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IEC / EN / BS EN 62305:2011

Protection against lightning

CPD

BS EN 62305 : Parts 1 - 4

Published September 2006

Amended : 2011

Very ‘wordy’ yet comprehensive document

BS EN 62305:2011 is the amendment of its 2006 version, which was first ever CENELEC lightning protection standard to be compiled by experts from all over the world. BS is the EN complaint version of 62305.

Very ‘wordy’ yet comprehensive document.

Following presentation is based on the interpretation of BS EN 62305:2011

Common misnomers

- Lightning strikes only tall structures
- Small structures do not require protection against lightning

Now lets review BS EN 62305 in a little more detail:

Peak currents are developed in a lightning strike

But, event is over in millionths of a second (typically 30 - 50ms)

BS EN 62305 - 4 Parts

BSEN 62305-1: General principles

BSEN 62305-2: Risk management



BSEN 62305-3: Physical damage and life hazard

BSEN 62305-4: Electrical & electronic systems within the structures

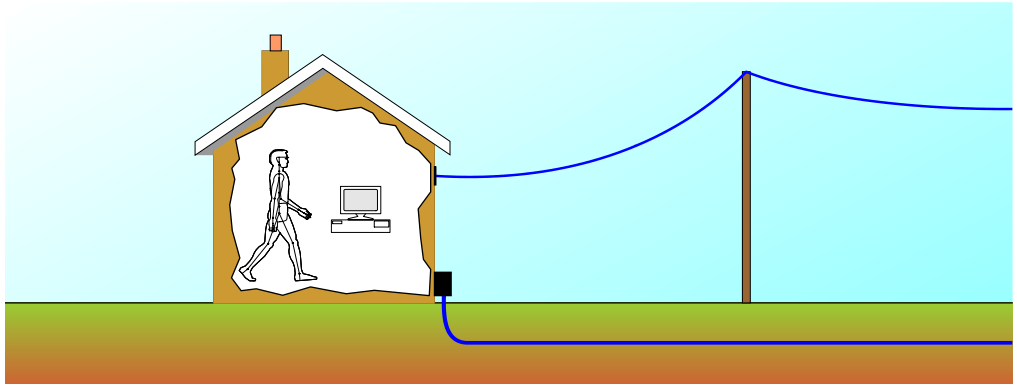
BS EN 62305 - 1

- General principles of lightning protection
- Leads-in/introduction to other parts
- Explains storyline how to design an LPS in accordance with accompanying part of this standard

Scope - BS EN 62305 - 1

Provides general principles for protection against lightning of:

- structures, their installations, contents and persons
- services connected to a structure



BS EN 62305-1

Lightning Protection Level (LPL)

Number related to a set of lightning current parameters, which allows relevant protection measures to be applied including the size of the rolling sphere

LPL	Maximum (kA)	Minimum (kA)
I	200	3
II	150	5
III	100	10
IV	100	16

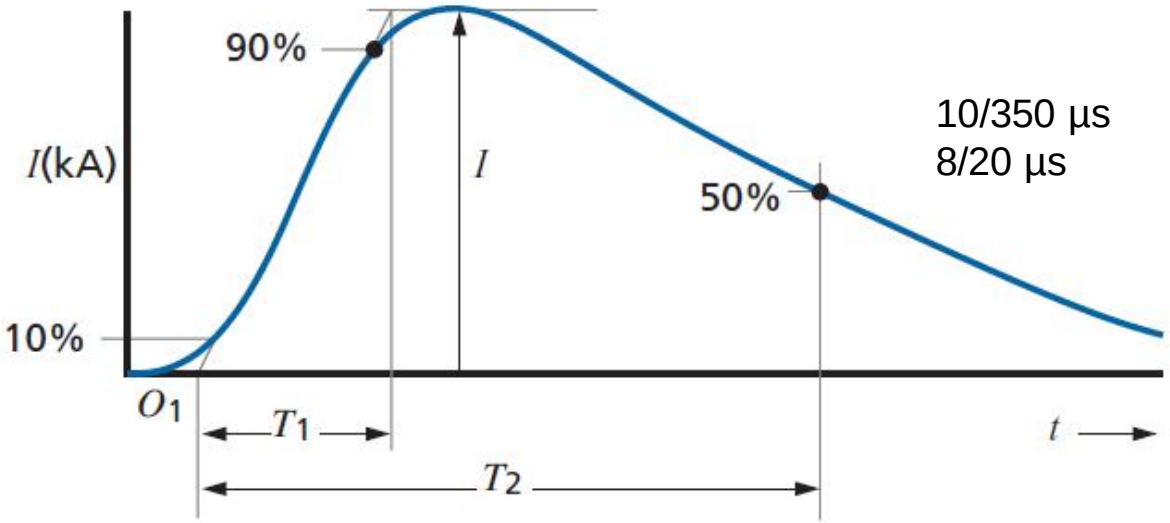
Minimum lightning current parameters

The minimum values of lightning current have been used to derive the rolling sphere radius for each LPL.

The relationship between the minimum peak current and the striking distance (or in other words the rolling sphere radius and is expressed as:

$$r = 10 \; x \; I^{0.65}$$

Short stroke parameters - waveform



10/350 µs
8/20 µs

O_1 = virtual origin
I = peak current
T_1 = front time (10µs)
T_2 = time to half value (350µs)

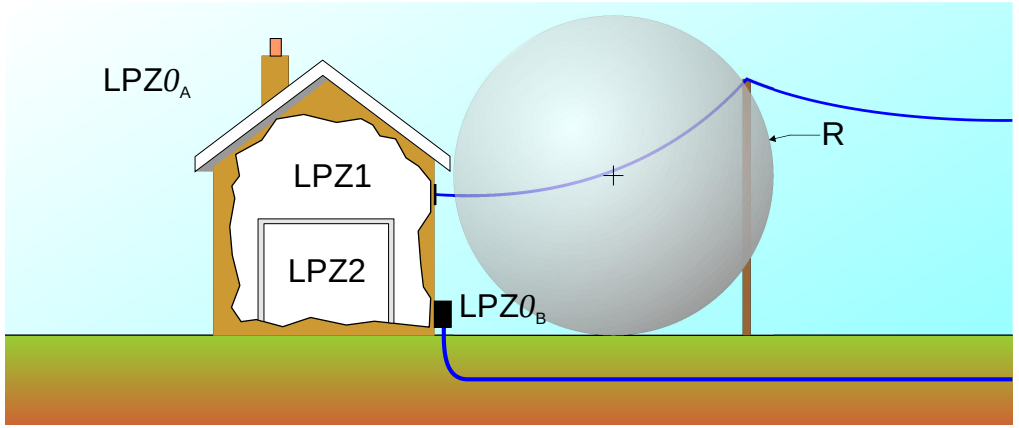
Lightning Protection Zone (LPZ)

Zone (area) where lightning electromagnetic environment is defined

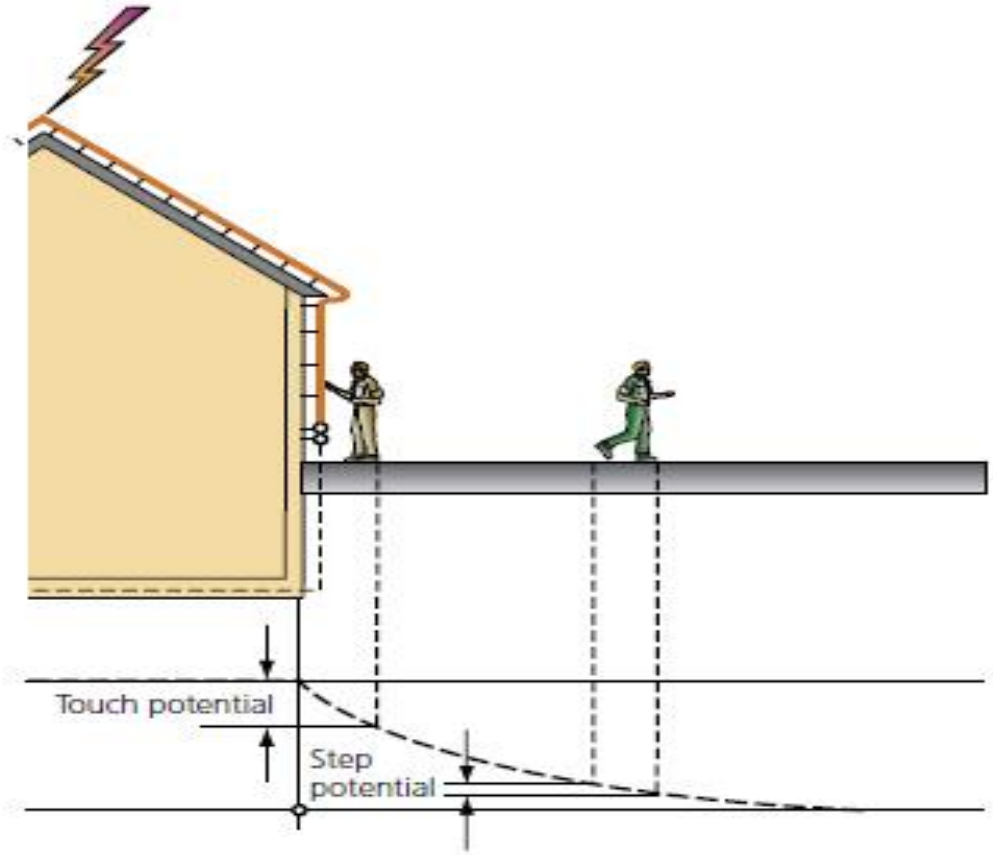
0_A Full current, full magnetic field, 0_B Partial/induced current full magnetic field

1 Limited induced current damped magnetic field

2 Limited induced current, further damped magnetic field



Step and touch potential gradients



BS EN 62305-2

Risk Management

In order to evaluate whether lightning protection is required, a risk assessment needs to be carried out in accordance to the BS EN 62305-2

BS EN 62305 - Part 2

Complex document

New approach to risk assessment

Looks at risk in far broader sense than physical damage to a structure

Following primary risks (R_n) relate to corresponding types of loss (L)

R_1 – risk of loss of human life

R_2 – risk of loss of services to the public

R_3 – risk of loss of cultural heritage

R_4 – risk of loss of economic value

Critical weighting factors

1. What is the use of the structure?
2. What is the construction type of the structure i.e. brick, re-inforced concrete etc.?
3. Dimensions of structure (L x W x H in meters)
4. No. of service lines feeding the structure
   - Power, single / three phase, overhead / underground
   - Telecom, how many lines, overhead / underground
   - Metallic water pipe
   - Metallic gas pipe
   - Metallic sewerage pipe
   - Metallic data lines
   - Any other metallic service entering the structure
5. Location ( )
6. Environment (urban, suburban, rural) ( )
7. How many transformers are feeding the structure?
8. Are the transformers remote or inside the electrical room in the structure itself?
9. Length of service lines (from LV side of the transformer to the main LT / panel board) ( )
10. Special hazards (low, average, high level of panic) ( )
11. How many people are occupying the structure and for many hours in a year?
12. Type of finished surface inside the structure (concrete, asphalt, wood, carpet, ceramic, marble etc) (&)
13. Any Fire protection provisions? (manual, automatic extinguishing system) ( )
14. Risk of fire (high, ordinary, low) ( )
15. Soil resistivity ( )
16. pH value of soil
17. What is building façade / cladding?
18. Flash density ( )
19. Name and address of the project

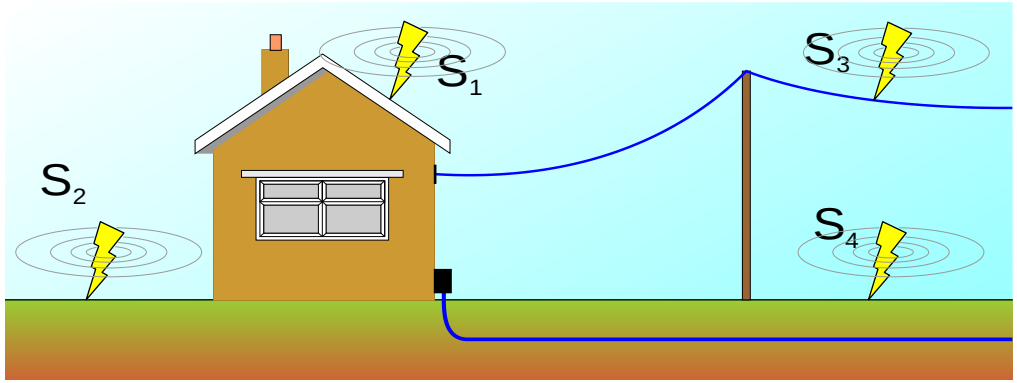
Sources of damage to a structure

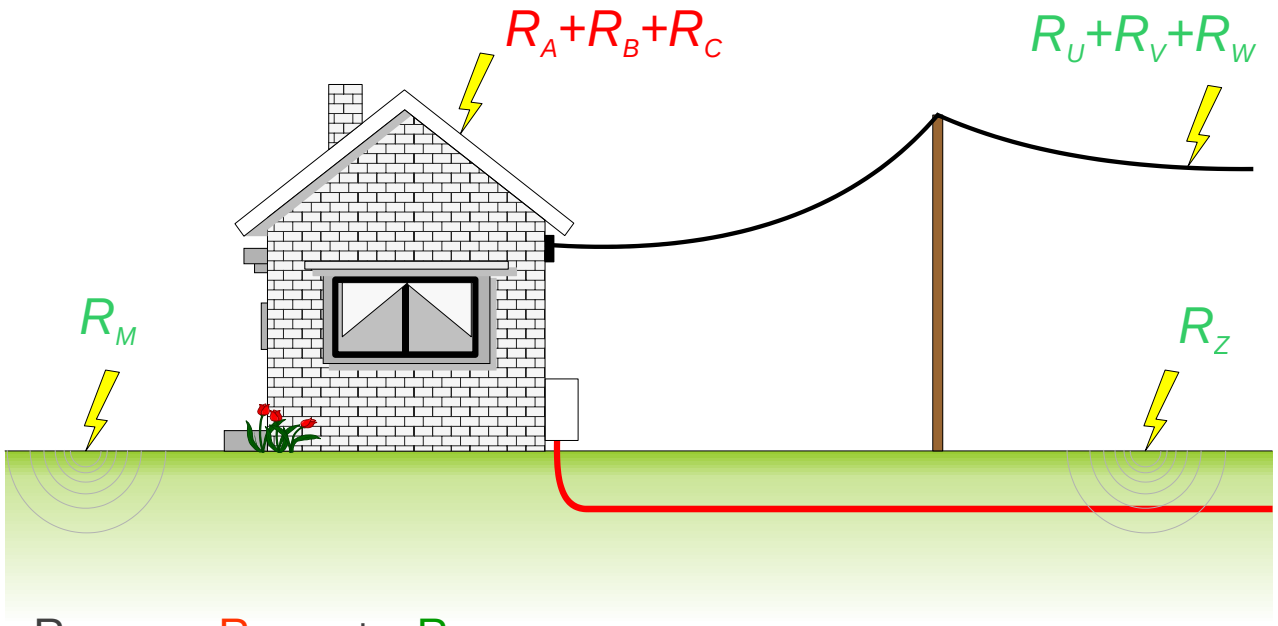
S1 – Flashes to a structure

S2 – Flashes near a structure

S3 – Flashes to services connected to a structure

S4 – Flashes near services connected to a structure





$$R_1 = R_D + R_i$$

$$= (R_A + R_B + R_C) +$$

$$(R_M + R_U + R_V + R_W + R_Z)$$

Definition of numerous risk components

R_X	Source of Damage	Type of Damage
R_A	Flashes to the structure (S1)	Injury to living beings (D1)
R_B	Flashes to the structure (S1)	Physical damage caused by dangerous sparking inside the structure (D2)
R_C	Flashes to the structure (S1)	Failure of internal systems caused by Lightning Electro Magnetic Pulse - LEMP (D3)
R_M	Flashes near the structure (S2)	Failure of internal systems caused by LEMP (D3)
R_U	Flashes to a service connected to the structure (S3)	Injury to living beings (D1)
R_V	Flashes to a service connected to structure (S3)	Physical damage caused by dangerous sparking inside the structure (D2)
R_W	Flashes to a service connected to structure (S3)	Failure of internal systems caused by LEMP (D3)
R_Z	Flashes near a service connected to structure (S4)	Failure of internal systems caused by LEMP (D3)

Each primary risk consists of numerous risk components

$R_1 = R_A + R_B + R_C^{(1)} + R_M^{(1)} + R_U + R_V + R_W^{(1)} + R_Z^{(1)}$

$R_2 = R_B + R_C + R_M + R_V + R_W + R_Z$

$R_3 = R_B + R_V$

$R_4 = R_A^{(2)} + R_B + R_C + R_M + R_U + R_V + R_W + R_Z$

(1) Structures – risk of explosion or hospitals – life saving equipment

(2) Properties where animals may be lost

Generic equation for evaluating each risk component is:

$R_X = N_X . P_X . L_X$

where

N_X = annual number of dangerous events

P_X = probability of damage

L_X = consequential loss (social values)

For example R_B component related to physical damage caused by dangerous sparking inside structure triggering fire or explosion

$R_B = N_D \cdot P_B \cdot L_B$

$R_B = (N_g A_{d/b} C_{d/b} \cdot 10^{-6})\ (P_B)\ (h_z . r_p . r_f . L_f)$

Where, $A_{d/b}$ (collection area) = $LW + 6H\ (L+W) + 9\pi(H)^2$

$C_{d/b}$ is the Location factor, derived from the table

P_B is the probability of damage to the structure, derived from the table, depending upon the level of protection

h_z is the factor increasing the loss due to physical damage, when a special hazard is present, derived from the table

r_p is the factor reducing the loss due to physical damage depending on the provision taken to reduce the consequences of fire, derived from the table

r_f is the factor reducing the loss due to physical damage depending on the risk of fire, derived from the table

L_f is loss due to physical damage

L_f (loss due to physical damage)

n_p is the possible number of victims in case of S1

n_t is the number of people occupying the structure

t_p is the expected time spent by people in the structure

$$L_f = \frac{n_p}{n_t} x \frac{t_p}{8760}$$

$$L_f = \frac{200}{200} x \frac{3650}{8760} \qquad L_f = 0.42$$

Equivalent risk component to R_B applicable to services is R_V, component related to physical damage (fire or explosion) triggered by dangerous sparking generally at entrance point of line into structure due to lightning current transmitted along incoming service

$R_V = N_V \cdot P_V \cdot L_V$

and $R_V = (N_L + N_{Da})(P_V)(h_z.r_p.r_f.L_f)$

where $N_L = N_g \cdot A_l \cdot C_d \cdot C_t \cdot 10^{-6}$

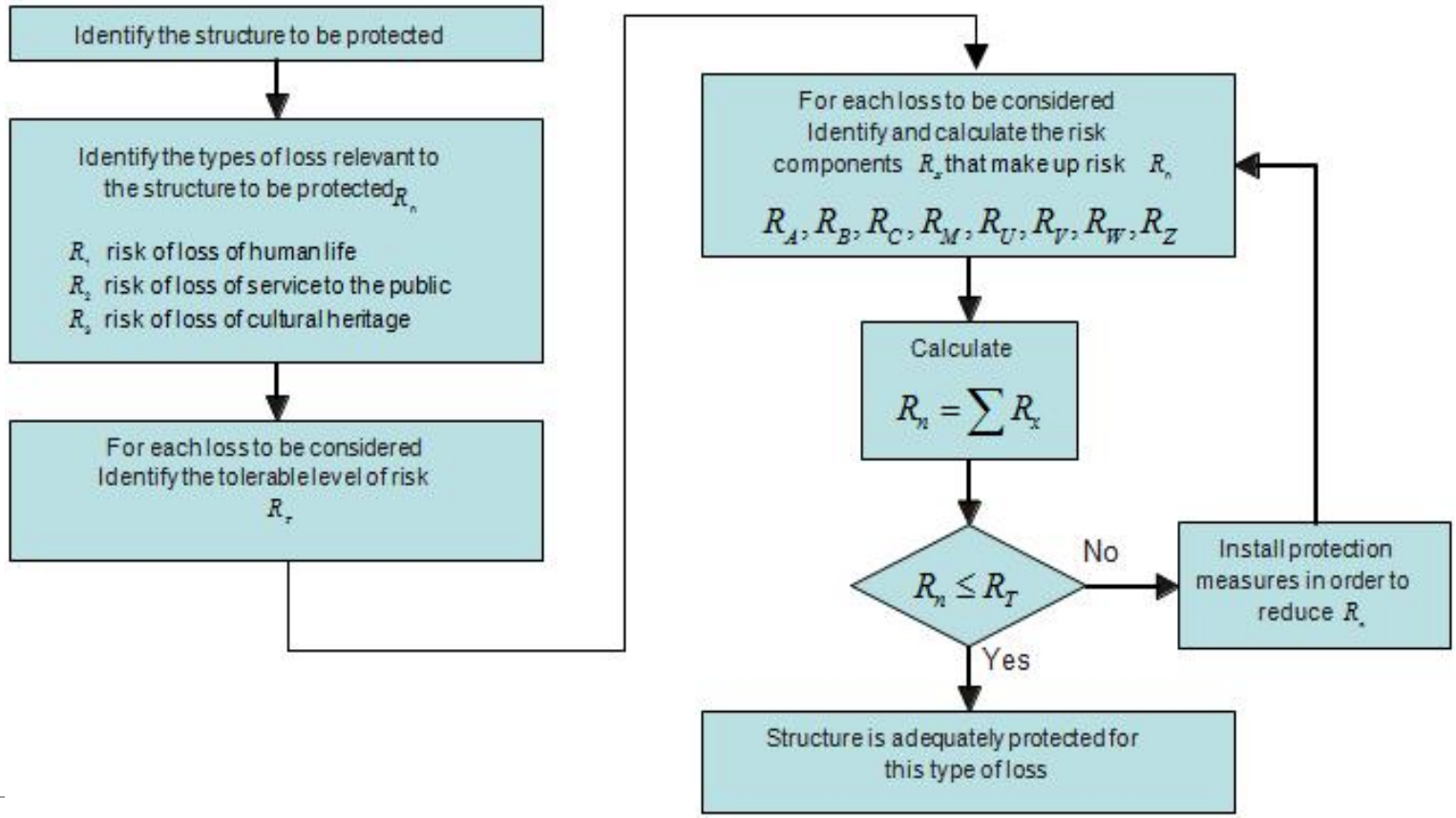
and $N_{Da} = N_g \cdot A_{d/a} \cdot C_{d/a} \cdot C_t \cdot 10^{-6}$

and $A_l = L_c - 3(H_a + H_b)6H_c$ – Aerial (overhead) cable

or $A_l = \sqrt{r\ [L_c - 3(H_a + H_b)]}$ – Buried cable

This exercise is repeated for all other all risk components

Risk procedure - summary



Risk management calculations

Use the written IEC standard for a detailed treatment of risk
or use the BSEN calculator

SIRAC limitations

Annex J
(informative)

Simplified software for risk assessment for structures

J.1 Fundamentals

The Simplified IEC Risk Assessment Calculator (SIRAC) is a software tool based on calculations and methods given in IEC 62305-2 and assists in the calculation of the risk components of simple structures. It is intended to support the application of IEC 62305-2 as the risk management method for lightning protection purposes. It is important to note that this tool is a simplified implementation of the more rigorous treatment of risk management described elsewhere in this standard. The calculator is designed to be relatively intuitive for users wishing to obtain an initial assessment of risk sensitivity.

The purpose and limitations of SIRAC are as follows:

- To enable more general users of the standard IEC 62305-2 to conduct calculations on typical structures without requiring them to possess in-depth knowledge of details and methodologies covered in the body of the standard.
- To promote the application of IEC 62305-2 and adoption of its risk assessment method by a wider readership and range of users. It is believed that such a user-friendly tool will also serve to increase the acceptance of the standard in the wider lightning protection community.
- To provide a tool specifically tailored to the calculation of risk in typical, non-complicated, structures and more general situations. To achieve this aim, certain parameters are defaulted to fixed values and the user required only to make selections from a more limited subset.
- The software does not implement the full functionality of this standard; such an implementation would have added unintended complexity to the tool. Users are encouraged to use the written standard for a more detailed treatment of risk when assessing complicated structures or special circumstances.
- it is applicable only for the calculation of single-zone structures.
- SIRAC should be viewed as a companion tool to IEC 62305-2 and will be supported through an on-line update function to an IEC FTP server where downloads will be available as the tool is updated.

J.2 Description of parameters

Parameters important to the calculation of the risk components in the software tool are divided into three categories:

- parameters, which the user is required to select in accordance with definitions and possibilities provided in the standard (see Table J.1);
- parameters, where the user's choice is limited to a subset of those provided in the standard (see Table J.2);
- parameters, which are fixed in code and which the user cannot alter (see Table J.3).

…..risk assessment of simple structure

…..only an initial assessment of risk sensitivity

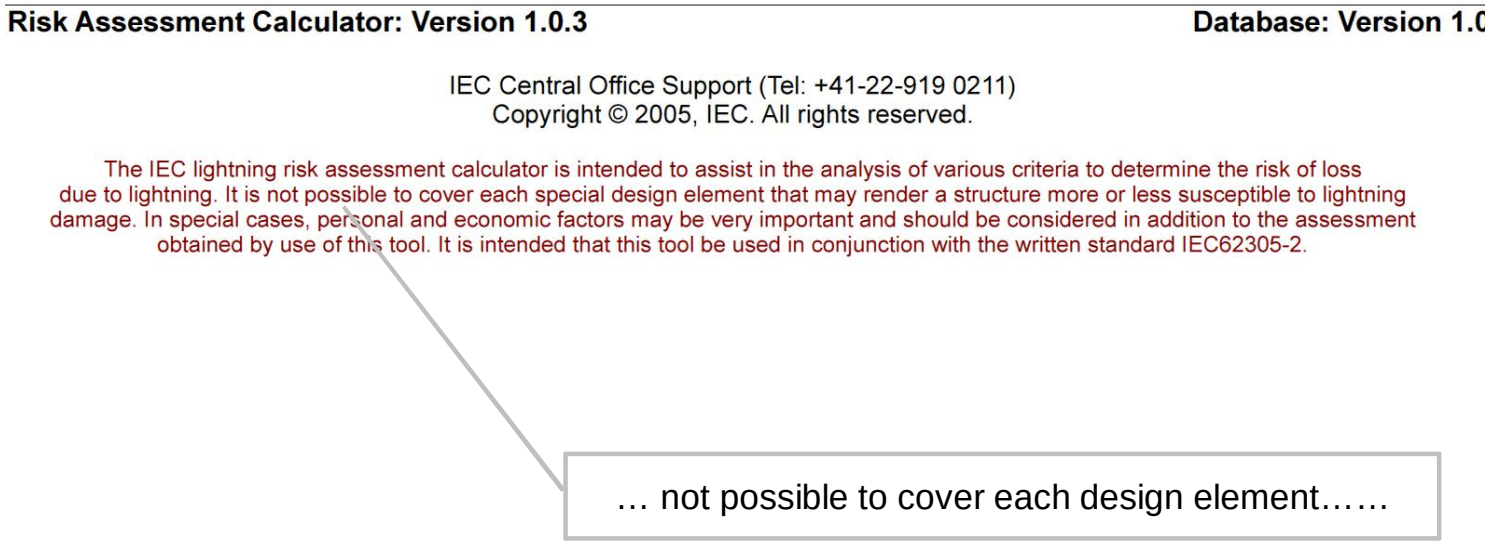
…..non–complicated structures and general situations.

…..does not implement the full functionality of this standard

….encourage to use the written standard for a detailed treatment of risk

SIRAC should be viewed as a companion tool to IEC 62305-2 and will be supported through an on-line update function to an IEC FTP server where downloads will be available as the tool is updated.

SIRAC limitations



Risk Assessment Calculator: Version 1.0.3 **Database: Version 1.0**

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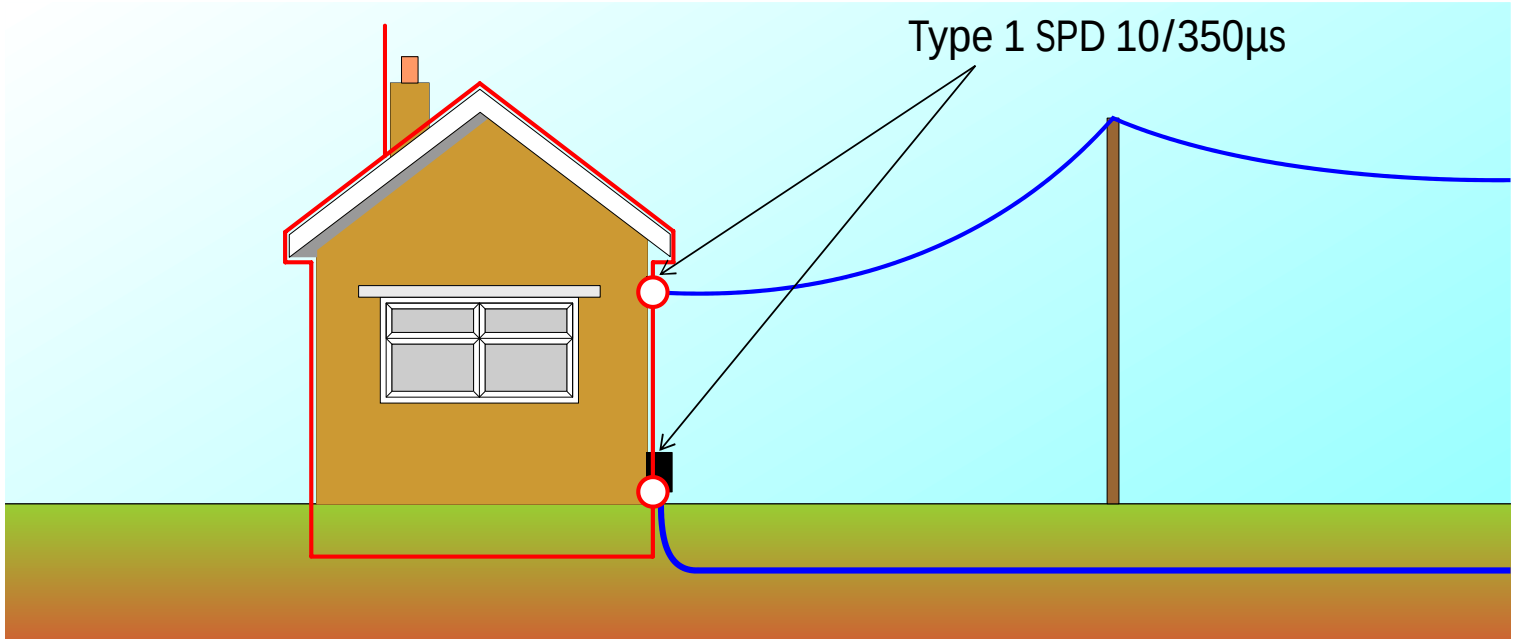
The IEC lightning risk assessment calculator is intended to assist in the analysis of various criteria to determine the risk of loss due to lightning. It is not possible to cover each special design element that may render a structure more or less susceptible to lightning damage. In special cases, personal and economic factors may be very important and should be considered in addition to the assessment obtained by use of this tool. It is intended that this tool be used in conjunction with the written standard IEC62305-2.

… not possible to cover each design element……

Excerpt from the footer of the SIRAC report from IEC

BS EN 62305-3

Physical damage to structures and life hazard



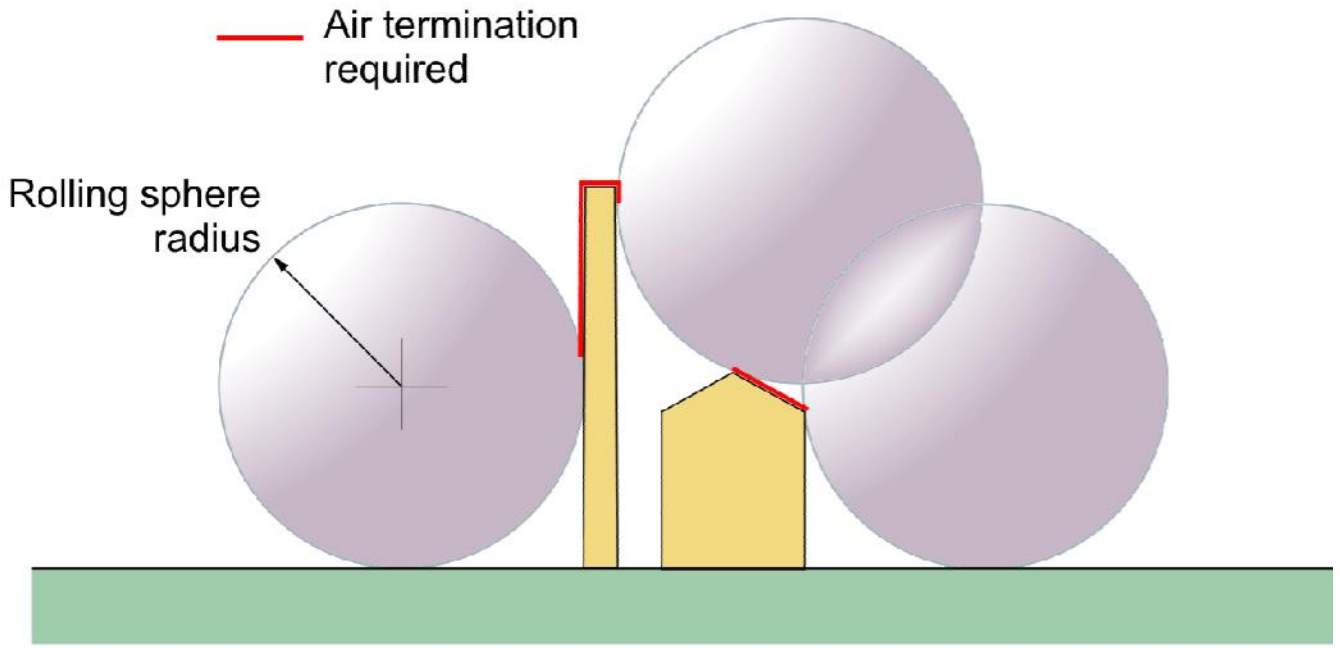
Faraday Cage

Air termination system

3 basic protective methods for determining position of air termination system

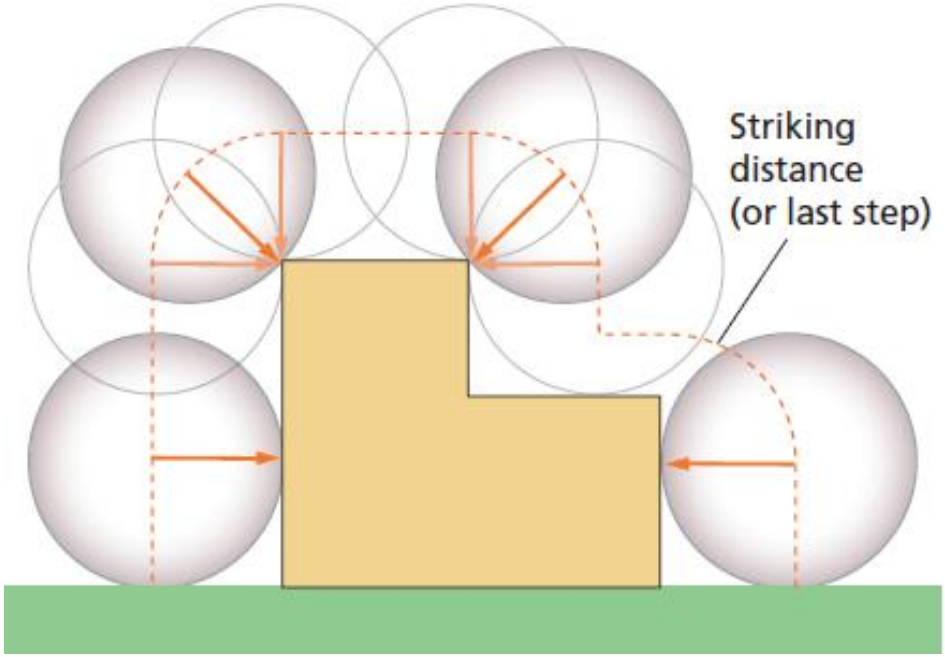
- Rolling sphere method
- Protective angle method
- Mesh method

Rolling sphere method



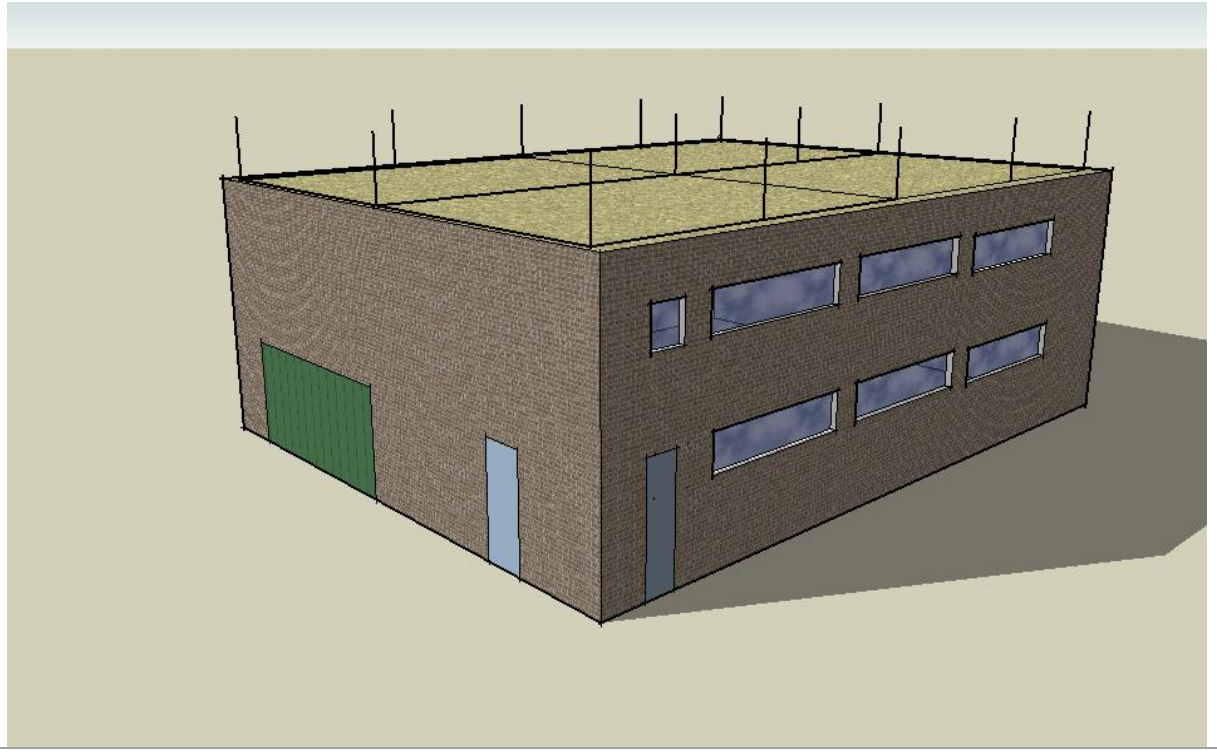
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Rolling sphere method



Protected zone

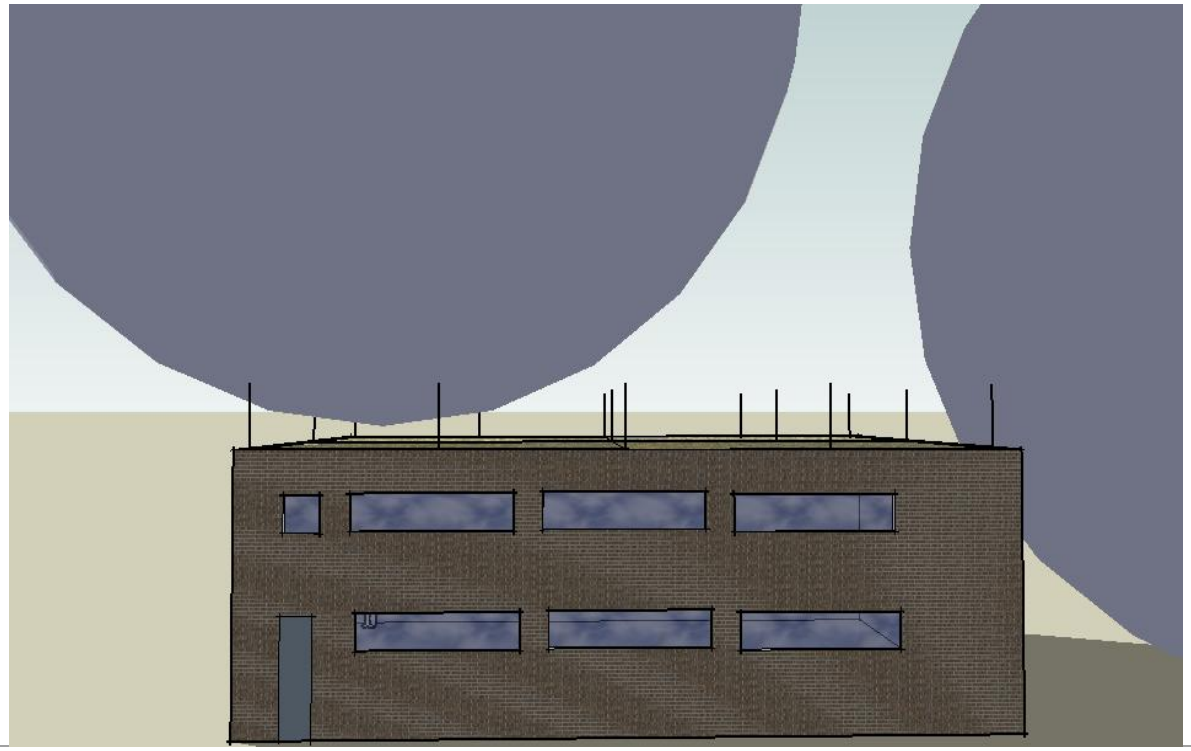
Rolling sphere method



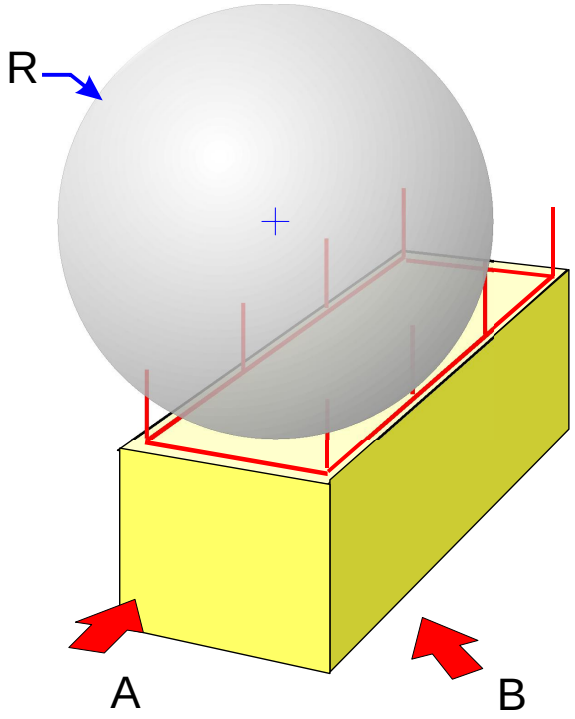
Rolling sphere method

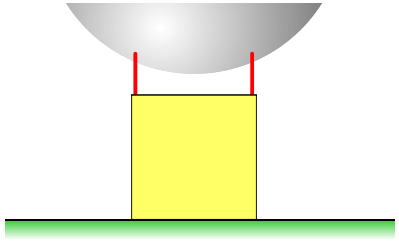


Rolling sphere method

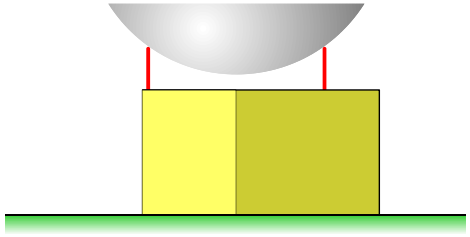


Rolling sphere method



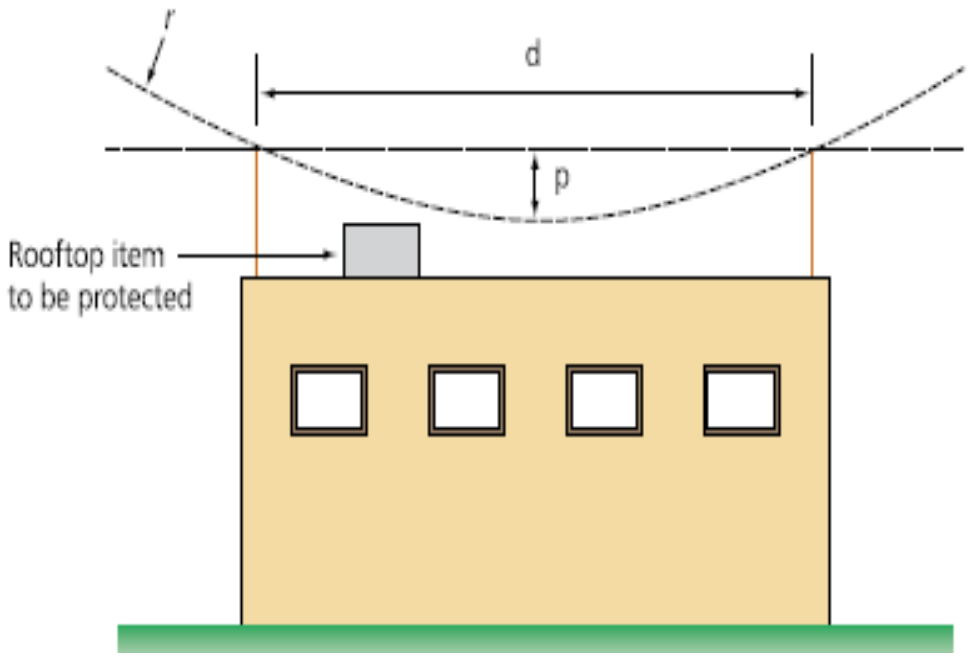


View on arrow A



View on arrow B

Penetration distance of rolling sphere

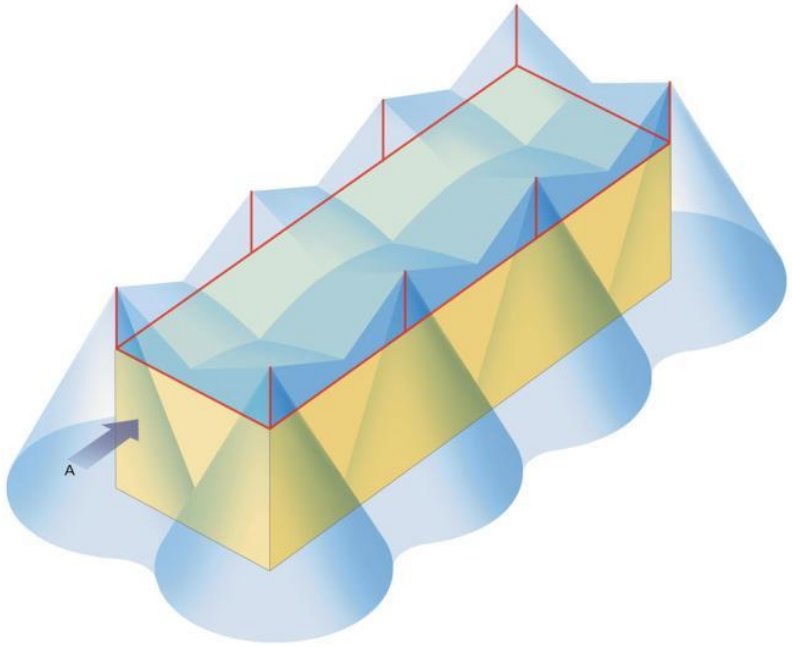


Where,
r = radius of the rolling sphere
p = penetration distance (m)
d = distance between two terminals
h = height of air terminals

$$p = r - \sqrt{r^2 - \left(\frac{d}{2}\right)^2}$$

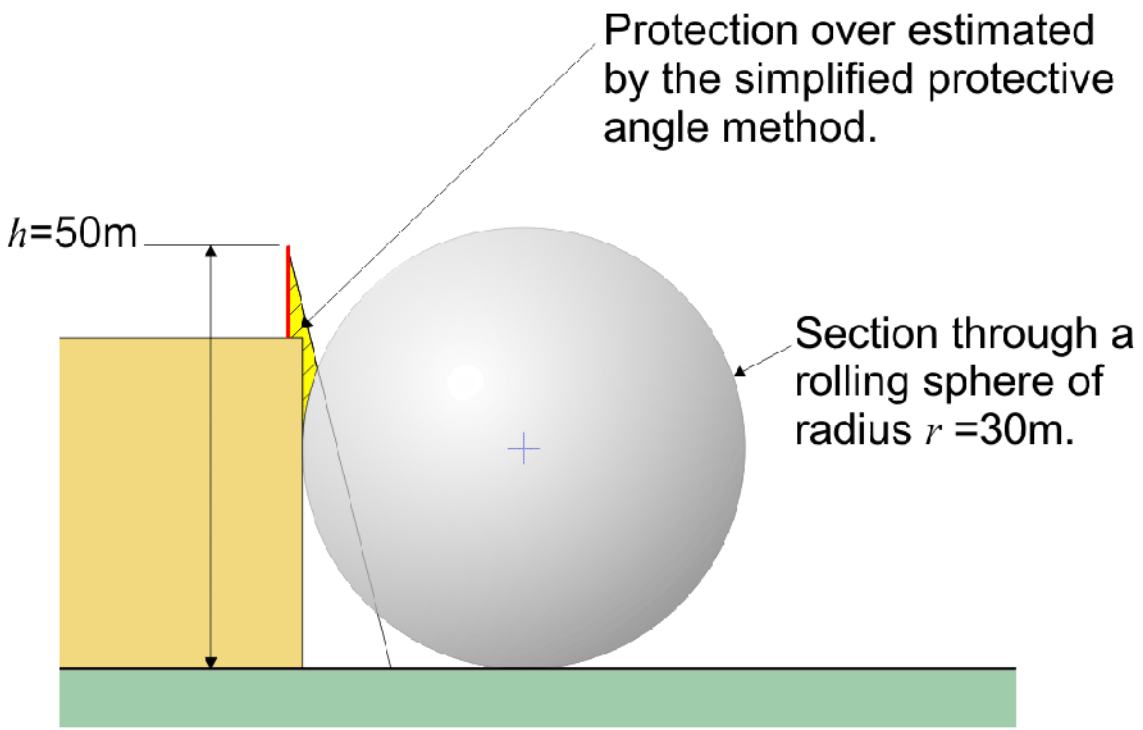
$$d = 2\sqrt{2rh - h^2}$$

Protective angle method



This is a mathematical simplification of the rolling sphere method

Protective angle method



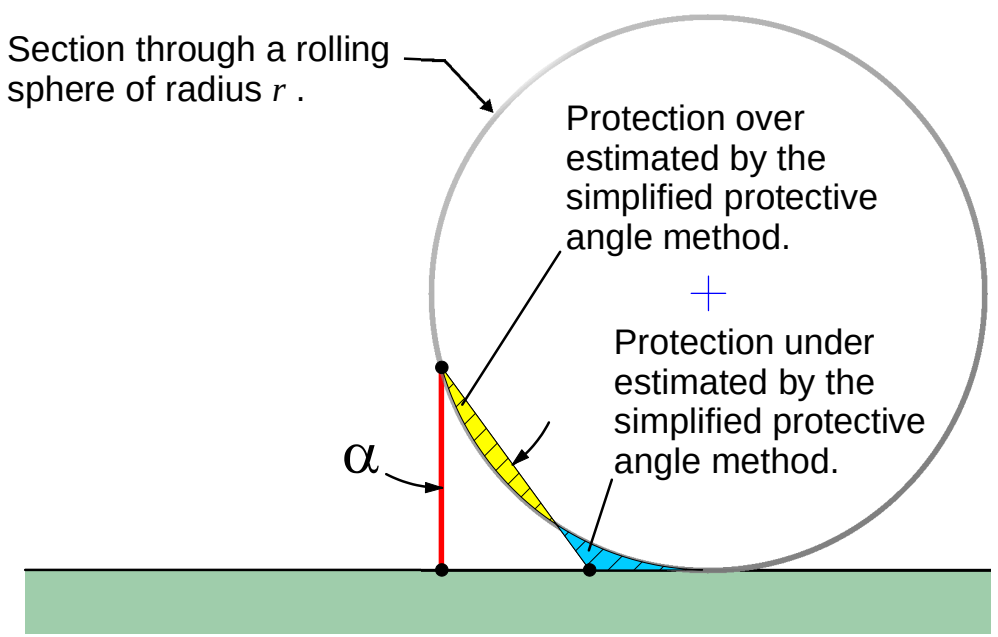
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IEC 62305-3

Protective angle method

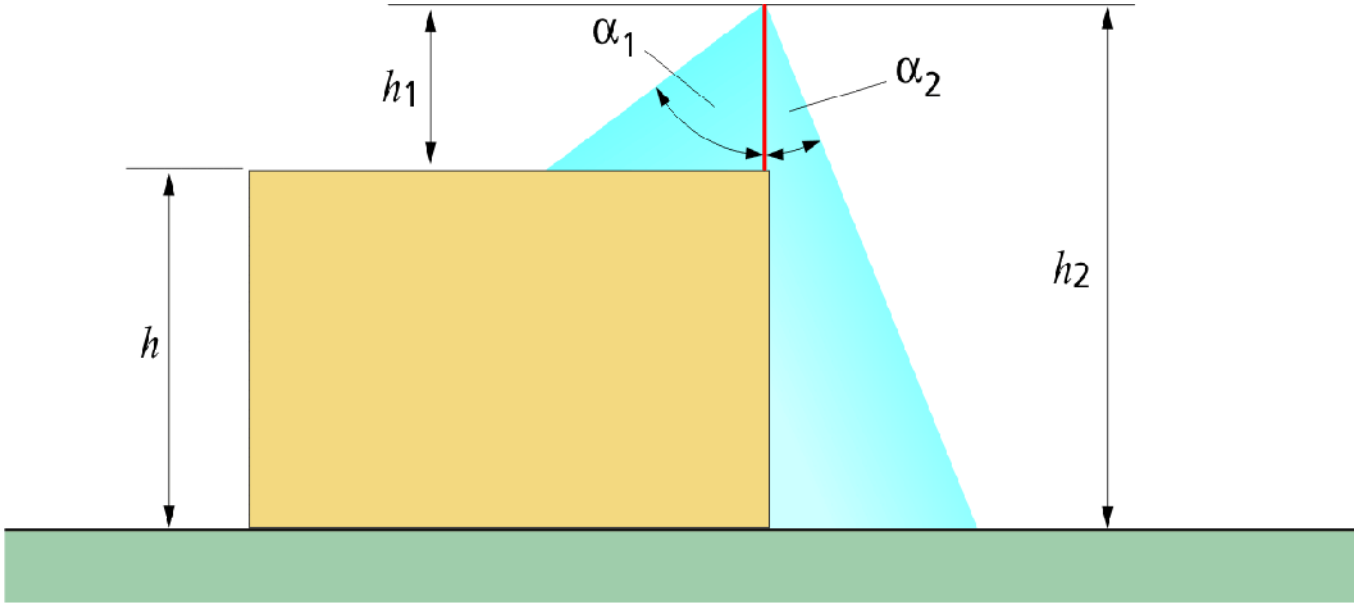
Protective angle method is a mathematical simplification of the rolling sphere method

- Suitable for single structures or small parts of larger structures
- Not suitable for structures higher than rolling sphere radius of selected LPL



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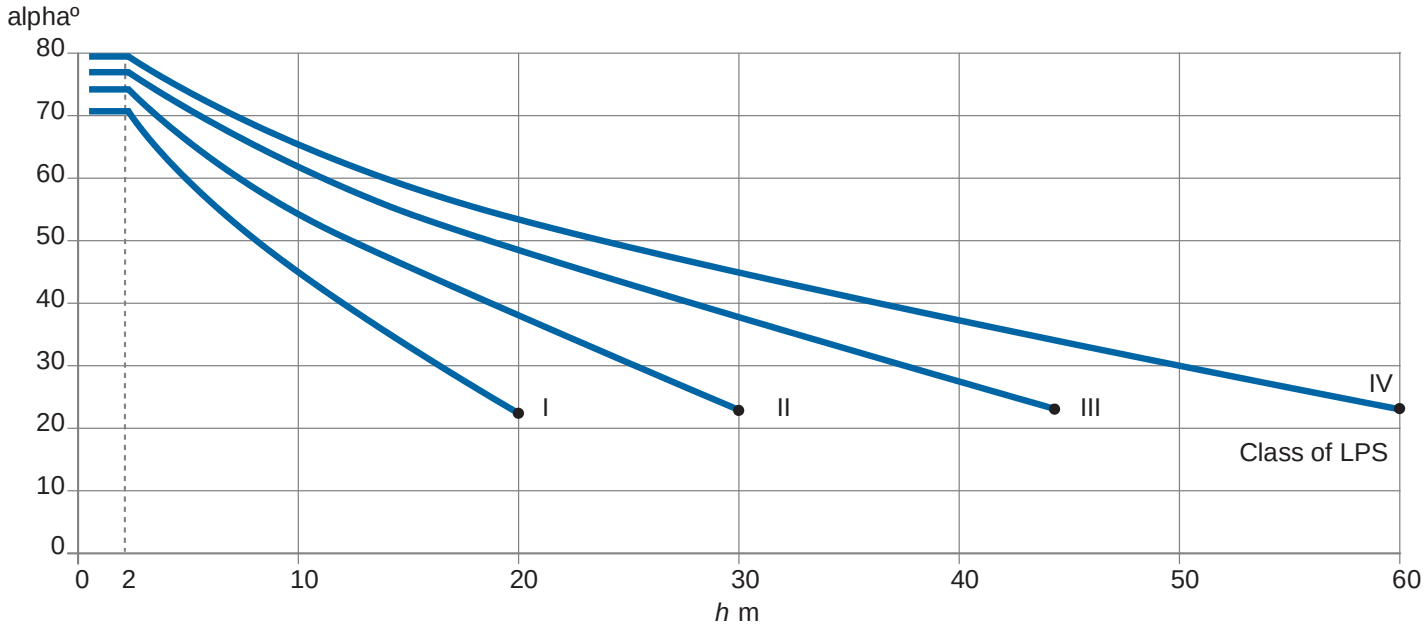
Protective angle method



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Variable angles depending on height to reference plane and class of LPS

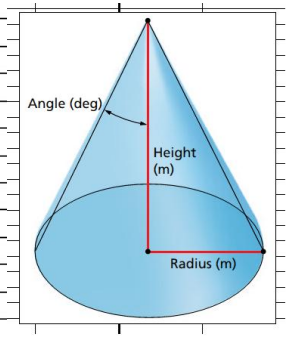
Determination of protective angle



Note 1 Not applicable beyond the values marked with •
Only rolling sphere and mesh methods apply in these cases.
Note 2 *h* is the height of air-termination above the reference plane of the area to be protected.
Note 3 The angle will not change for values of *h* below 2m.

Determination of protective angle

Height of air rod above reference plane (m)	LPS Class IV		LPS Class III		LPS Class II		LPS Class I	
	Angle (deg)	Radius (m)	Angle (deg)	Radius (m)	Angle (deg)	Radius (m)	Angle (deg)	Radius (m)
1	78.7	5.0	76.3	4.1	73.2	3.3	70.0	2.7
2	78.7	10.0	76.3	8.2	73.2	6.6	70.0	5.5
3	76.7	12.7	74.1	10.5	70.1	8.3	66.3	6.8
4	74.7	14.6	72.0	12.3	67.1	9.5	62.6	7.7
5	72.8	16.1	69.9	13.6	64.4	10.4	59.1	8.4
6	71.0	17.4	67.9	14.8	62.0	11.3	55.9	8.9
7	69.3	18.5	66.0	15.7	59.7	12.0	53.0	9.3
8	67.7	19.5	64.3	16.6	57.6	12.6	50.2	9.6
9	66.2	20.4	62.6	17.4	55.6	13.2	47.7	9.9
10	64.7	21.2	61.1	18.1	53.8	13.6	45.2	10.1
11	63.4	21.9	59.6	18.7	52.0	14.1	42.8	10.2
12	62.1	22.6	58.2	19.3	50.3	14.4	40.4	10.2
13	60.8	23.3	56.8	19.8	48.6	14.8	38.1	10.2
14	59.6	23.9	55.4	20.3	47.0	15.0	35.8	10.1
15	58.4	24.4	54.1	20.7	45.4	15.2	33.6	10.0
16	57.3	24.9	52.8	21.1	43.8	15.3	31.4	9.8
17	56.2	25.4	51.5	21.4	42.3	15.4	29.2	9.5
18	55.2	25.9	50.3	21.7	40.6	15.4	27.1	9.2
19	54.2	26.3	49.1	21.9	39.2	15.5	24.9	8.8
20	53.2	26.7	47.9	22.1	37.7	15.5	22.8	8.4
21	52.3	27.1	46.6	22.2	36.3	15.4		
22	51.3	27.5	45.5	22.4	34.8	15.3		
23	50.5	27.9	44.3	22.4	33.4	15.1		
24	49.6	28.2	43.1	22.5	31.9	15.0		
25	48.8	28.5	42.0	22.5	30.5	14.7		
26	48.0	28.8	40.9	22.5	29.0	14.4		
27	47.2	29.1	39.8	22.5	27.5	14.0		
28	46.4	29.4	38.7	22.5	25.9	13.6		
29	45.6	29.6	37.7	22.4	24.4	13.1		



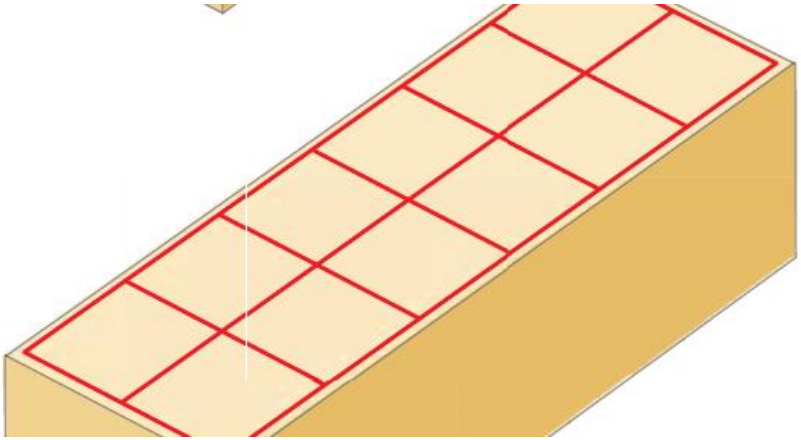
Mesh method

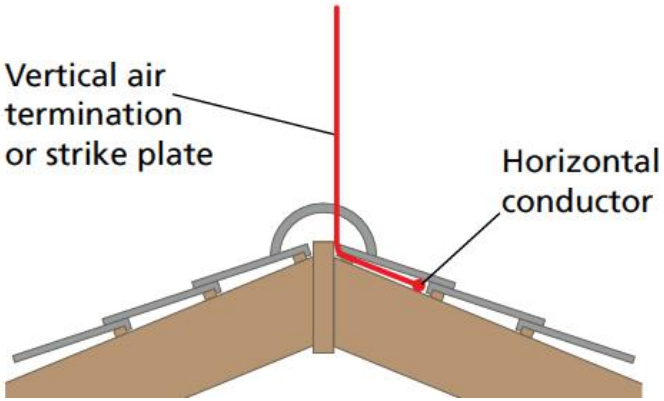
Suitable for plain surfaces provided:

- conductors are positioned at roof edges and overhangs
- no metal installation should protrude above air termination system

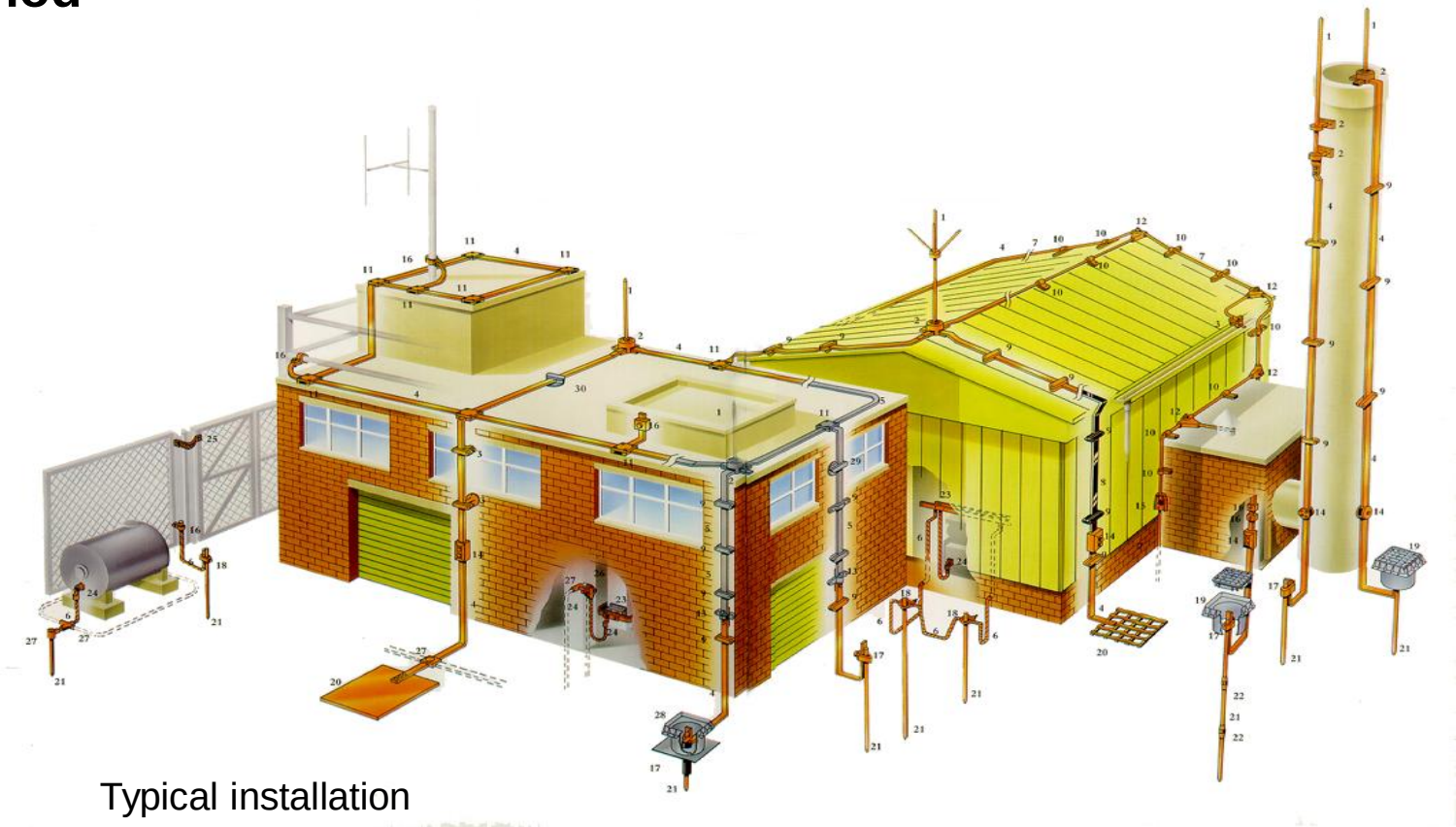
Most practical application (Faraday Cage principle)

Mesh method




Vertical air
termination
or strike plate
Horizontal
conductor

Mesh method



Typical installation

Summary of mesh method

Class	Mesh size (m x m)	DC spacing (m)	Rolling sphere (m)	Service entry Type 1 SPD
I	5 x 5	10	20	25kA, 3Ø
II	10 x 10	10	30	18.75kA, 3Ø
III	15 x 15	15	45	12.5kA, 3Ø
IV	20 x 20	20	60	12.5kA, 3Ø

Each class has its own mesh size, down conductor spacing and relevant radius of rolling sphere

Suggested conductor fixing centres

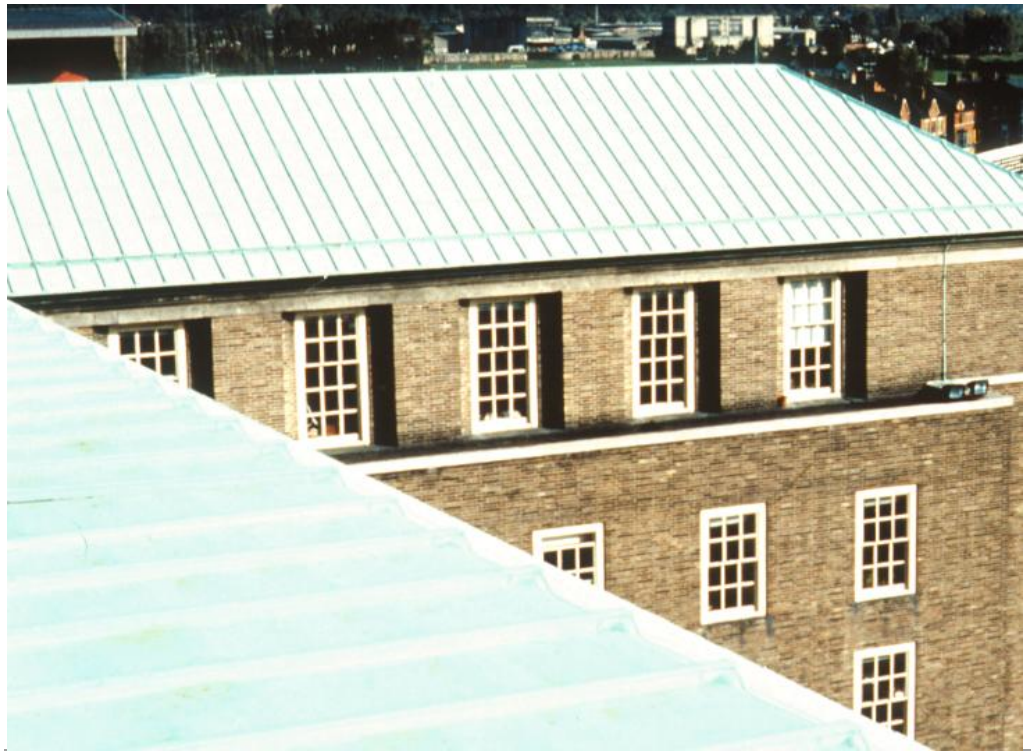
Arrangement	Tape conductors (mm)	Round solid conductors (mm)
Horizontal conductors on horizontal surfaces	1000	750
Horizontal conductors on vertical surfaces	500	500
Vertical conductors from the ground to 20 m	1000	750
Vertical conductors from 20 m and thereafter	500	500

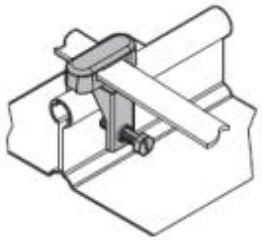
Natural components (metallic roofs/equip)

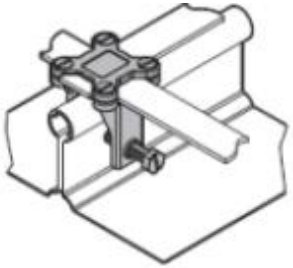
Class of LPS	Material	Thickness[(1)] t (mm)	Thickness[(2)] t' (mm)
I to IV	Lead	-	2.0
	Steel (stainless, galvanized)	4	0.5
	Copper	5	0.5
	Aluminum	7	0.65
	Zinc	-	0.7

NOTE 1: thickness *t* prevents puncture, hot spot or ignition.
NOTE 2: thickness *t'* only for metal sheets if it is not important to prevent puncture, hot spot or ignition problems.

Metal roof – air termination network

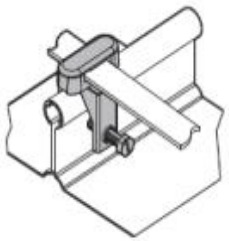


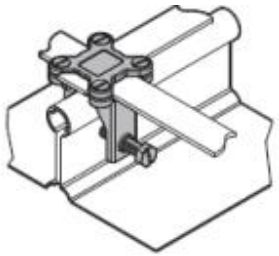




Metal roof – air termination network

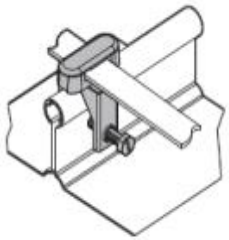


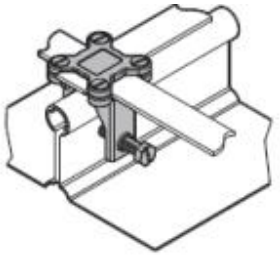




Metal roof – air termination network

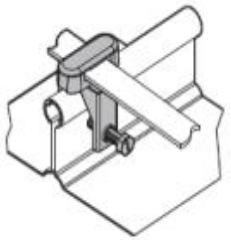


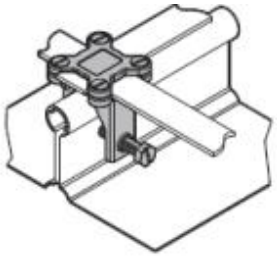




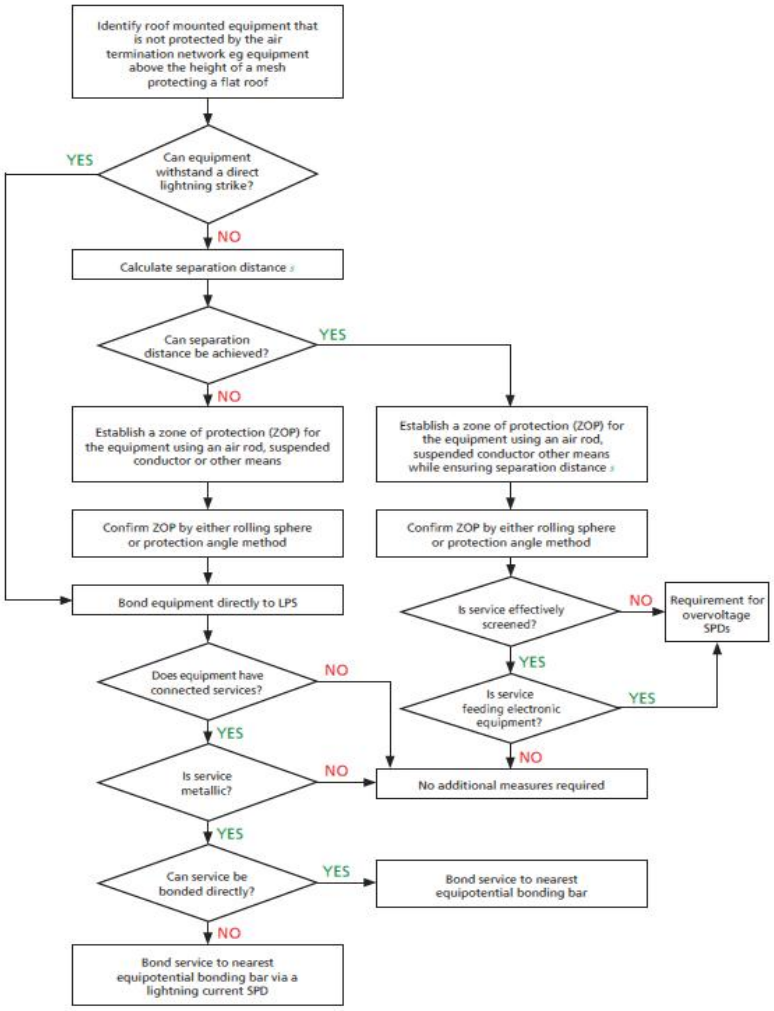
Metal roof – air termination network



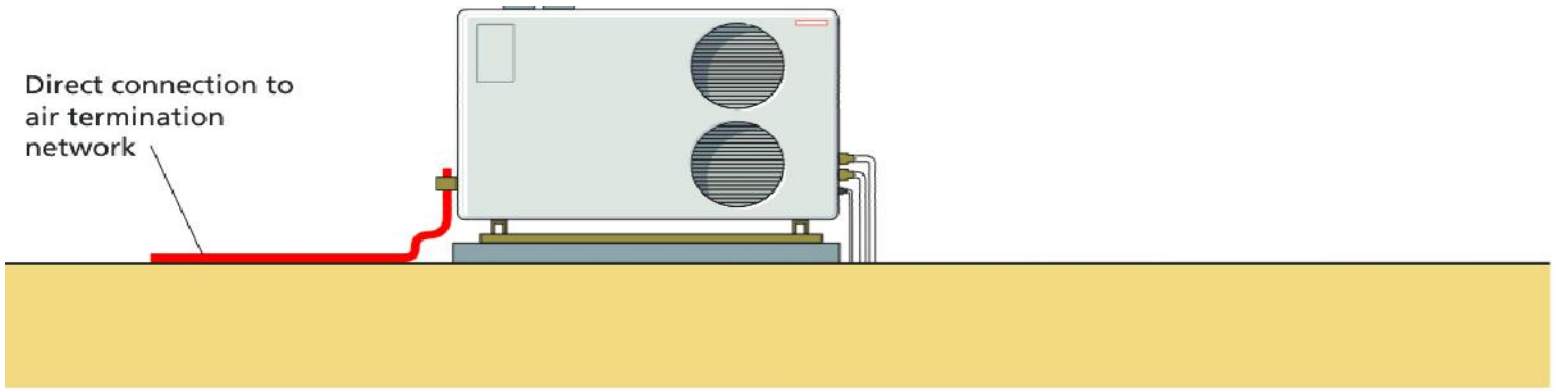




Protecting roof mounted equipment



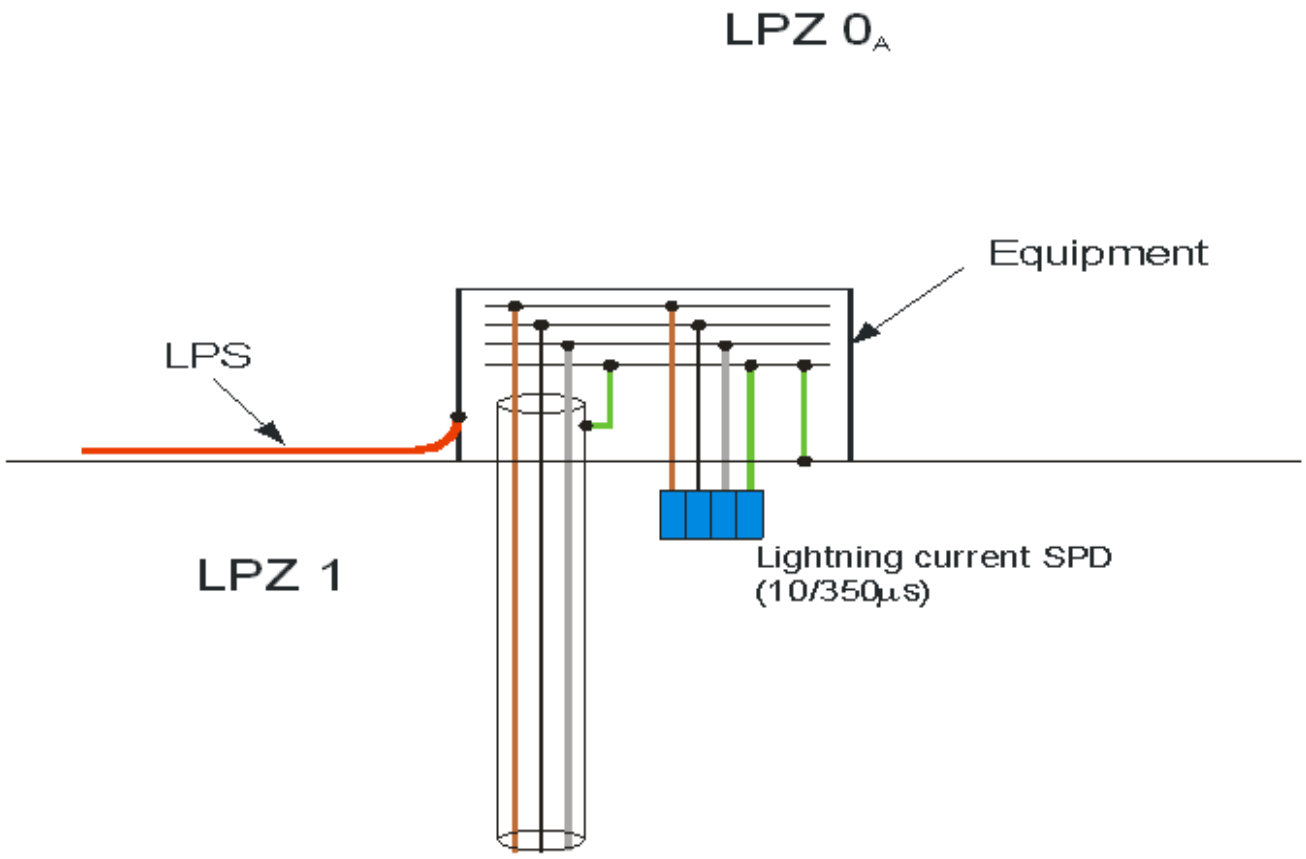
Roof mounted equipment – case 1



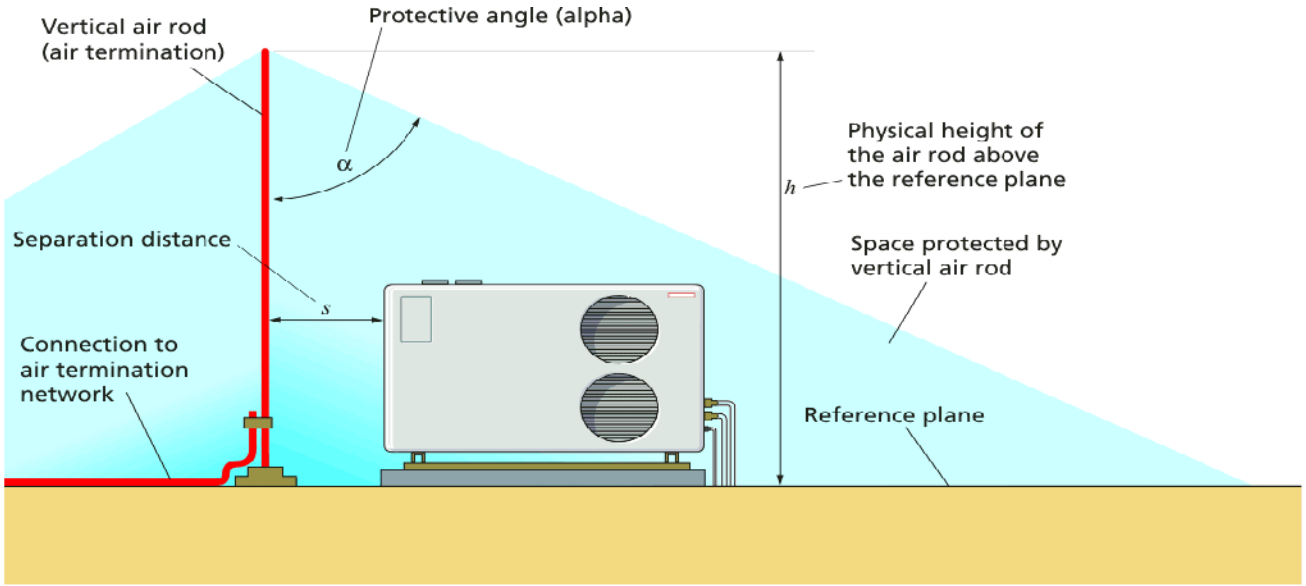
©2007 Furse

Equipment casing can withstand direct strike – bond casing directly to LPS

Electrical services entering structure – ‘live’ cores bond to nearest equipotential bonding bar via Type I lightning current (10/350 µs) SPDs

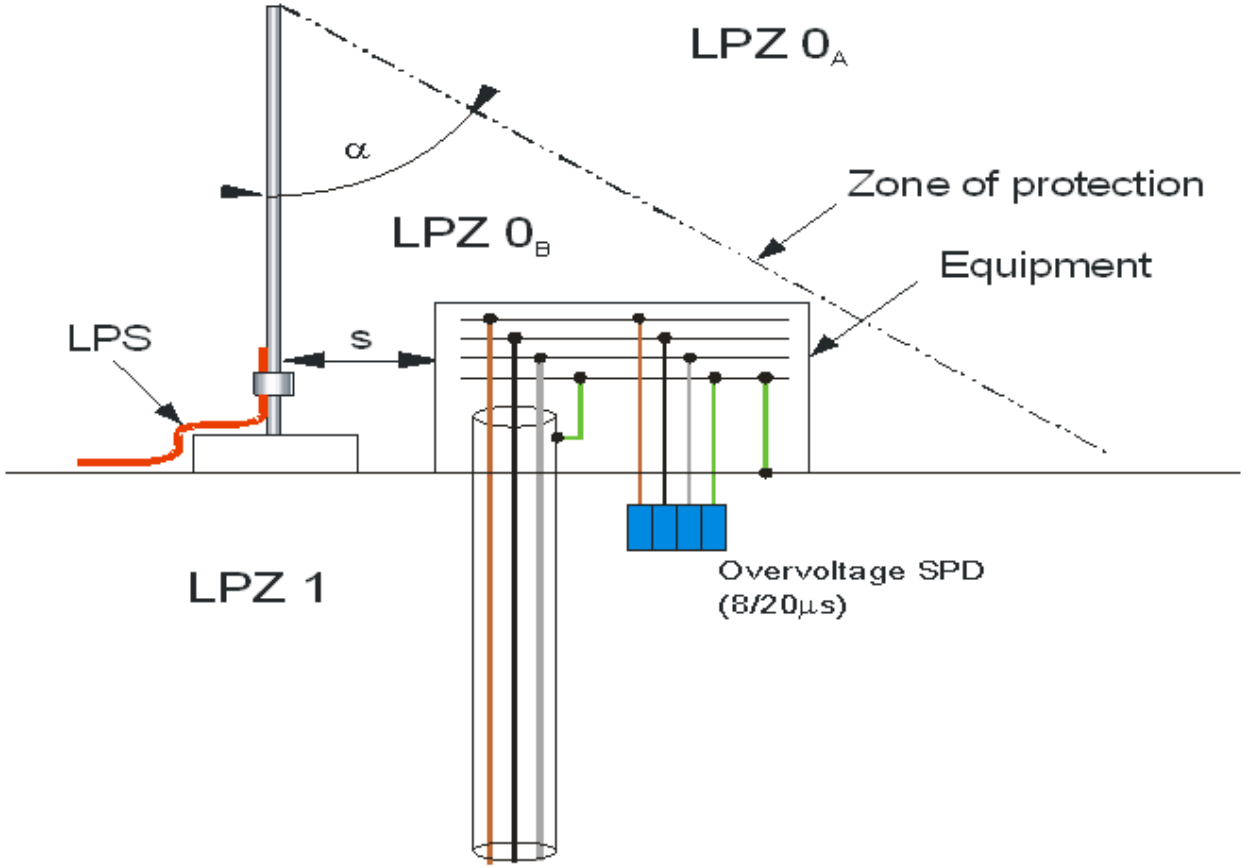

LPZ 0A
Equipment
LPS
LPZ 1
Lightning current SPD
(10/350µs)

Roof mounted equipment – case 2

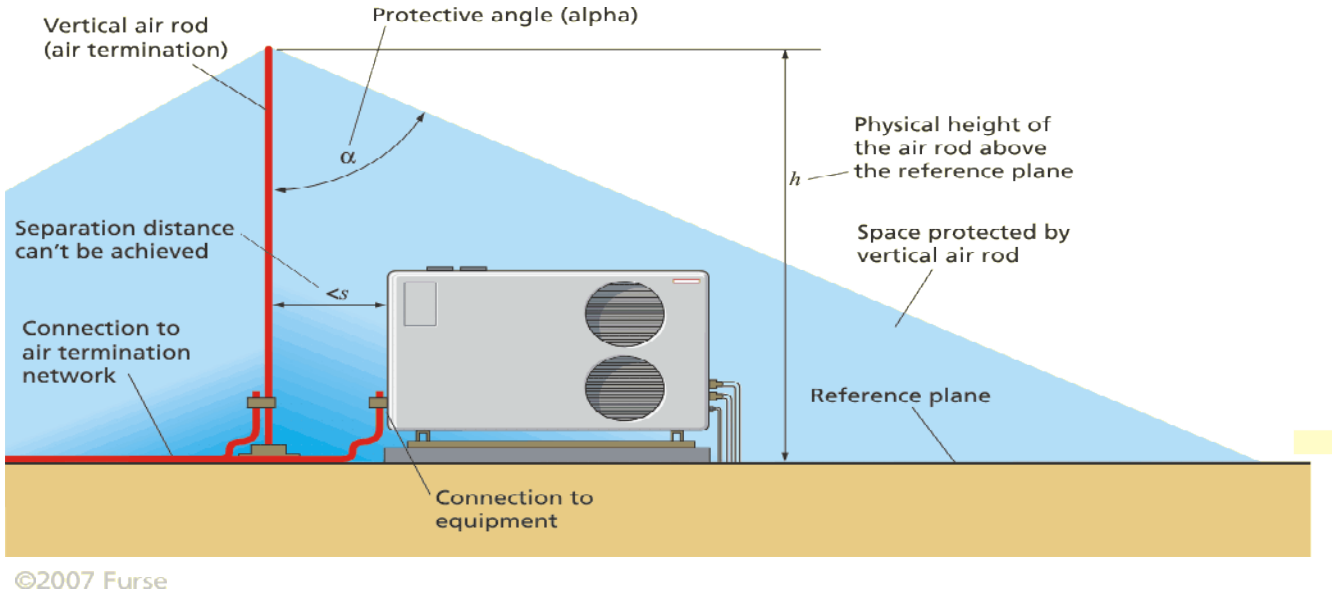


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Equipment casing cannot withstand direct strike – evaluate separation distance. If achievable (sufficient space on roof) – install air rod (or suspended conductor) connected to LPS and bond the live cores via Type II over-voltage (8/20 µs) SPDs


LPZ 0A
α
Zone of protection
LPZ 0B
Equipment
LPS
s
LPZ 1
Overvoltage SPD
(8/20µs)

Roof mounted equipment – case 3



Equipment casing cannot withstand direct strike – evaluate separation distance. If not achievable (insufficient space on roof) – install air rod (or suspended conductor) connected to LPS, bond air rod to casing and Install Type 1 current (10/350 µs) SPD

IEC 62305-3

Separation distance

- Separation distance (electrical insulation) between external LPS and structural metal parts required to minimise any partial lightning current being introduced internally in structure
- If sufficient gap, current in a down conductor cannot bridge gap/flashover to internal metalwork
- Simplified & detailed calculation methods now in IEC 62305 (simplified shown)
- In structures with metallic or electrically continuous connected reinforced concrete framework, separation distance not required

Where

– k_i = related to class of LPS

– k_c = coefficient related to current flowing in d.c

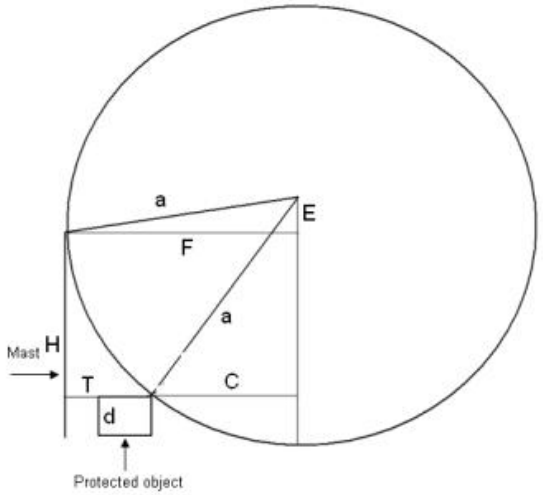
– k_m = coefficient related to separation medium

– l = length along air termination or d.c, from point where s is to be considered to nearest equipotential bonding point

$$s = k_i \cdot \frac{k_c}{k_m} \cdot l$$

©ABB

Protecting roof mounted equipment – using rolling sphere



For single mast

$$H = a - \sqrt{a^2 - \left(\sqrt{a^2 - (a-d)^2} + T\right)^2}$$

a: the radius of the sphere

d: the heights of the protected object

T: the distance between the mast and the far corner of the protected object

Protecting roof mounted equipment – using rolling sphere

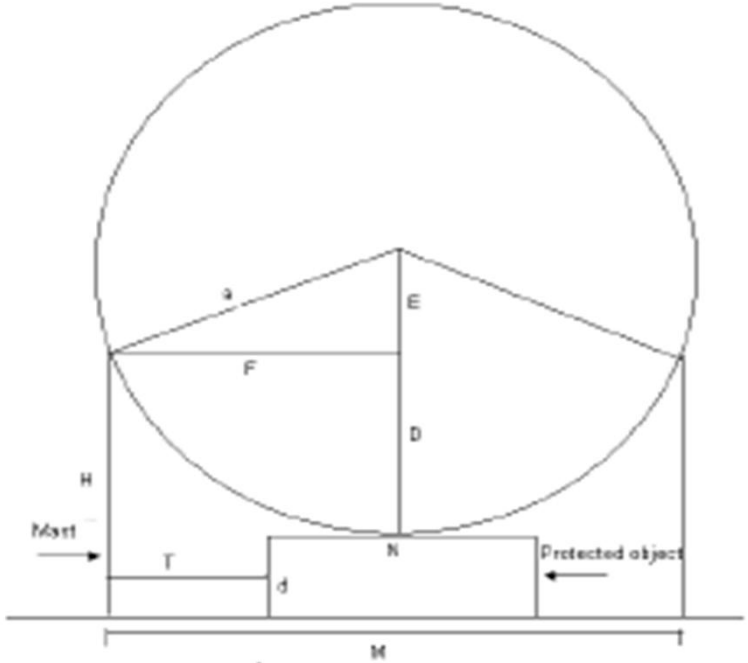


Figure 2. double mast protections

$$H = a + d - \sqrt{a^2 - \left(\frac{M}{2}\right)^2}$$

For Twin masts

Down conductors



Take most direct route (taking into account architectural /practical constraints). Variation in spacing +/- 20%

More down conductors ----- better lightning current being shared between them

Enhanced further by equipotential bonding to conductive parts of structure

Don’t install down conductors in gutters or down spouts (potential corrosion problem)

Down conductors



Where reinforced concrete columns are used as down conductors and foundation piles as earth termination...,

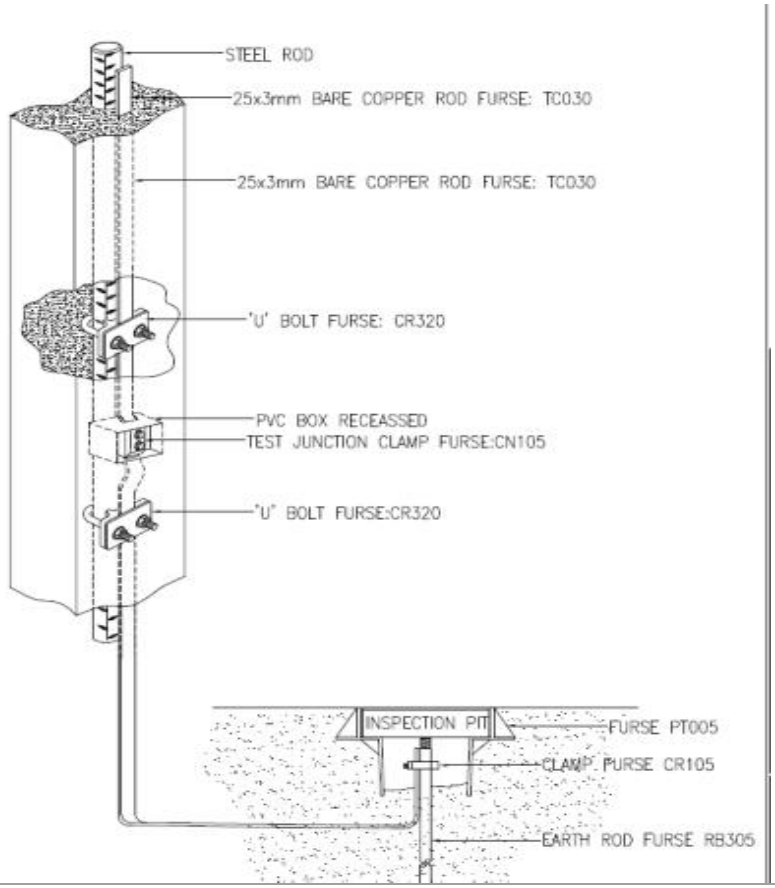
....every column, including those located internally, should be connected to the air termination system and to the reinforcing within concrete foundation by proprietary bonding points

(Part 3 E.4.3.7)

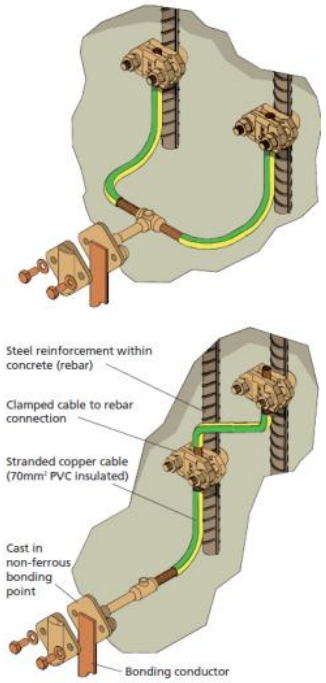
Down conductors inside PVC sleeves / conduits are not advisable --- flash over energy may break concrete.

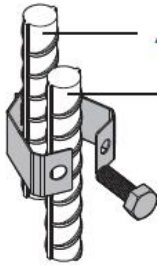
The huge surge current may be dangerous to the PVC material due to high temperature rise during its passage thru' the same.

Down conductor - typical installation



Natural components





Encourages use of natural fortuitous metalwork present (i.e. rebars) etc.

Reinforcing bars carrying lightning currents should be welded, clamped with suitable connection components or overlapped minimum of 20 times rebar diameter.

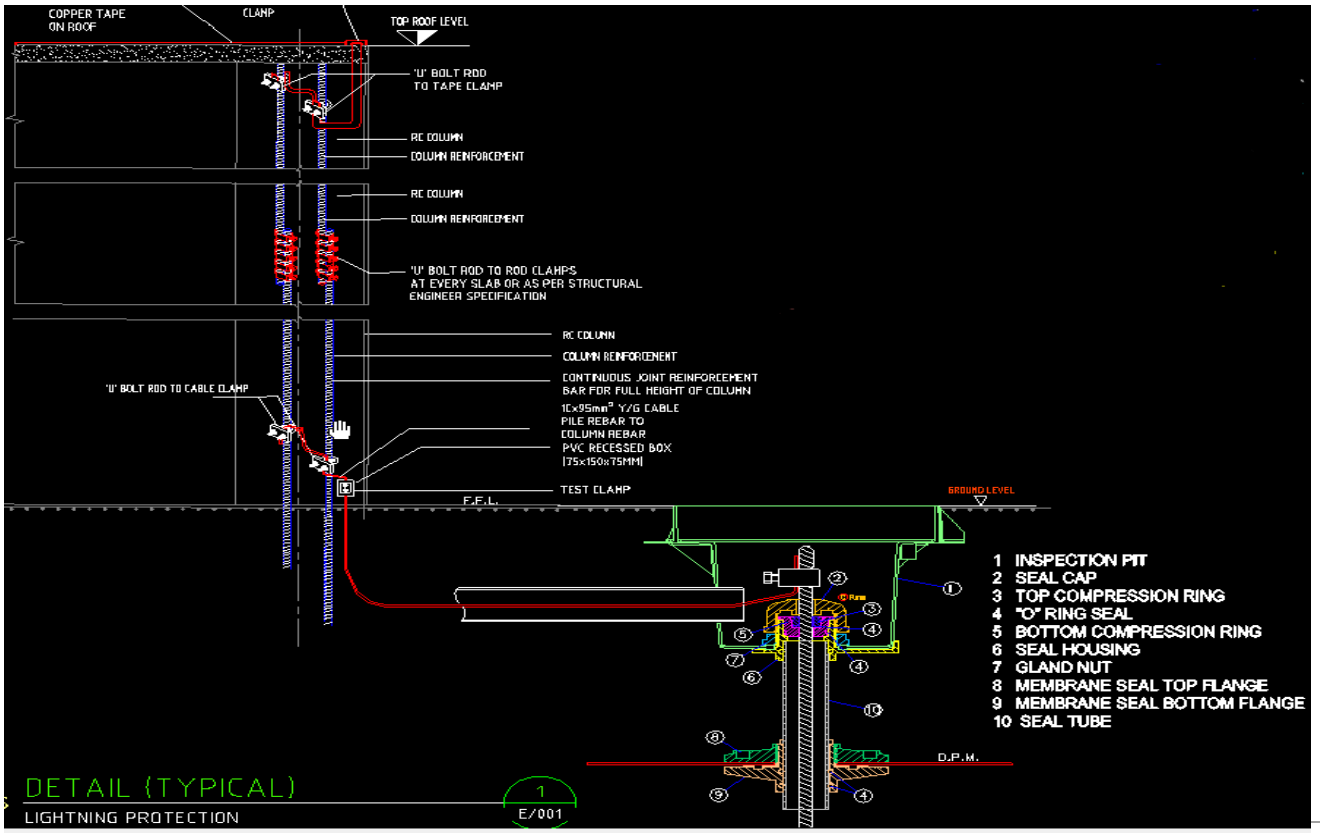
A minimum of two rebars have to be used in a column as down conductor.

Requires electrical continuity - maximum overall resistance of 0.2 ohm

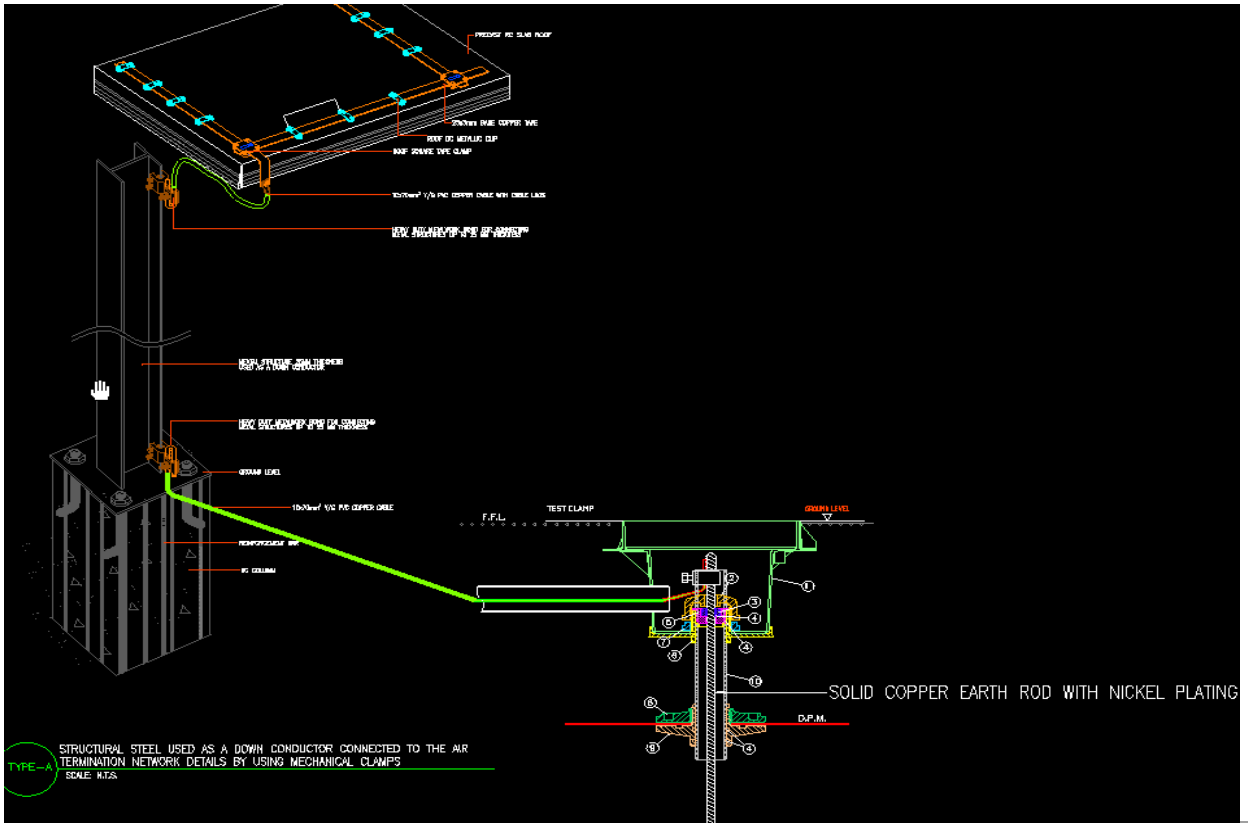
For structures utilizing steel reinforced concrete (including pre-cast, pre-stressed reinforced units), the electrical continuity of the reinforcing bars shall be determined by electrical testing between the uppermost part and ground level. The overall electrical resistance should not be greater than 0,2 Ω, measured using test equipment suitable for this purpose. If this value is not achieved, or it is not practical to conduct such testing, the reinforcing steel shall not be used as a natural down-conductor as discussed in 5.3.5. In this case it is recommended that an external down-conductor be installed: In the case of structures of pre-cast reinforced

Clause 4.3 of EN 62305 – Part 3

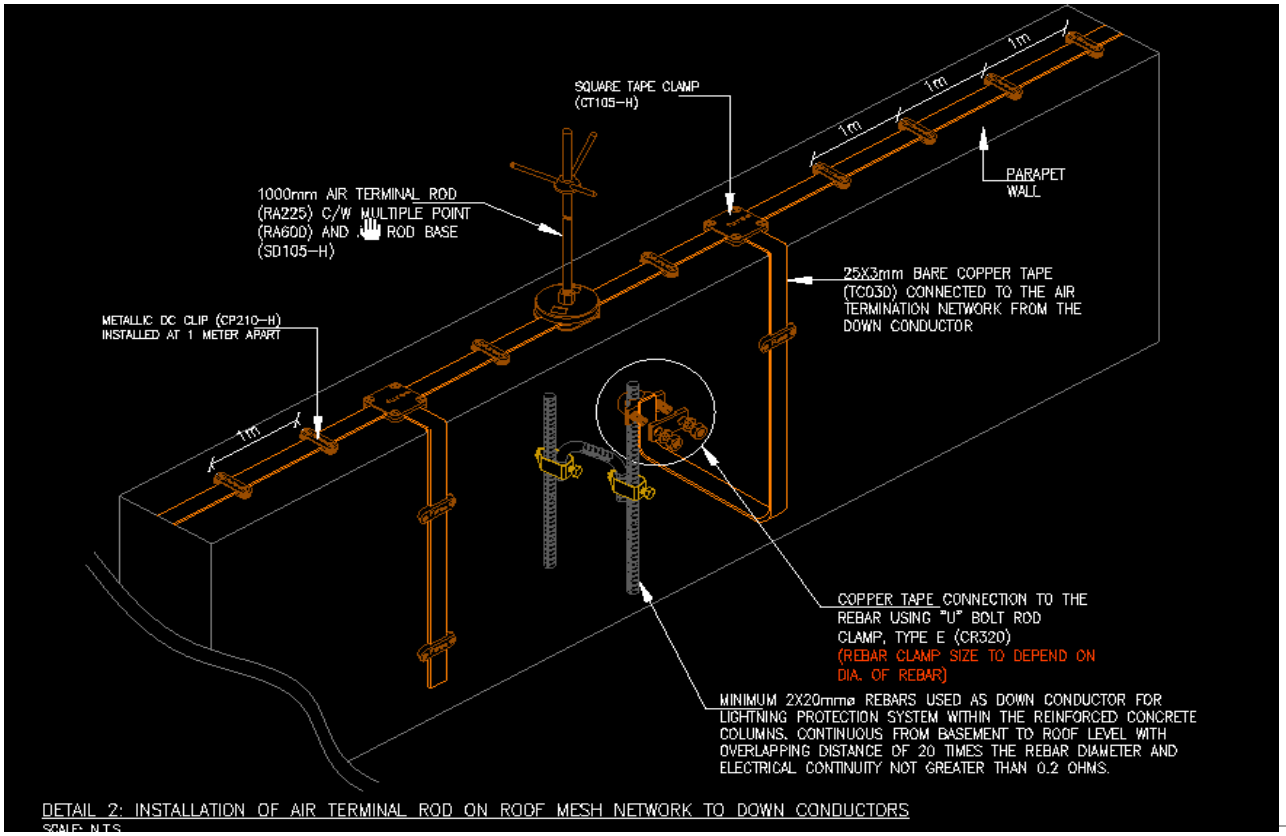
Typical installation



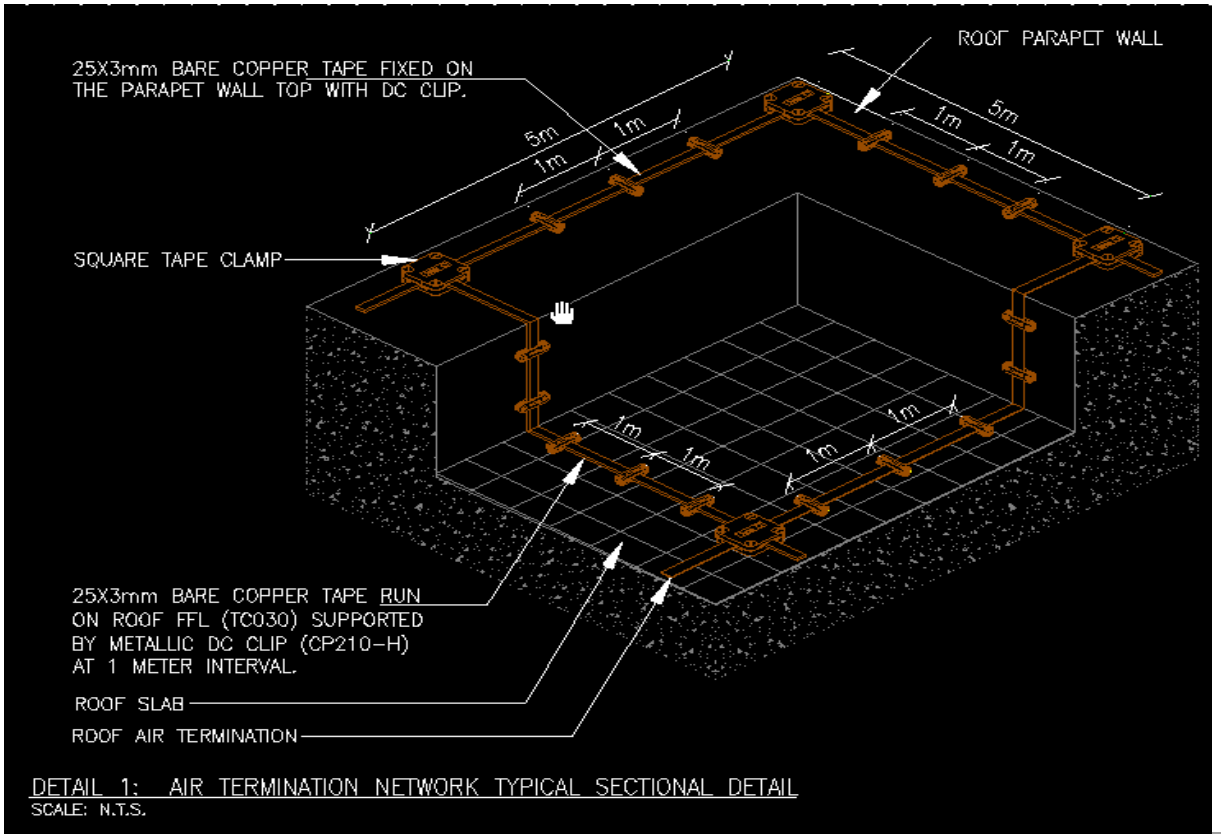
Typical installation



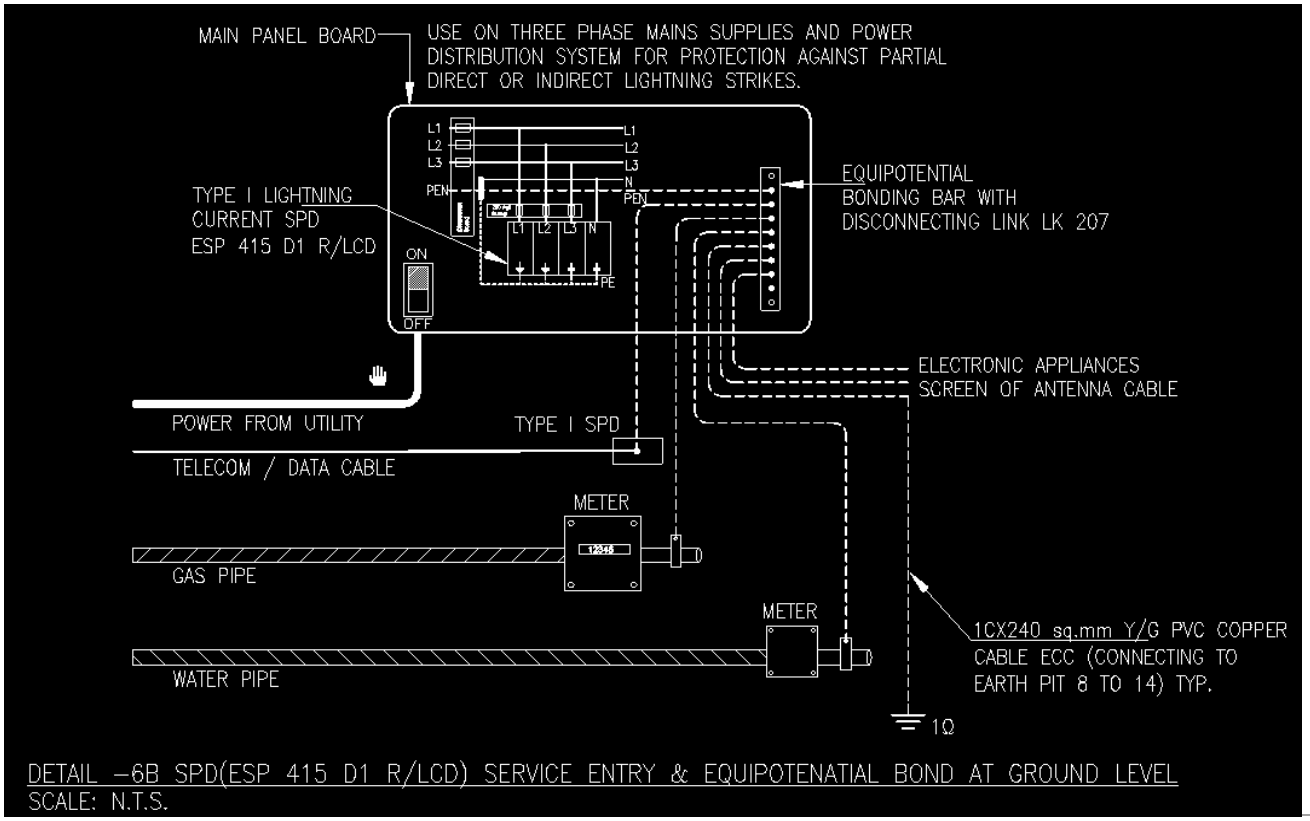
Typical installation



Typical installation



Typical installation

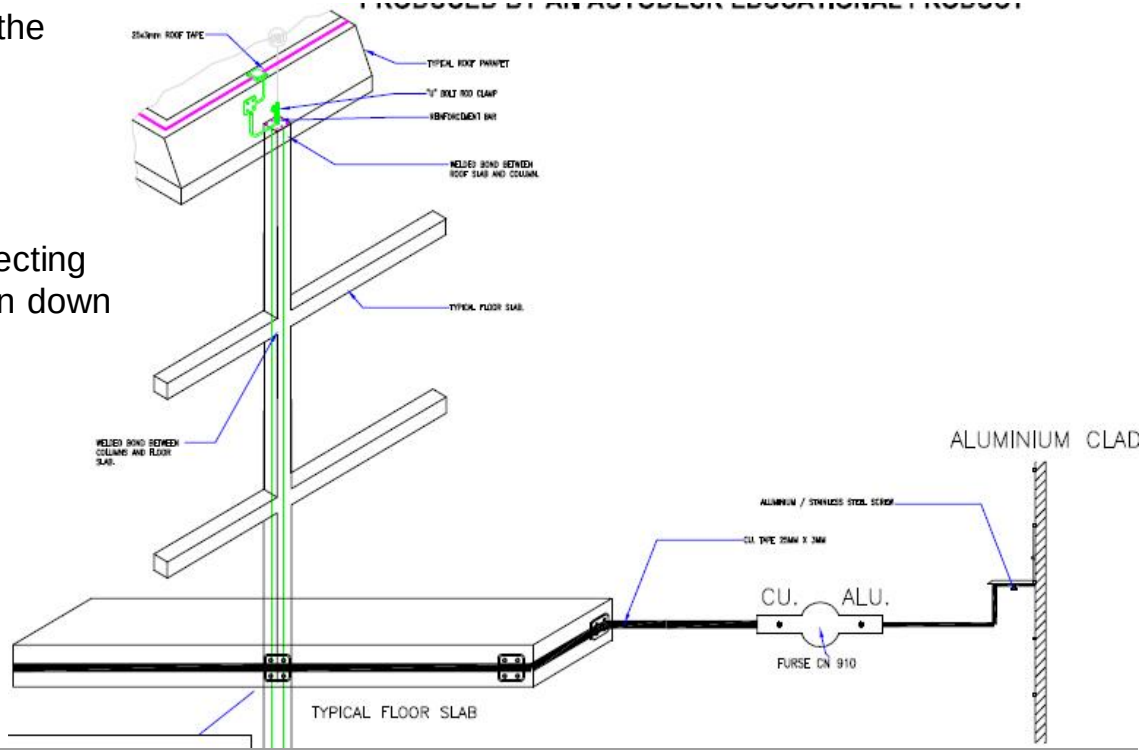


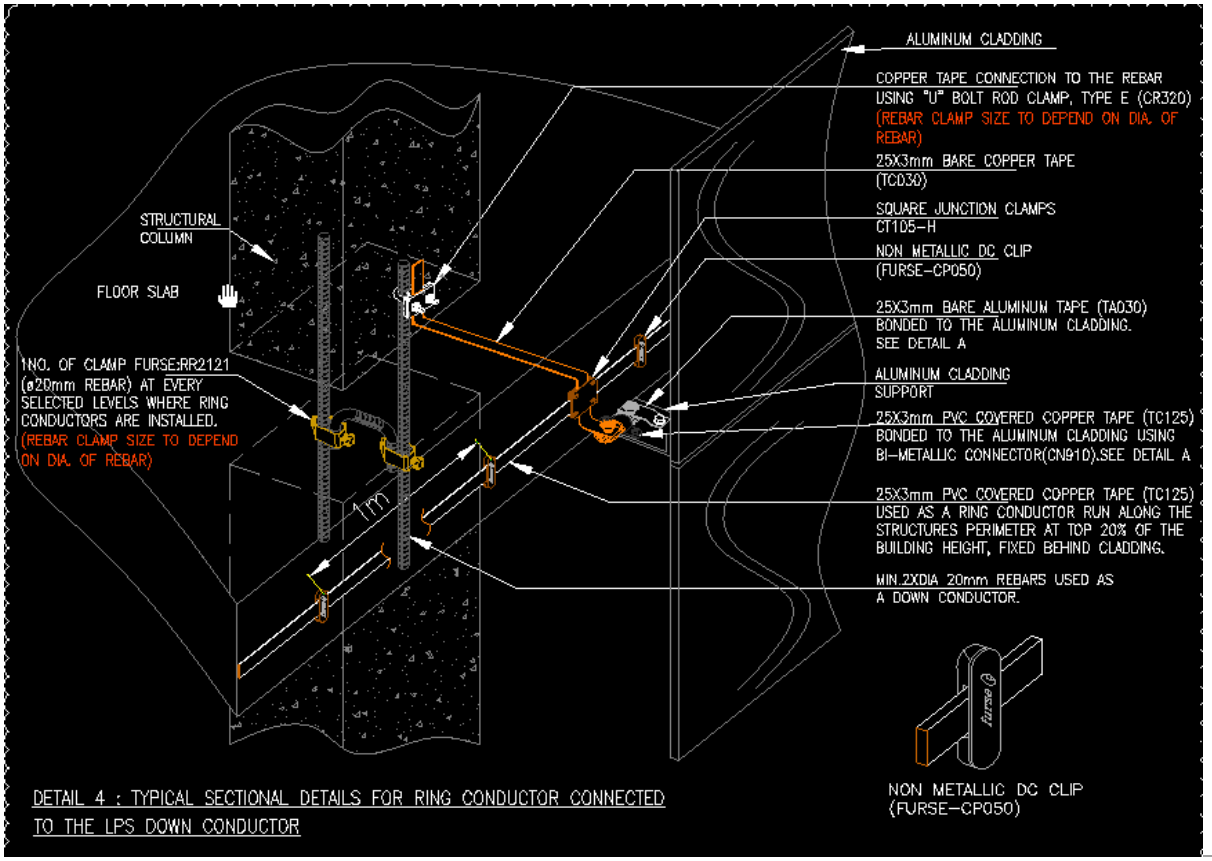
Protecting tall structures against side strikes

Lightning doesn't necessarily strike the topmost part of the building only.

Ring conductor

Conductor forming loop around structure and interconnecting down conductors to improve lightning current distribution down them.





DETAIL 4 : TYPICAL SECTIONAL DETAILS FOR RING CONDUCTOR CONNECTED TO THE LPS DOWN CONDUCTOR

Ring conductor spacing

It is a **good practice** that depending on the level of protection, the radius of the rolling sphere is decided.

Assume LPL I

- 1st Ring Conductor at 20 m height

- Spacing of 20 meters (5 floors) between 20m to 120m height

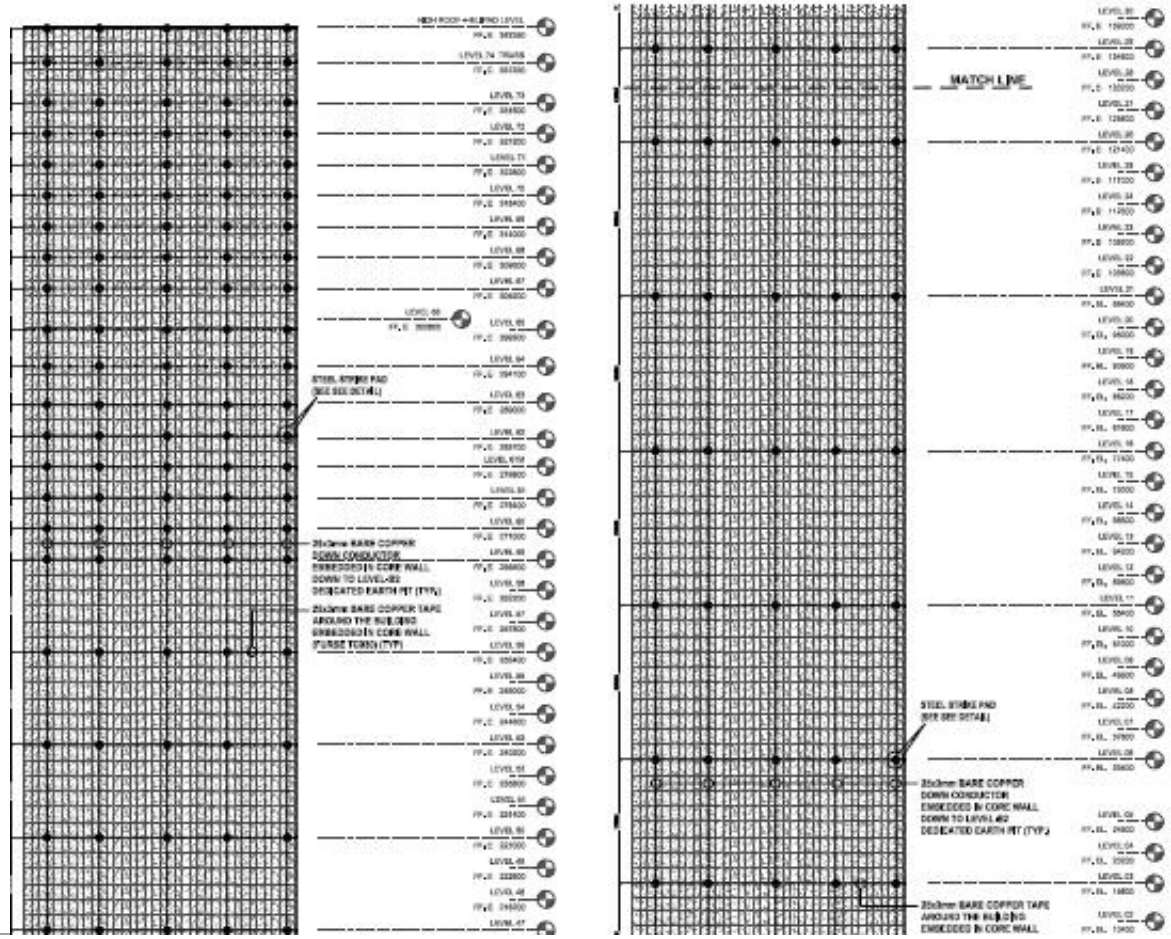
- Spacing of 10 meters (3 floors) between 120m to 400m height

- Spacing of 5 meters (each floor) from 400m height onwards

- If the structure is >120m in height, then apply ring conductor on each floor for the top 20% and then follow the above rule

Ring conductor spacing

Typical project example



Earth termination system

a) Type A arrangement

rods or horizontal conductor electrodes

b) Type B arrangement

ring conductor or foundation earth electrode

Type A arrangement

Total number of rods/earth electrodes should not be less than two

OR

Minimum length of earth rod shall be 2.4m

However, please use the formula to find out the actual number of earth rods required before deciding on installation

Calculation of resistance to earth – single electrode

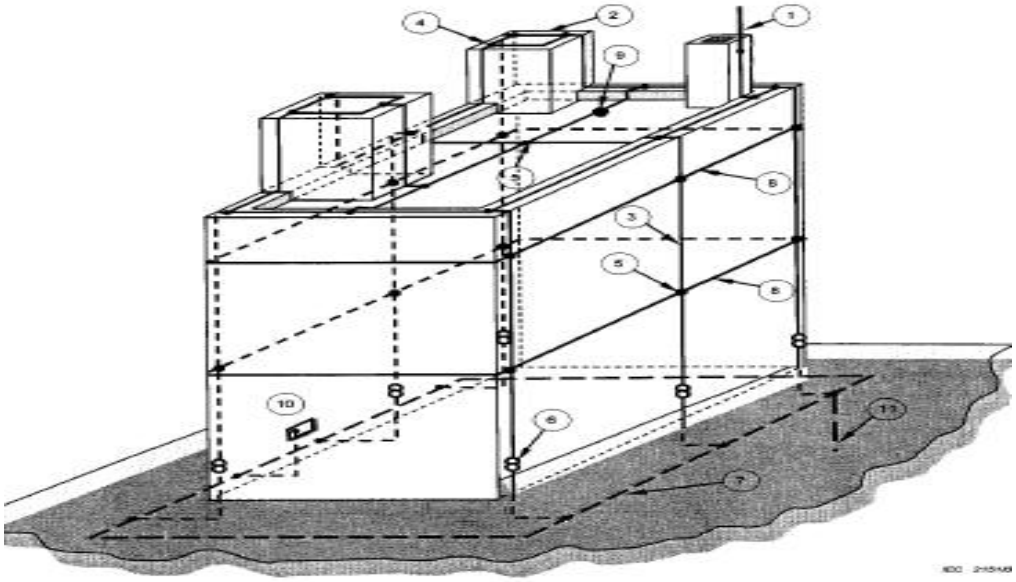
(eq. 9.5.4 : BS7430 : 2011)

$$R = \frac{r}{2\pi \times L_r}\left[\ln\left(\frac{8L_r}{d}\right) - 1\right]$$

$$R = \frac{1}{2\pi L}\left[(r - r_c)\left(Ln\left[\frac{8L}{D_i}\right] - 1\right) + r_c\left(Ln\left[\frac{8L}{d}\right] - 1\right)\right]$$

Diameter of earth rod	m	d
Soil Resistivity	ohm-m	ρ
Length of rod	m	L_r
Resistivity of in-fill material	Ohm-m	r_c

Type B earthing arrangement



Key
1 Air-termination rod
2 Horizontal air-termination conductor
3 Down-conductor
4 T-type joint
5 Cross-type joint
6 Test joint
7 B-type earthing arrangement, ring earth electrode
8 Equipotentialization ring conductor
9 Flat roof with roof fixture
10 Terminal for connecting the equipotentialization bar of the internal LPS
11 A-type earthing arrangement

It is a Type A arrangement that is inter connected to ensure an equipotential value

Calculation of resistance to earth – parallel electrode & horizontal conductors

(eq. 9.5.5 : BS7430 : 2011)

$$Rp = \frac{1}{n}\frac{r}{2\rho \times L}\left[\ln\left(\frac{8L}{d}\right) - 1 + \frac{L}{s}\ln\left(\frac{1.78n}{2.718}\right)\right]$$

Diameter of earth rod	m	d
Soil Resistivity	ohm-m	ρ
Length of rod	m	L
Number of earth rods		n
Spacing between earth rods	m	s

$$R = \frac{r}{2\rho \times L}\left[\ln\left(\frac{2L}{wh}\right)^{2} + Q\right]$$

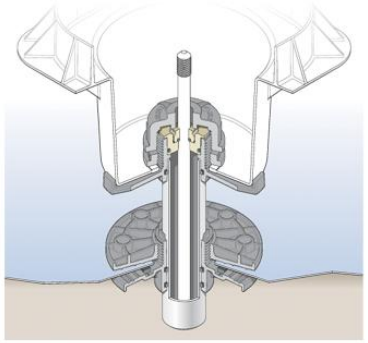
Length of conductor	m	L
Soil Resistivity	ohm-m	ρ
Width of the conductor	m	w
Depth of the electrode	M	h
Co-efficient (rectangular)	-1	Q
Co-efficient (circular)	-1.3	Q

Earthing

Earth rod seals

Purpose:

- For use in building foundations, where the damp proof membrane must be pierced
- Product attributes:
  - Watertight seal to 80 psi
  - Seal packs for all Furse rods
  - Full range of accessories and seal tubes
  - Patented and registered designs
  - IEC 62561-5





©ABB

Earthing arrangements

TN-S system grounding (earth neutral – separate)

The neutral of the supply is connected with earth at only one point or as near as is reasonably practicable to the source. The consumer's grounding terminal is typically connected to the metallic sheath or armor of the distributor's service cable into the premises.

Earthing arrangements

TNS (earth neutral separate)

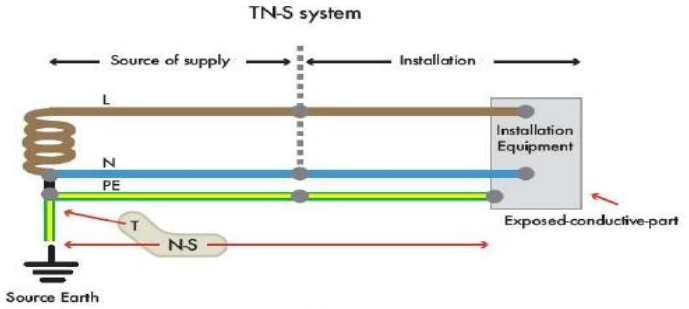
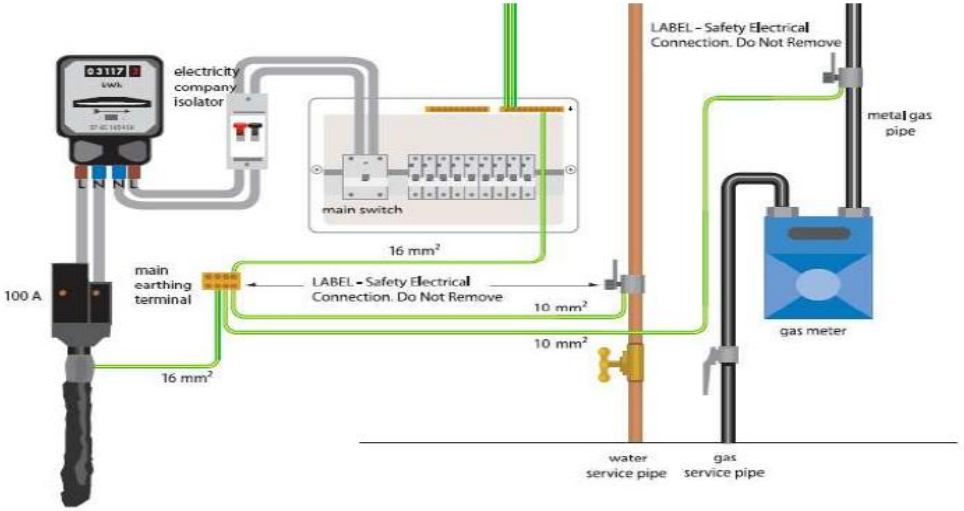
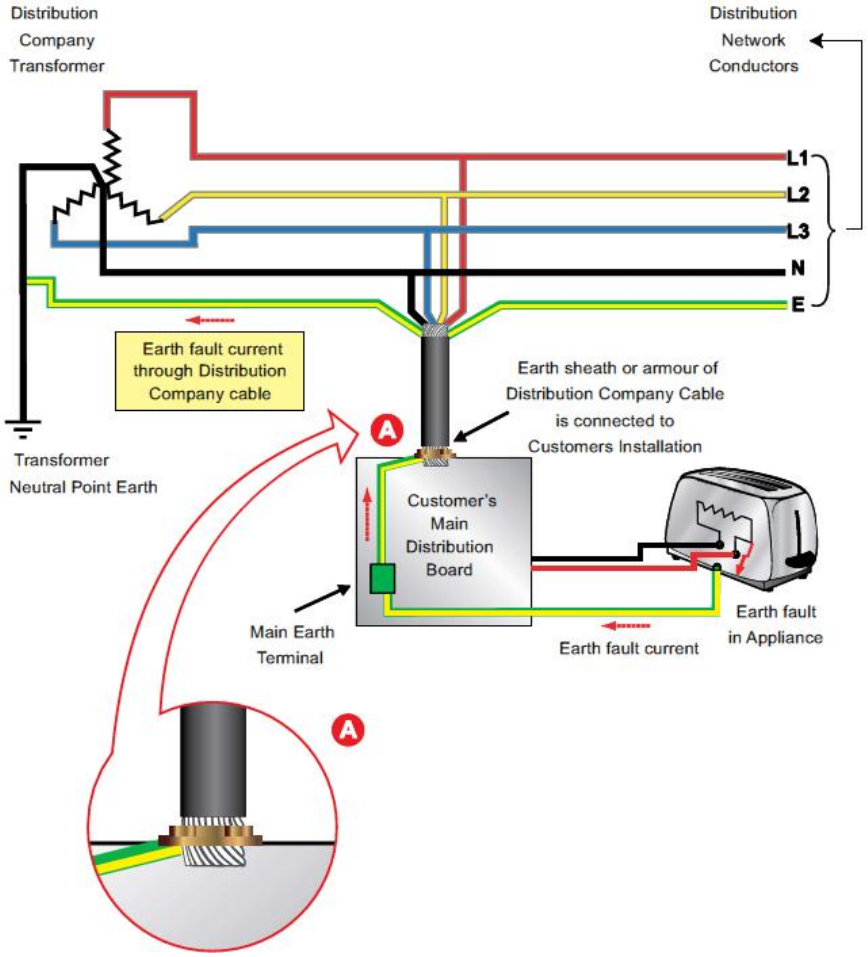


Fig 3.1 TN-S System



Earthing arrangements

Earth neutral combined – separate



Earthing arrangements

TN-C-S system grounding (earth neutral – combined - separate)

The supply neutral conductor of a distribution main connected with earth at source and at intervals along its run. This is usually referred to as protective multiple grounding (PME).

With this arrangement the distributor’s neutral conductor is also used to return earth fault currents arising in the consumer’s installation safety to the source.

To achieve this, the distributor will provide a consumer’s grounding terminal which is linked to the incoming neutral conductor.

Earthing arrangements

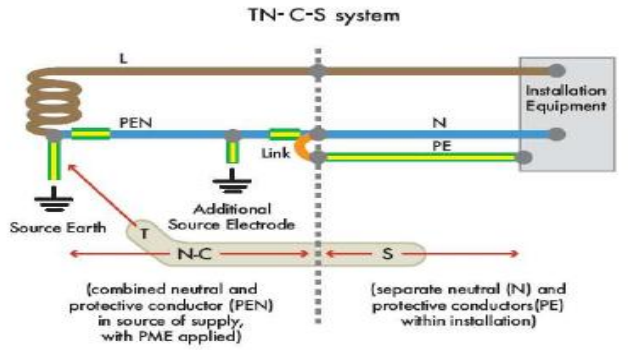


Fig 3.3 TN-C-S System

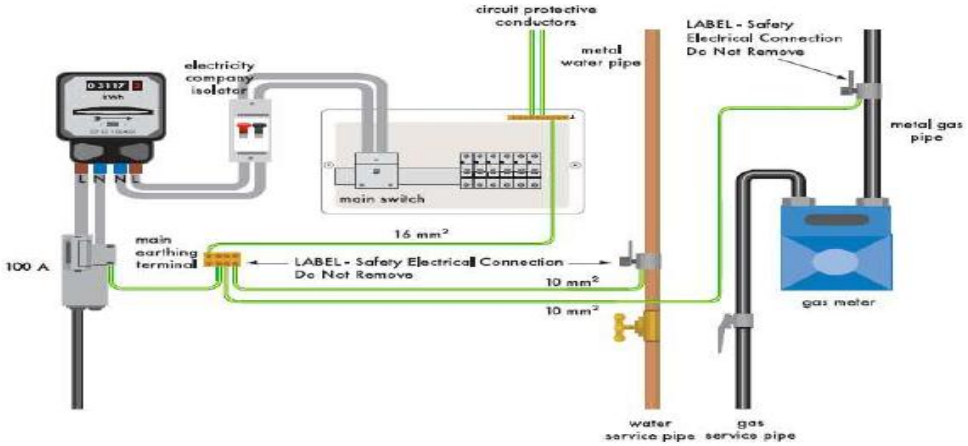


Fig 3.4 TN-C-S System Application

Product manufacturing standards

- BS EN 50164 series (linked to BS EN 62305)
- IEC/EN 62561 series (linked to BS EN 62305)

BS EN 50164 / IEC/EN 62561 series

EN 50164-1	Lightning Protection Components (LPC) – Part 1: Requirements for connection components
EN 50164-2	Lightning Protection Components (LPC) – Part 2: Requirements for conductors and earth electrodes
EN 50164-3	Lightning Protection Components (LPC) – Part 3: Requirements for isolating spark gaps
EN 50164-4	Lightning Protection Components (LPC) – Part 4: Requirements for conductor fasteners
EN 50164-5	Lightning Protection Components (LPC) – Part 5: Requirements for earth electrode inspection housings and earth electrode seals
EN 50164-6	Lightning Protection Components (LPC) – Part 6: Requirements for lightning strike counters
EN 50164-7	Lightning Protection Components (LPC) – Part 7: Requirements for earthing enhancing compounds

NOTE The above mentioned standards EN 50164 series will ultimately be replaced by EN 62561 series.

EN 50164 are being withdrawn and eventually be replaced by IEC 62561

Inspection, testing and maintenance of LPS

Maximum period between inspections (62305-3)

Protection Level	Visual Inspection (year)	Complete Inspection (year)	Critical Systems Complete Inspection (year)
I / II	1	2	1
III / IV	2	4	1

BS EN 62305 -4

Electrical and electronics system within the structure

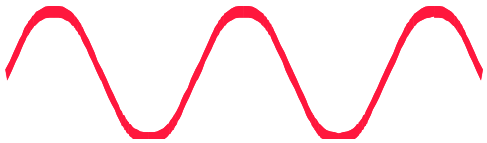


Electronic systems protection

- Disruption – loss of data, RCDs tripping
- Degradation – reduced equipment lifespan
- Components weakened- until unexplained equipment failure
- Insurance – are you covered?
- Damage – immediate loss of equipment
- Dangerous sparking – loss of life

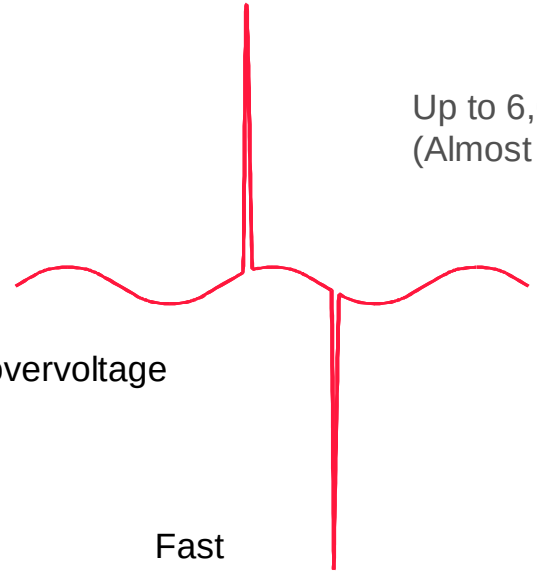
Transient overvoltage (surges)

Normal mains power supply



Large

Up to 6,000 volts
(Almost 20 times mains supply)

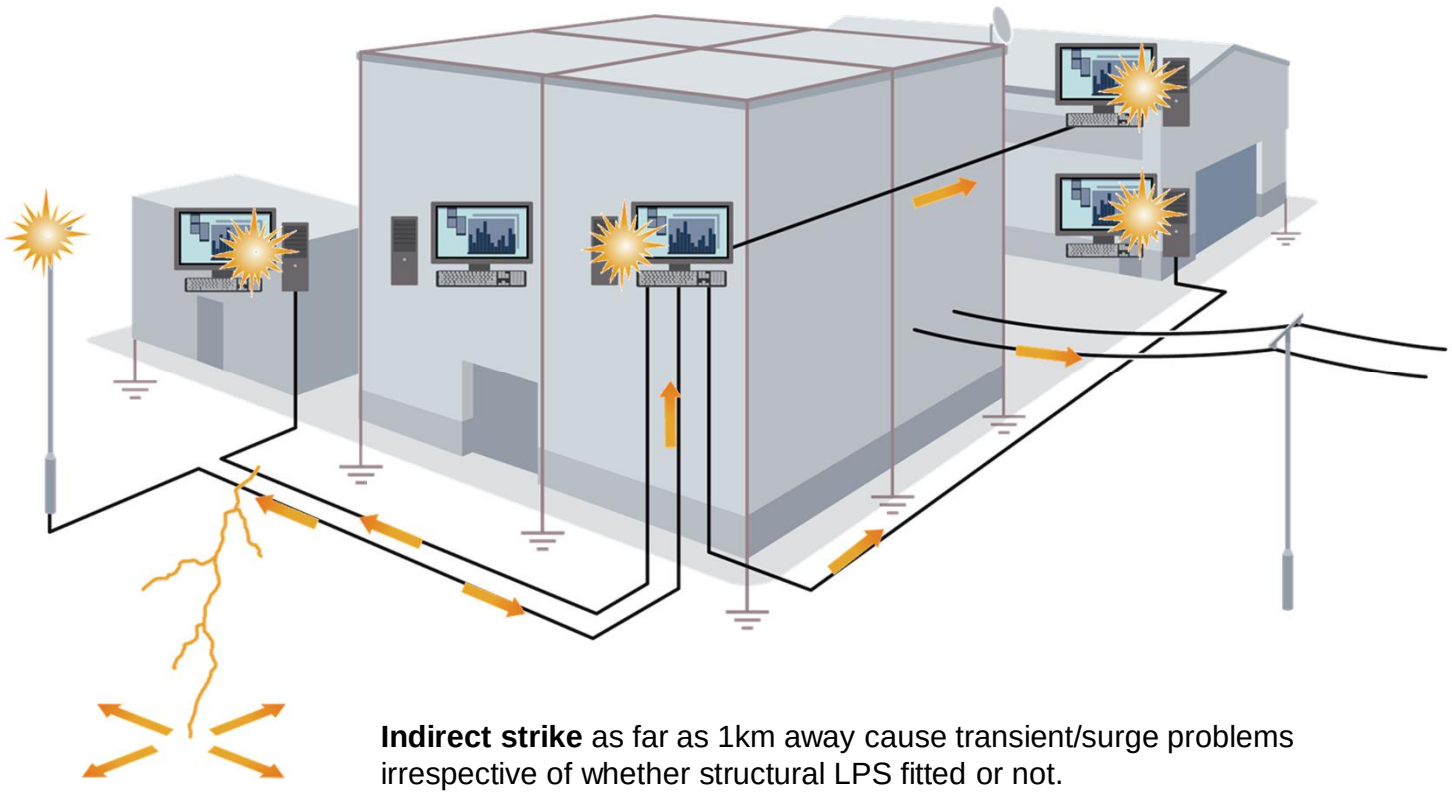


Transient overvoltage

Fast

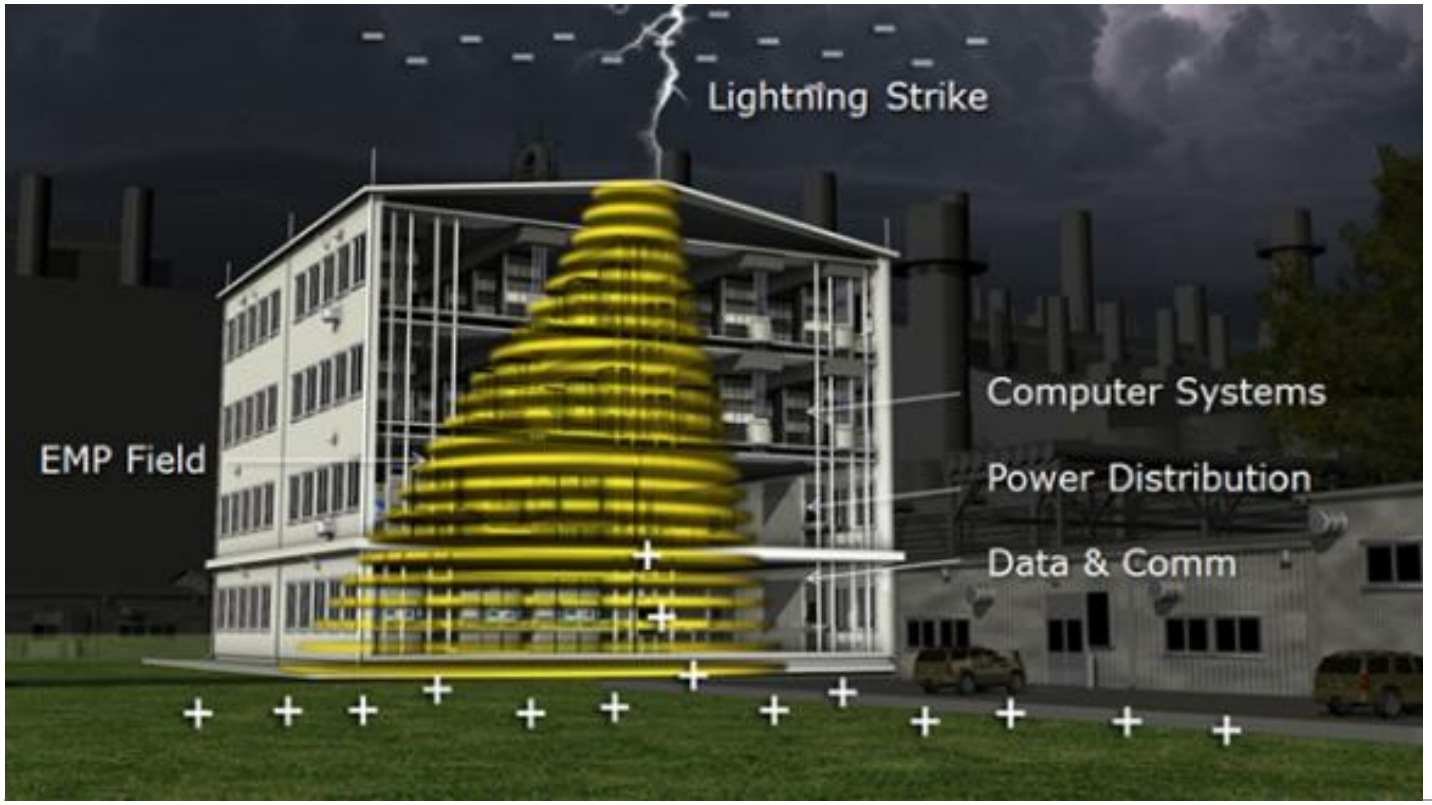
Typically 50 microseconds duration (20,000 transients per second)

Common cause of lightning transient



Indirect strike as far as 1km away cause transient/surge problems irrespective of whether structural LPS fitted or not.

Indirect effects of lightning strike



Electrical and electronic systems within structures

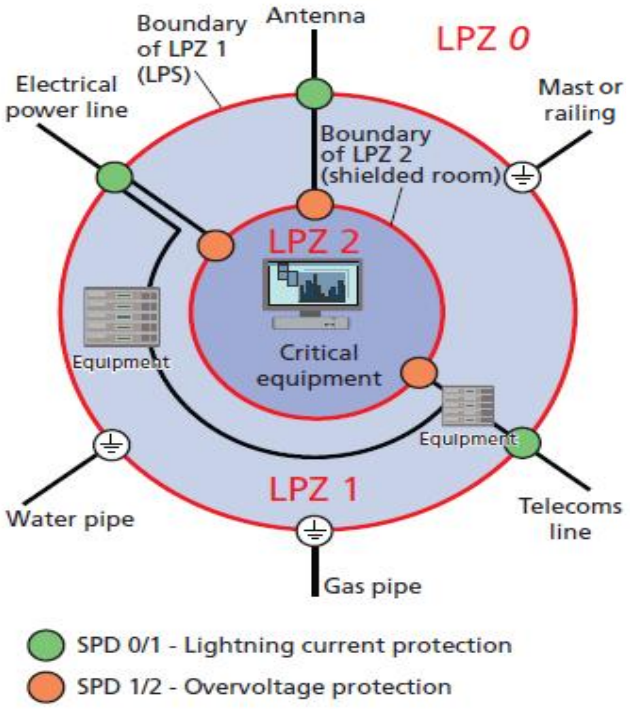
Basic protection measures in an LPMS

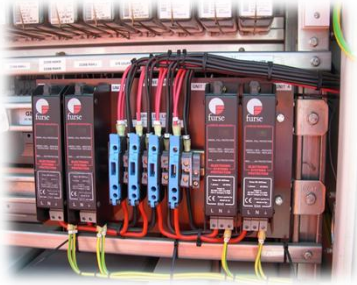
- Earthing and bonding
- Magnetic shielding and line routing
- Surge protective device set

Typical installation

Surge Protective Device set (SPD set)

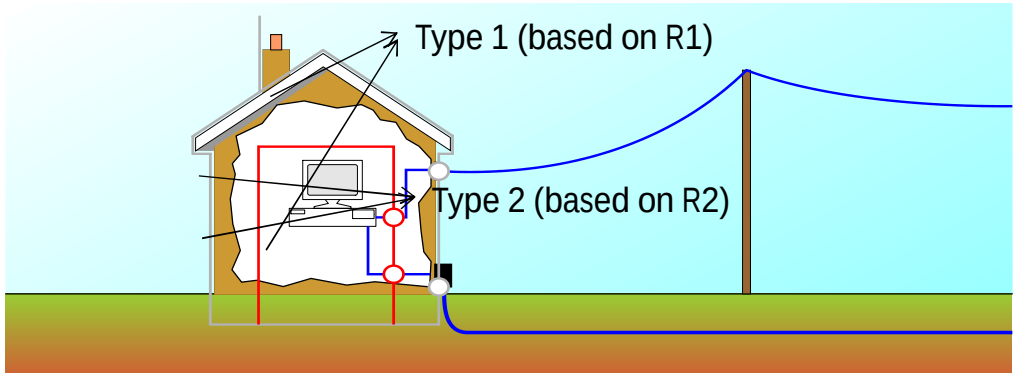
- Protection of internal systems against surges may require an SPD set consisting of a coordinated set of SPD's
- SPD shall be suitably located at :
  - Main distribution board (service entrance)
  - Sub distribution board
  - Terminal equipment

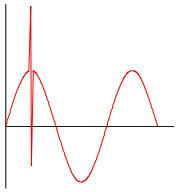




BS EN 62305-4 rotection of electronic systems

- LEMP Protection Measures System (LPMS) / SPM
- Complete system of protection measures for internal systems against LEMP





Coordinated SPDs

Series of SPDs installed in structure – from heavy duty lightning current Type I SPD at service entrance, through to overvoltage SPD protecting terminal equipment.

Each SPD should complement each other such that LEMP effects are completely nullified.

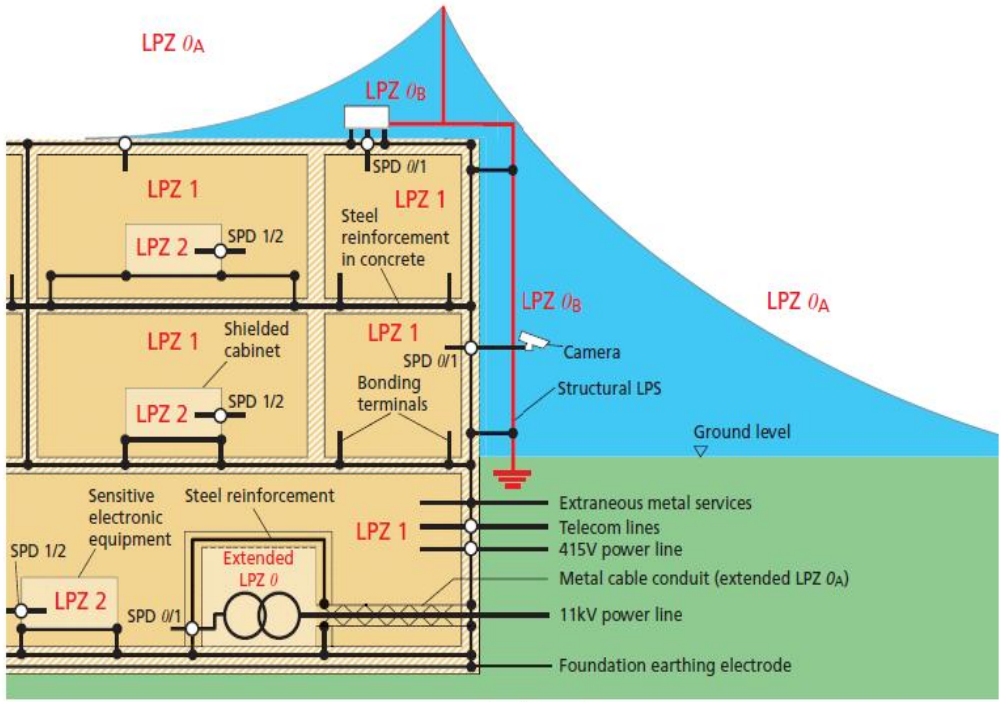
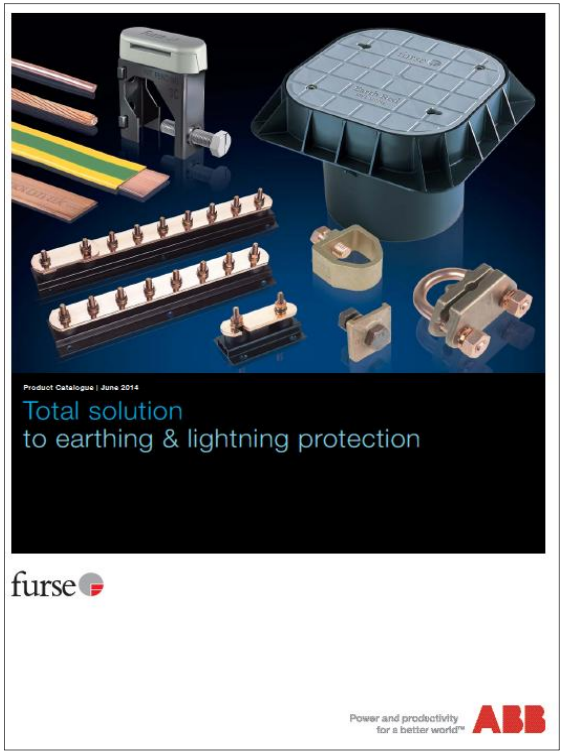


Figure 5.18: Example of a complete LPMS

All above information is an insight into the BSEN 62305 standard and requires more in-depth review.

All topics discussed today are included and expanded upon in our Guide to BS EN 62305:2011.

Thank you



https://new.abb.com/low-voltage/products/earthing-lightning-protection/furse/literature

