock	L _{A4}	1.000E-05	$r_{\rm t} \times L_{\rm T4} \times c_a / c_{\rm t}$ (Eq.C.10)
L4: Economic	D1 - Injury to living beings by electric shock	$L_{_{\mathrm{U4}}}$	1.000E-05	$r_{\rm t} \times L_{\rm T4} \times c_a / c_{\rm t}$ (Eq.C.12)
loss	D2 - Physical damage	L_{B4},L_{V4}	1.000E-04	$r_{p} \times r_{f} \times L_{F4} \times (c_{a} + c_{b} + c_{c} + c_{s}) / c_{t}$ (Eq.C.13)
	D3 - Failure of electrical and electronic systems	L_{C4} , L_{M4} , L_{W4}	1.000E-02	$L_{O4} \times c_s / c_t$ (Eq.C.14)
	RISK OF LOSS OF HUMAN LIFE			
D1	S1 - Lightning flash to a structure	R _{A1} =	0.0002 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Injury to living beings by	53 - Lightning flash to an incoming line	R _{U1/P} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electric shock	53 - Lightning flash to an incoming line	R _{U1/T} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D2	S1 - Lightning flash to a structure	R _{B1} =	0.0019 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Physical	53 - Lightning flash to an incoming line	R _{V1/P} =	0.0000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
Damage	53 - Lightning flash to an incoming line	R _{V1/T} =	0.0003 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S1 - Lightning flash to a structure	R _{c1} =	0.1475 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D3	52 - Lightning flash near a structure	R _{M1} =	0.0203 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Failure of electrical and	53 - Lightning flash to an incoming line	R _{W1/P} =	0.0048 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electronic	53 - Lightning flash to an incoming line	$R_{W1/T}$ =	0.0336 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
systems	54 - Lightning flash near a line	$R_{Z1/P}$ =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S4 - Lightning flash near a line	$R_{Z_{1/T}}=$	0.0000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
		R ₁ =	0.21 ×10 ⁻⁵	$R_1 = \Sigma R_{\chi_1}$
RISK OF UI	NACCEPTABLE LOSS OF SERVICE TO THE PUBLIC			
D2	S1 - Lightning flash to a structure	R _{B2} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Physical	53 - Lightning flash to an incoming line	R _{V2/P} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Damage	S3 - Lightning flash to an incoming line	R _{v2/T} =	0.0000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
	S1 - Lightning flash to a structure	R _{c2} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D3	S2 - Lightning flash near a structure	R _{M2} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Failure of	S3 - Lightning flash to an incoming line	R _{w2/P} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electrical and electronic	S3 - Lightning flash to an incoming line	R _{w2/T} =	0.0000 ×10 ⁻⁵	$R_{\chi} = N_{\chi} \times P_{\chi} \times L_{\chi}$ (Eq.5)
systems	S4 - Lightning flash near a line	R _{Z2/P} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S4 - Lightning flash near a line	R _{Z2/T} =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
		R ₂ =	0.00 ×10 ⁻⁵	$R_2 = \Sigma R_{\chi_2}$

D2 Physical Damage	S1 - Lightning flash to a structure S3 - Lightning flash to an incoming line	R _{B3} = R _{V3/P} =	0.0000 ×10 ⁻⁵ 0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x (Eq.5)$ $R_x = N_x \times P_x \times L_x (Eq.5)$
Damago	53 - Lightning flash to an incoming line	R _{V3/T} =	0.0000 ×10 ⁻⁵	$R_x = N_x \times P_x \times L_x $ (Eq.5)
		R ₃ =	0.00 ×10 ⁻⁵	$R_3 = \Sigma R_{\chi_3}$
	ECONOMIC LOSS			
D1	51 - Lightning flash to a structure	R ₄₄ =	0.0044 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Injury to living beings by	53 - Lightning flash to an incoming line	$R_{U4/P}=$	0.0001 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electric shock	53 - Lightning flash to an incoming line	R _{U4/T} =	0.0008 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D2	51 - Lightning flash to a structure	R _{B4} =	0.0443 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Physical	53 - Lightning flash to an incoming line	R _{V4/P} =	0.0011 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Damage	53 - Lightning flash to an incoming line	$R_{V4/T}$ =	0.0080 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	51 - Lightning flash to a structure	R _{C4} =	3.5112 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
D3	S2 - Lightning flash near a structure	R _{M4} =	0.4828 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
Failure of electrical and	53 - Lightning flash to an incoming line	$R_{W4/P}$ =	0.1140 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
electronic	53 - Lightning flash to an incoming line	$R_{W4/T}$ =	0.8000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
systems	S4 - Lightning flash near a line	$R_{Z4/P}$ =	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
	S4 - Lightning flash near a line	$R_{Z4/T}=$	0.0000 ×10 ⁻⁵	$R_X = N_X \times P_X \times L_X$ (Eq.5)
		R ₄ =	4.97 ×10 ⁻⁵	$R_1 = \Sigma R_{\chi_1}$

RISK ASSESMENT SUMMARY

1. RISK OF LOSS OF HUMAN LIF	Ε
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ZONE 1: Building general R_i = 0.48 ×10⁻⁵ ZONE 2: High Dependancy Units R_i = 0.21 ×10⁻⁵

 $\Sigma R_1 = 0.69 \times 10^{-5}$ TOLERABLE

Tolerable risk R_{TI} = 1E-05

2. RISK OF UNACCEPTABLE LOSS OF SERVICE TO THE PUBLIC

ZONE 1: Building general 0.00 $\times 10^{-5}$ ZONE 2: High Dependancy Units R_i = 0.00 $\times 10^{-5}$

 $\Sigma R_2 = 0.00 \times 10^{-5}$ TOLERABLE

Tolerable risk R_{T2} = 1E-03

3. LOSS OF IRREPLACEABLE CULTURAL HERITAGE

ZONE 1: Building general 0.00 $\times 10^{-5}$ ZONE 2: High Dependancy Units R_1 = 0.00 $\times 10^{-5}$

 $\Sigma R_3 = 0.00 \times 10^{-5}$ TOLERABLE

Tolerable risk R_{T3} = 1E-04

3. ECONOMIC LOSS

ZONE 1: Building general 5.45 $\times 10^{-5}$ ZONE 2: High Dependancy Units R_4 = 4.97 $\times 10^{-5}$

 ΣR_4 = 10.41 ×10-5 TOLERABLE

Tolerable risk R_{T4} = 1E-03

Notes:

Following provisions required to keep risk level within permissible limits.

- 1. LPS Level II.
- 2. Coordinated SPD system Level II.
- 3. Automated fire protection and alarm system.
- 4. Equipotential bonding for external services (Electrical cable armour, Telecome cable armour/shield, Medical gas line and LPG lines).