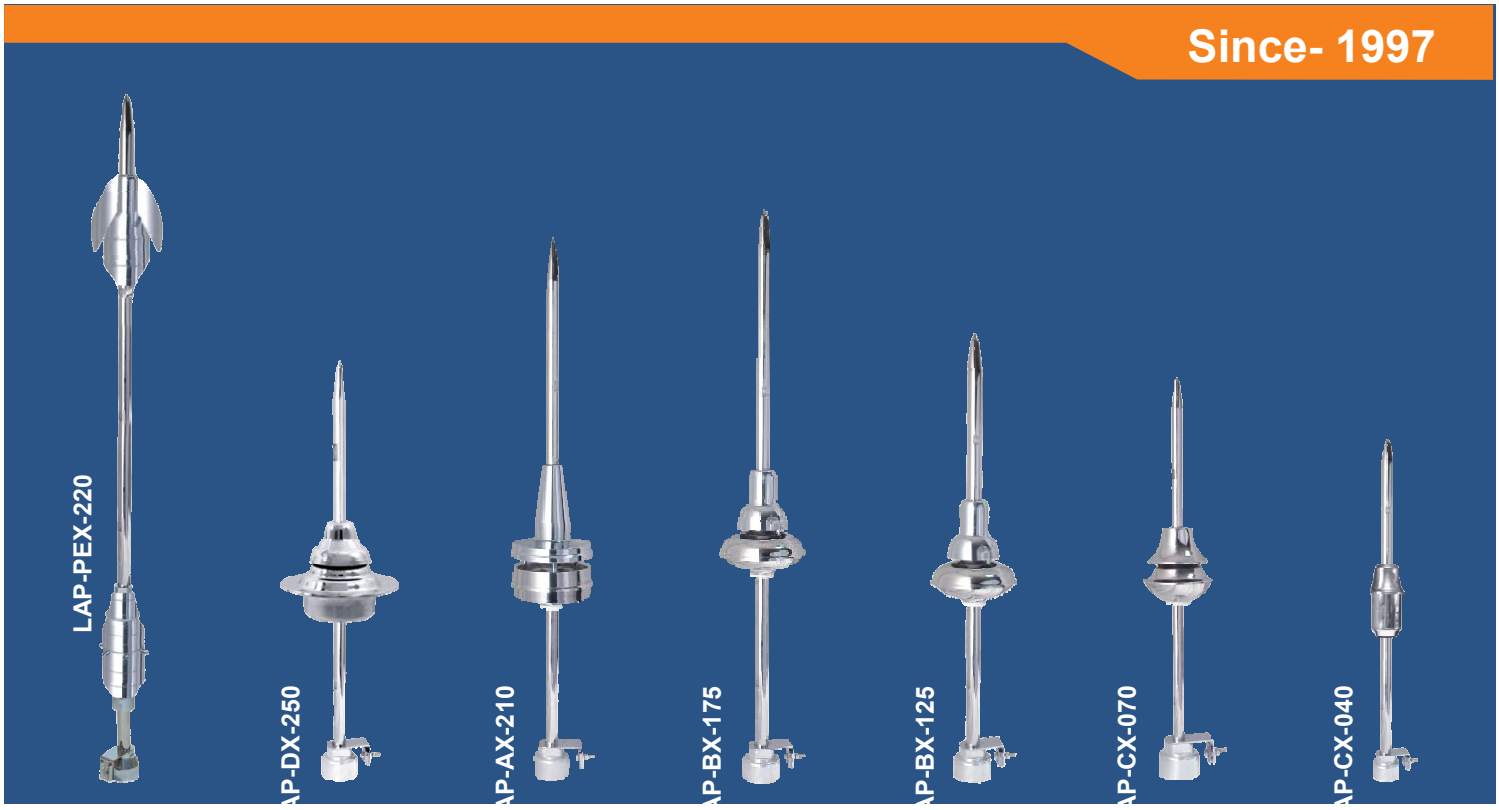
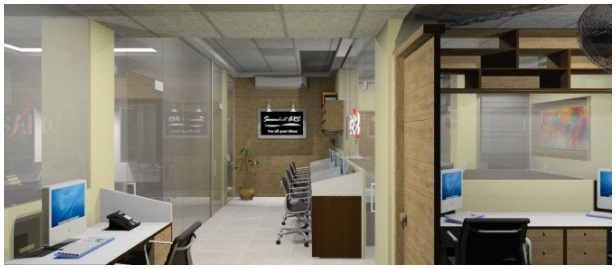
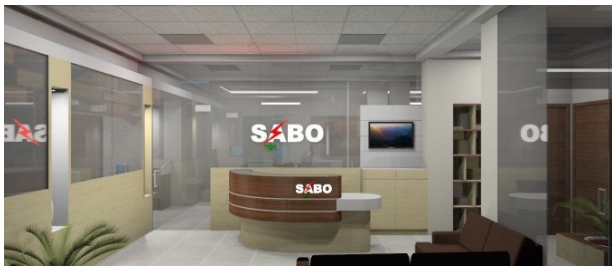
SABO

LIGHTNING, GROUNDING
& BONDING SYSTEMS

Advanced Early Streamer Emission (ESE) Lightning Conductor







INTRODUCTION

Sabo Systems Pvt. Ltd, formed in 1997, with an aim of providing safe & quality engineered products tocustomers. We have expertise in Lightning Protection, Surge Protection, Maintenance Free Earthing,equipotential bonding & Exothermic welding materials. We manufacture & provide the same, consideringlatesttechnologicaladvancements&standards.Wealwaysputatyourdisposallatesttechnology,innovateeveryday&providecustomizedsolutionsalso.

MISSION&VISION

Ourmissionistoprovideoptimum,safe&mostadvancedsolutionstoourcustomers.Weaimtobecomeareferralinthefieldof LightningProtection,SurgeProtection,Earthing&Bondingsystems.

R&D

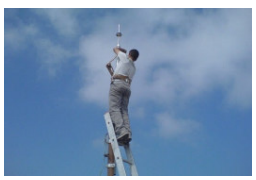
Our technical experts, engineers & researchers develops latest technology products for providing safe,efficient&costeffectivesolutions.

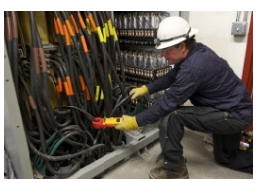
STANDARDS&CERTIFICATIONS

- NFC17-102/UNE21186
- SIGMA/METU/NABLLab
- ISO9001:2008
- IEC61643-11
- CE
- UL467
- IEEE837
- IEEE80
- IS3043
- IS2309
- CPRI

SERVICES

- SiteSurveys
- RiskAnalysis
- TechnicalAssistance
- Installation
- Verification
- MaintenanceSolutions
- Training





LIGHTNINGPROTECTION

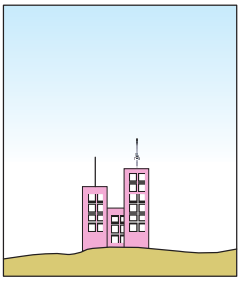
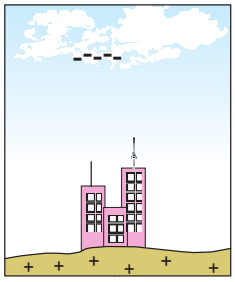
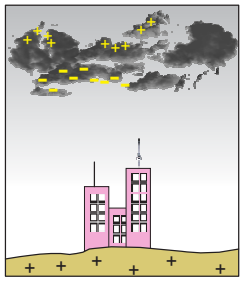
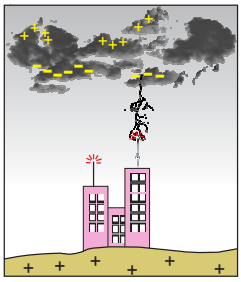
Lightning is one of the most beautiful natural phenomena to see & most disastrous one to experience.Lightningdischargemaycarrycurrentuptohundredsofkiloamperes(KA).Itmaycausedamagetohumanlife,structure,electricalaswellaselectronicequipments.Itmayalsocausefire&disruptworkingoperationsof any industry. It's been an electronic era and our dependence on electronics has been increased. Onelightning strike can destroy partially / completely all equipments installed in any establishment. Hence,protectionfromsuchnaturaldisastersfromlightningstrikeisessential.

LightningProtectionSystemhasfourbasicobjectives:

1. Tocapturelightningstrike.
2. Safelyroutingthelightningdischargecurrenttoground.
3. Provideefficientearthing/groundingpathfordissipationoflightningcurrent.
4. Removesecondaryeffectsoflightninglikeovervoltages/surges.

LIGHTNINGFORMATION

In normal conditions, atmospheric charges are balanced, but cloud formation creates charge polarization. Insuchcase,normallylowerpartofcloudgetsnegativelycharged,inducingthepositivechargeatthegroundor other elements on ground. Electric field at the atmosphere can reach in kilovolts(KV). Positive charges aremore evident at pointed and metallic objects or well earthed objects & trees. When electric field becomeshigh then cloud starts discharging towards ground, which results in downward leader. Similarly, metallicparts / structure where positive charges are present, starts moving upwards forming an upward leader.These upward and downward leader when meet may result in lightning discharge to ground. Such highcharged metallic part may struck by lightning. This discharge moves down to earth through most direct path.Hence,ifthispathisnotcontrolledthendisastersmayhappen.However,lightningdischargescanbebothpositiveandnegative.

EFFECTSOFLIGHTNING

- ThermalEffect–Excessiveenergyinlightningdischargemaycausefire.
- ElectrodynamicEffect–Damagetostructure.
- ElectricalEffect–
  Equipmentmaydamage.Duetoincreaseingroundpotential,surgecurrentsmaydamageequipmentsconnectedtoelectricalnetwork.
- InductiveEffects–
  Duetoelectromagneticfield,currentsmaycoupletoallconductors&maydamageequipmentsconnectedtoit.
- Effectsonlivingbeings–Electrocution,burnsorevenlossoflife&mayleadtocardiacarrestalso.

Damageduetolightningmaybehighintermsoflossoflife,fire,equipmentsfailure,lossoftime,&production.Hence,protectionfromdirectlightningstrikeismust.





StandardforESELightningProtectionSystem

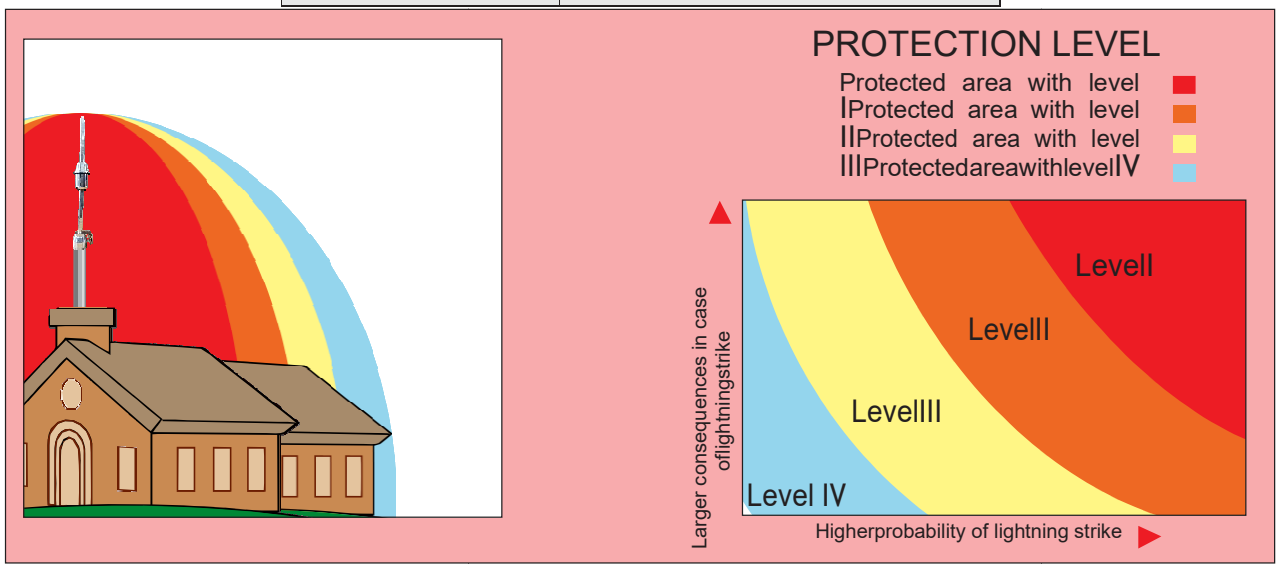
OurLightningProtectionSystemisdesignedasperNFC17-102,UNE21186&othernationalstandards.AbovestandardsconsiderLightningProtectionSysteminfollowingcases:

- Importantmonuments/archaeologicalbuildings.
- Structuresoccupiedbylargenumberofpeople.
- Equipments/machinesusedforproduction/workingsystem/hospitalsetc.
- Highrisebuildings.
- Isolatedstructures.
- Areaswithhighlightningdensity.
- Buildingscontainingflammablematerial/explosives.
- Buildings/structureswhichcomesunderriskindexasperstandards.

Procedure for risk analysis is also described in above standard & should be followed in selecting& design ofLightningProtectionsystem.Riskassessmentdeterminestheneedoflightningprotectionsystem&degreeofsecurity/levelofprotectionrequired.

Levelofprotection/riskanalysis:NFC17-102standardshavementioned4levelsofprotectionbasedonriskoflightningstrikeonaparticularstructureasLevelI, LevelII,LevelIII&LevelIV

Efficiency	LevelofProtection
>0.98	LevelI+Additionalmeasures
>0.95&≤0.98	LevelI
>0.90&≤0.95	LevelII
>0.80&≤0.90	LevelIII
≤0.80	LevelIV



Accessing the risk of Lightning Protection System is based on lot of factors, however, it is recommendedto opt Level Iprotection level.

SABOLIVAADVANCEDESELIGHTNINGCONDUCTOR

WehavedevelopednewAdvancedActiveLightningconductorbasedonEarlyStreamerEmission(ESE)technology. The main feature of our ESE air terminal is generation of an upward leader before any otherobject within its protection area at correct time. So, when downward leader approaches the ground /structure,upwardleaderinterceptsthesameandroutethesametoearth.Thisearlydischargeofupwardleader is called advance time / advance triggering time or ∆t. This is average gain in upward leader triggeringtimecomparedtoaconventionallightningrod.Advancetriggeringtimedeterminestheprotectionradius ofeach terminal. If ∆t is more, then the distance at which downward leader is intercepted increases thusavoidingstrikeinwiderarea.

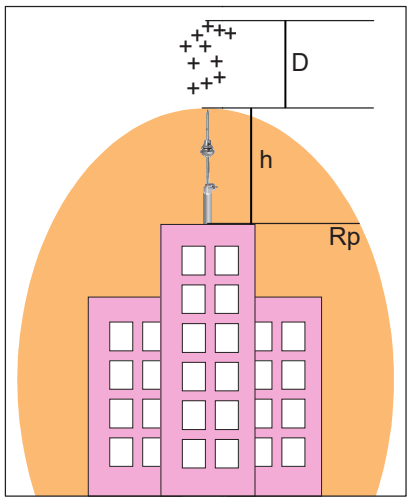
SABOLIVAESELightningconductorarealsotestedinaccordancewithNFC17-102forshortcircuittestof100KA from SIGMA HV Lab, temperature test of -40°Cto +120°C for its suitability for all environmental&climaticconditions,CEcertified&marked&carriesuniqueserialnumber.Ourlightningconductor alsocarry30yearswarranty.

NFC17-102hasgivenupperlimitvalueof∆tas60µsforcalculatingprotectionradiusoflightningconductor,butthosefoundh igherintestingarebetterandprovideshighsafetyfactor.
BelowaredetailsofadvancetriggeringtimeofvariousmodelstestedinLaboratory:

Model No	∆t(µs)
LAPCX 040	22
LAPCX 070	31
LAPBX 125	40
LAPBX 175	60
LAPAX 210	82
LAPDX 250	96
LAPPEX 220	136

ProtectionRadius

ProtectionradiusofESEairterminalisrelatedtoitsheight (h) relativetothesurfacetobeprotected,toitsefficiency&sele ctedprotectedlevel.Protectionradiuscalculationformulais:
Rp= √ 2h(2D-h)+∆L(2D+∆L)



Where,Rp(m)=ProtectionradiusatgivenHeight
H(m)=HeightofESEattipoverthehorizontalplanethroughthefur thestpointofobjecttobeprotected.
D(m)=20mforLevelI
30 m for Level II45 m for Level III60mforLevelI V
∆L=Distancetocatchlightninging∆tperiod=∆t
∆t=Advancetriggeringtimeinmicroseconds.

Exampleforcalculatingprotectionradiusasperaboveformula.Valueof ∆tforLAPBX175obtainedis60µs,∆L=60m

AssumingLevelIprotection,D=20m,Height(h)=5mRp = √ 2h(2D-h)+∆L(2D+∆L)
= √ 2x5(2x20-5)+60(2x20+60
=79m

NFC17-102-2011haslimitedhighervalueof∆tas60µs.Hence,conductorswithhigher∆tvaluesshouldbeconsideredas60µs&accordin glytheirprotectionradiuswillbelimited.

PHYSICALPROPERTIES LAP-CX 040

Model No.	Size&Weight	Package Size	∆t Early StreamerWarningTi me (AccordingtoNFC17-102-2011standard)	ProtectionRadius(M) (AccordingtoNFC17-102-2011standard)(At 5m height)			
				Level 1	Level 2	Level 3	Level 4
LAP-CX040	Length:70cm Net weight: 2.30kgGrossweight:2 .90kg	13x13x70cm	22 µsec	39	46	54	61

PHYSICALPROPERTIES LAP-CX 070

Model No.	Size&Weight	Package Size	Δt Early StreamerWarningTime (AccordingtoNFC17-102-2011standard)	ProtectionRadius(M) (AccordingtoNFC17-102-2011standard)(At 5m height)			
				Level 1	Level 2	Level 3	Level 4
LAP-CX070	Length:70cm Net weight: 2.40kgGrossweight:3 .10kg	13x13x70cm	31 µsec	49	56	65	72

PHYSICALPROPERTIES LAP-BX 125

Model No.	Size&Weight	Package Size	Δt Early StreamerWarningTime (AccordingtoNFC17-102-2011standard)	ProtectionRadius(M) (AccordingtoNFC17-102-2011standard)(At 5m height)			
				Level 1	Level 2	Level 3	Level 4
LAP-BX125	Length:80cm Net weight: 4.20kgGrossweight:4 .60kg	17x17x80cm	40 µsec	58	65	75	84

PHYSICALPROPERTIES LAP-BX 175

Model No.	Size&Weight	Package Size	Δt Early StreamerWarning Time (AccordingtoNFC17-102-2011standard)	ProtectionRadius(M) (AccordingtoNFC17-102-2011standard)(At 5m height)			
				Level 1	Level 2	Level 3	Level 4
LAP-BX175	Length:100cmNet weight:4.80kg Grossweight:5.50kg	17x17x100cm	60 µsec	79	88	99	107

PHYSICALPROPERTIES LAP-AX 210

Model No.	Size	Package Size	Δt Early StreamerWarningTime
LAP-AX 210	Length:100cmNet weight:5.00kg Grossweight: 5.70kg	17x17x100cm	82 µsec

PHYSICALPROPERTIESLAP-DX250

Model No.	Size	Package Size	Δt Early StreamerWarningTime
LAP-DX250	Length: 70cm Net weight: 5.00kgGrossweight:5 .70kg	25x25x50cm	96µsec

PIEZOELECTRICESELIGHTNINGCONDUCTOR

PHYSICALPROPERTIES LAP-PEX 220

Model No.	Size	Package Size	Δt Early StreamerWarningTime
LAP-PEX220	Length: 150cmNetweight :15kg Grossweight: 16.5kg	16x16x160cm	136µsec

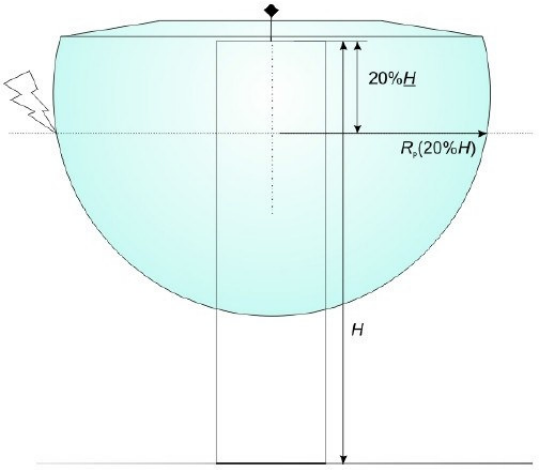
New advanced active 3rd generation Piezoelectric + ESE lightning conductor which has additional sixpiezoelectriccrystalsalongwithiongeneratorsthatgeneratesmorechargesincontrolledtime&emitswithgreaterspeedtoahigheraltitude,thatinterceptsdownwardlightningleaderatsuchhighlevels,providinglargerprotectioncoverageradius.

Selection&PositioningofESEAirTerminal

Selection of ESE air terminal should be made considering protection radius desired & risk of lightning strikei.e.,levelofprotection.

Positioning ofESEairterminal shouldbedone considering:

- Minimum 2m above the highest point of structure including aerials, air conditioning towers, tanks,dome,parapet,etc.
- Architecturalview
- For protecting open areas like sports field, golf courses, swimming pools, campsites, etc. ESEshouldbeinstalledoverspecificplacessuchaslightingmasts,polesoranyothernearbystructurethat allowsittocoverthewholearea.

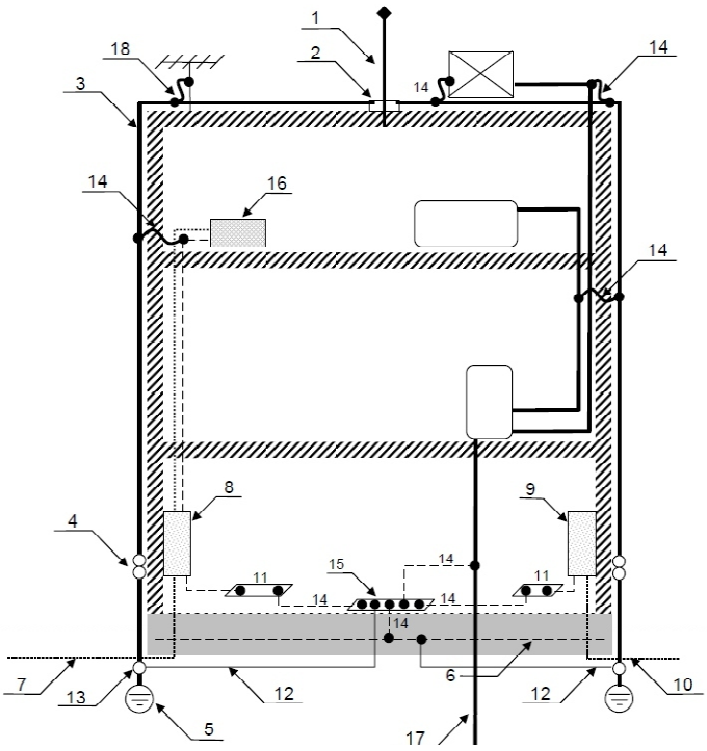


For buildings higher then 60m or any other point morethan 120m, protection against lateral lightning strikeshould be considered. For such buildings, top 20%heightofthestructureshouldbeprotectedbyinstalli ngESEairterminalateachwall.ESEoneachsuchwallsh ouldbeconsideredhavingradiusof protection≥20%heightofthebuilding.Also,minimum 4 down conductors interconnected by a ring conductor along the perimeter should be used &earthedforsuchhighrisebuildings.

Protectionofbuildingsrequiringlevelofprotectionl+additionalmeasures

For higher degree of protection more than Level I, apart from using ESE air terminal based on Level I, allmetal parts & reinforced bars of buildings used as down conductors should be connected to ESE / downconductoratrooflevel&groundlevel.Also,ringconductorsmaybeusedatrooflevel&groundlevel.
For buildings, where lightning strike occurs more often, protection radius of ESE air terminal shall beconsideredas40%lesserthantestedconsideringadditionalsafetyfactor.

LIGHTNING PROTECTION SYSTEMALONG WITH EQUIPOTENTIALBONDING



1. OneormoreESEAirTerminal
2. Connectioncomponent
3. Oneormorespecificdown-conductors
4. Atestjointforeachdownconductor
5. Oneearthterminationforeachspecificdownconductor
6. Foundationearthelectrode(earthingofthestructure)
7. Electric powercable
8. MainelectricpowerdistributionboxwithSurgeProtectionDevice(SPD)
9. MaintelecomdistributionboxwithSPD
10. TelecomcablewithSPD
11. Oneormoreequipotentialbondingbars
12. Oneormoreequipotentialbondingsbetweenearthterminations
13. Disconnectablebondingdevice
14. Oneormoreequipotentialbondings(directorthroughanIsolatingSparkGap)
15. Mainearthingbar
16. Electricequipment
17. Metallicpipe
18. Oneormoreequipotentialbondingsthroughasparkgapforaerialmast

DownConductor

Function of down conductor is to conduct lightning current from the air terminal to the earth terminationsystem. They should preferably be placed at the external part of the structure. For a non isolated ESEsystem, at least two down conductors should be used. For better current distribution the two paths to groundshould be situated on two different facades, unless unavoidable. For an isolated ESE system, one downconductorissufficient.

Incaseofpylons,mast,chimneys&othermetallicstructures:

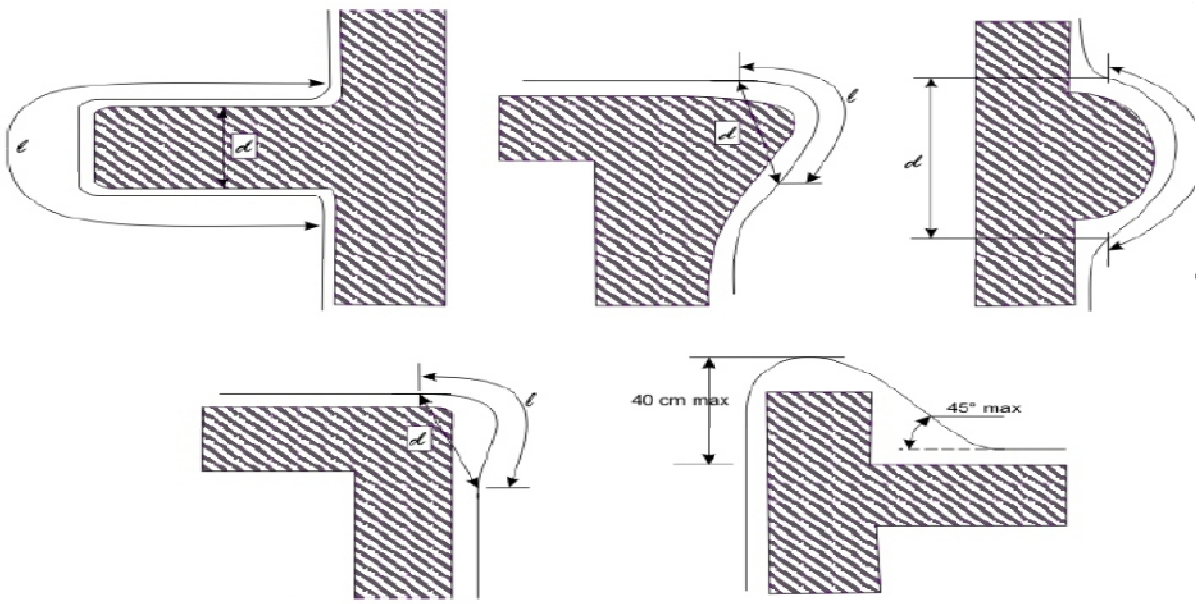
- Ifstructurefulfilstherequirementfornaturalcomponents*,thenmaybeusedasfirstdownconductor.
- Ifstructureisisolateditmaybeusedasonlydownconductor.
- Ifstructureisnonisolated,itcanbeusedasonedownconductoronlyifit'ssectionis100sqmmormore.

*Naturalcomponentsareexternalsteelstructurehavingminimum2mmthicknessifitispipe,resistanceof ≤0.1Ω, not coated with insulating material with more than 0.1mm coating and cross sectional area of 100sq.mm.Downconductorshouldbeofminimum50sq.mm.copper.Itispreferredtousecopperstripinsteadofcopperwireof8mmdia,ascopperstripsurfaceareaishigher.25x2mmor25x3mmcopperstrip/tinnedcopperstripasdownconductor.

Routingofdownconductor

Down conductor should be routed through straight & shortest path. Sharp bends or upward sections areavoided. Bend radii should be 20 cm or more. Bends formed edge wise should be used. They should not berouted along or through electrical duct or conduits. Routing down conductor through parapet wall or cornicesorobstaclesshouldbeavoided.

Kindlycheck below figure for down conductor bend shapes.



l = length of
loopd=widthof
loop
Note:d>l/20foravoidingriskofanydielectricbreakdown.

TestJoint

Each down conductor should be provided with test joint todisconnect the earth termination system for measurements.These test joints are usually installed at the bottom of downconductors.Whendownconductorsareinstalledonmetalwallsorwhenspecificdownconductorisnotprovided,testjointsareinserted between the earthing system & metallic part of thestructure. If test joints are installed below the ground level,inspectionpitcovershouldbeprovided.

LightningEventCounter

ItisusedtogetcountsofnumberoftimeslightninggetsdischargedtoearththroughESEsysteminstalled.Itshould beinstalledatmostdirectdownconductoreyelevelabovetheground.Itshouldbewaterproofandweatherproof (IP65/IP67),nonresettableandof6digits.

We have developed **Lightning Counter with Email / SMS Facility** also. Testable version of lightningcounterisalsoavailable.

Specifications:

- CountingRange: 0 to 999999
- Dischargecapacity:Above1KA
- Degreeofprotection:IP65
- Workingtemperature:-30^{0}Cto+80^{0}C
- Shouldbeinstalledpreferablyatapprox.1. 5meter/eyelevelfromtheground.

ModelNo.

- LSC-LX01
- LSC-LX01-EwithEmailfacility
- LSC-LX 01-Swith SMSfacilitv

Specifications:

- CountingRange: 0 to 999999
- Dischargecapacity:Above0.35KA
- Degreeofprotection:IP67
- Workingtemperature:-20^{0}Cto+60^{0}C
- Shouldbeinstalledpreferablyatapprox.1. 5meter/eyelevelfromtheground.

ModelNo.:LEC-D

LIGHNINGCONDUCTORTESTER

Ouralllightningconductors&testablelightningcounterare testable through an external digital tester ModelLLCT-D1

EQUIPOTENTIALBONDING

Duringthedischargeoflightningcurrentfromlightningairterminaltoearth,dangeroussparkmayoccurbetweenLightningprotectionsystem&followingcomponents:

- Metalinstallations
- Internalsystems
- Externalconductiveparts&linesconnectedtothestructure

These sparks may be avoided by bonding / interconnecting lightning protection system with structuralmetallic parts, metal installations, internal systems, external conductive parts & lines connected tostructures.Whenlightningequipotentialbondingisestablishedtointernalsystems,partoflightningcurrentmay flow into such systems which should be protected through surge protection devices. Hence, surgeprotectiondeviceshouldalsobebondedlightningprotectionearthing.

LightningequipotentialbondingforanisolatedESEsystemshallbeestablishedatgroundlevelonly.

FornonisolatedESElightningprotectionsystem,Lightningequipotentialbondingcanbedoneatfollowingplaces:

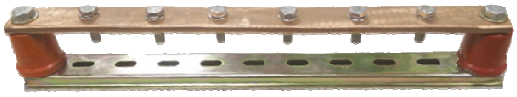
- GroundLevel/Basement–Bondingconductorsshouldbeconnectedtoabondingbusbar,whichshould be connected to earth termination system. Such bus bar should be installed at intervals ofapprox20mtralongthelengthofbuildingforkeepingbondingconductorsasshortaspossible.
- Incaseswhereinsulationrequirementsarenotfulfilled,allmetallicconductors/waterpipeelectricalequipments / data or power cable should be kept at a distance of 2 m or more from down conductor &gasconnectionshouldbemorethen5mawayfromdownconductor.Forsoilswithresistivitygreaterthen 500 Ω-m the minimum distance between earthing / down conductor and electrical conduit /metalshouldbekeptas5m.

16 sq.mm.copper wire should be the minimum cross section area of bonding conductor for connectingexternalmetallicparts&bondingbusbartoearthtermination/earthingsystem&6sq.mm.copperwireforinternalmetallicpart/installationstobusbar.

For external conductive parts, lightning equipotential bonding shall be made at the entry point of that partinto the structure. Equipotential bonding may also be achieved by Isolating Spark gap surge protectiondevices.

Ifinternalequipmentsarescreenedorlocatedinametallicconduit,thensuchmetallicconduitshouldbebondedwithequipotentialbasbar.

If internal equipments are not screened / located insidemetal conduits, then they shall be bonded via suitableSPD's. In TN systems, PE & PEN conductors shall bebonded to ESE system directly with a surge protectiondevice



EarthTerminationSystem

EarthingShouldbeprovidedateachdownconductor.Minimum2to3electrodesareusedforeachdownconductor. Certain contact surface with soil should be assured in order to dissipiate lightning current in ashort time.For lightning protection system, copper bonded earth rod of 3 mtr length & of cross sectionalarea ≥ down conductor size (preferably between 12 mm dia to 17.2mm) is used with minimum copperbondingthicknessof250microns.Spacingbetween2electrodesshouldbekeptasminimum3m&joined bycopperstripofsamesizeasdownconductor.

Earthresistanceforlightningprotectionshouldbekept<10Ω.

Earthresistanceenhancementcompounds(non-corrosive& high conductive) SABO-EREC shall also be used alongwithearthelectrodesforgettinglowearthresistancevalu esper earth pit as well as for better dissipation of lightningdischargeandfaultcurrents.

Earth electrodes should be laid horizontally below 0.5m incase of hard soils / places where vertical driving of rods isdifficult.

EarthPitCover

Features:

- Factorybuiltholesforaccessingstrips/wireseasilyattwoside
- Madeofheavy–dutypolyethyleneforextradurability
- Resistantmaterials
- Longservicelife
- Greentopcapmatchestheenvironment
- Non breakablefor loadupto5000kg

Specifications:

- AtTop:260mm
- AtBottom:345mm
- Height:275mm

Specialmeasures

An aerial on the roof of a building increases the lightning stroke probability and is the first vulnerable elementlikelytoreceivethelightningdischarge.Theaerialsupportmastshouldbeconnecteddirectlyorthroughas urgeProtectionDeviceoranisolatedsparkgaptothelightningprotectionsystemwithasuitableconductor,unlesst heantennaisoutsidetheprotectedareaoronanotherroof.Thecoaxialcableshouldbeprotectedwithasurgeprote ctivedevice.

Acommonsupportmastmay beusedunderthefollowingconditions:

- theESEAirTerminalisfixedtothetipofthemast;
- theESEAirTerminaltipisatleast2mabovethenearestaerial;
- thedown-conductorisfixeddirectlyontotheairterminalwithaclamp;
- the aerialcoaxialcableisroutedinsidethe antennamast.

Incaseofatrestletower,itispreferabletoroutethecoaxialcableinsideametaltube.

Flammableandexplosivematerialstorageareas

Tanks containing flammable fluids should be earthed but such earth connection may not provide adequateprotectionagainstatmosphericdischarges.Athoroughadditionalsurveyisthereforenecessary.ESE AirTerminalsshouldbeplacedatasafedistanceof5mormorefromsuchareashigherthantheinstallationstobe protected. If it is possible down-conductors layout should alsobe outside such area. When it is notfeasible,specialcareshallbeconsideredtoavoidelectricalarc.

Earthterminationsystemsshouldbeorientedoppositetothestorageareas.

Religiousbuildings

Steeples,towers,minaretsandbelfriesarepronetobeingstruckbylightningbecauseoftheirprominence.

Themainprominence(s)shouldbeprotectedwithESEAirTerminalsconnectedtothegroundbyadirectdown-conductor routed along the main tower. When the main prominence (s) is higher than 40 m, it isrecommended that the second specific down- conductor should follow the nave ridge. In case the end of thenaveisfittedwithanon-metalliccrossorstatuethensuchobjectswillbeprovidedwithanairterminal.

Both ESE System earth termination systems and the electric earthing should be interconnected by an earthconductor.

Some religious buildings have electric bells. The electrical power supply must be protected against overvoltagesusingsurge protectivedevicesaccording toNFEN 61643-11and CLC/TS61643-12.

SURGEPROTECTIONDEVICE(SPD)

It's been an electronic era and our dependancy on electronic equipments has been increased. These equipments are highlysensitive to surges or spikes. Surge enters to any structure or network system through lightning discharges and switchingoperationsofheavyloads,etc.Theymayenterthroughanyconductorlikepowercables,signalandtelecomcables,water,gas,firepipelines,structurereinforcements,etc.eitherdirectlyorindirectly.Protectionofsuchequipmentsfromsuchhazardoussurgesaremustorelseourequipmentsmayget0damage.Thesemaybeprotectedbyprovidingfollowingsurgeprotectiondevices:

SPDconnectedtoLVpowersupplysystemsupto1000V

- Type1/ClassBSPD–Lightningcurrentarresters
- Type1and2SPD–B+Ccombinedarresters
- Type2/ClassBSPD–Surgearresters
- Type 3 / Class D SPD – Overvoltage protection forequipmentsoperatingupto5V/12V/24V...upto230VAC/DC
- Isolatingspark-gap

SPDconnectedtoinstallationsofphotovoltaicsystemsupto1200V

- Type1and2/ClassB+CSPDforphotovoltaicsystems
- Type2/ClassCSPDforphotovoltaicsystems

SPDconnectedtodata/signal/telecommunicationnetworks

- Surgeprotectionformeasurementandcontrol,securityand
- firealarmsystemsandtelecommunications
- SurgeprotectionforEthernetandvideolines
- Lightningarrestersandsurgeprotectionforcoaxiallines

Industry

Commercial buildings use very sophisticated systems prone to abnormalities caused by overvoltage in the power system and signal lines. Our products minimize shutdown time of productiontechnologiesandsubsequentfinanciallosses.

- Protectionof230/400Vpowersystem
- Protectionofpowersystemupto1000V
- Protectionofaccesssecurityandfirealarmsystems
- Protectionofsignalandcommunicationlines

Buildings

Bothresidentialandcommercialbuildingsfeatureagreatnumberofsensitivetechnologiesandappliances. Our products considerably increase their reliability and, consequently, greatlyimprovetheusercomfortofsuchbuildings.

- Protectionof230/400Vpowersystem
- Protectionofaerialsystems
- Protectionofaccess,securityandfirealarmsystems,CCTV,telecommunicationslines,datanetwork,etc.
- Protectionoftechnologicalfacilitiesinbuildings(heating,airconditioning,etc.)

Photovoltaic(PV)systems

PVsystemsmustwithstandweatherconditionsastheyarelocatedinhighlyexposedplaces.Ourproductsensurethebestpossibleprotectionagainsttemporaryovervoltagetoprovidetrouble-free operation throughout their working life. Protection of PV power plants/PV technologies forresidentialhousesandforfactories/OffgridPVtechnology.

- ProtectionofDCandACside
- Protection of signallines

Antennasandtransmitters

Located in rather exposed places, receiving and transmitting systems must withstand harshatmospheric conditions during their working life. Our products ensure the best possibleprotection of technologies against lightning strikes and induced overvoltage and thus theysignificantlyincreaseoperationalreliabilityoftechnologiesontransmissionroutes.

- Protectionof230/400Vpowersystem
- Protectionofaerialdownconductors
- Protectionofcommunicationlines

Datacentres

Intheeraofinformationtechnologies,datacentresandserverroomshavebecomeaninevitablepartoflifeandcollecteddataareofvitalimportance.Inaccessibilityorcompletelossesofdatacanhave catastrophic consequences in both industrial areas and everyday life. Our products canprotectthemandpreventtechnicalproblemsandfinanciallosses.

- Protectionof230/400Vpowersystem
- Protectionofsignalandcommunicationlines

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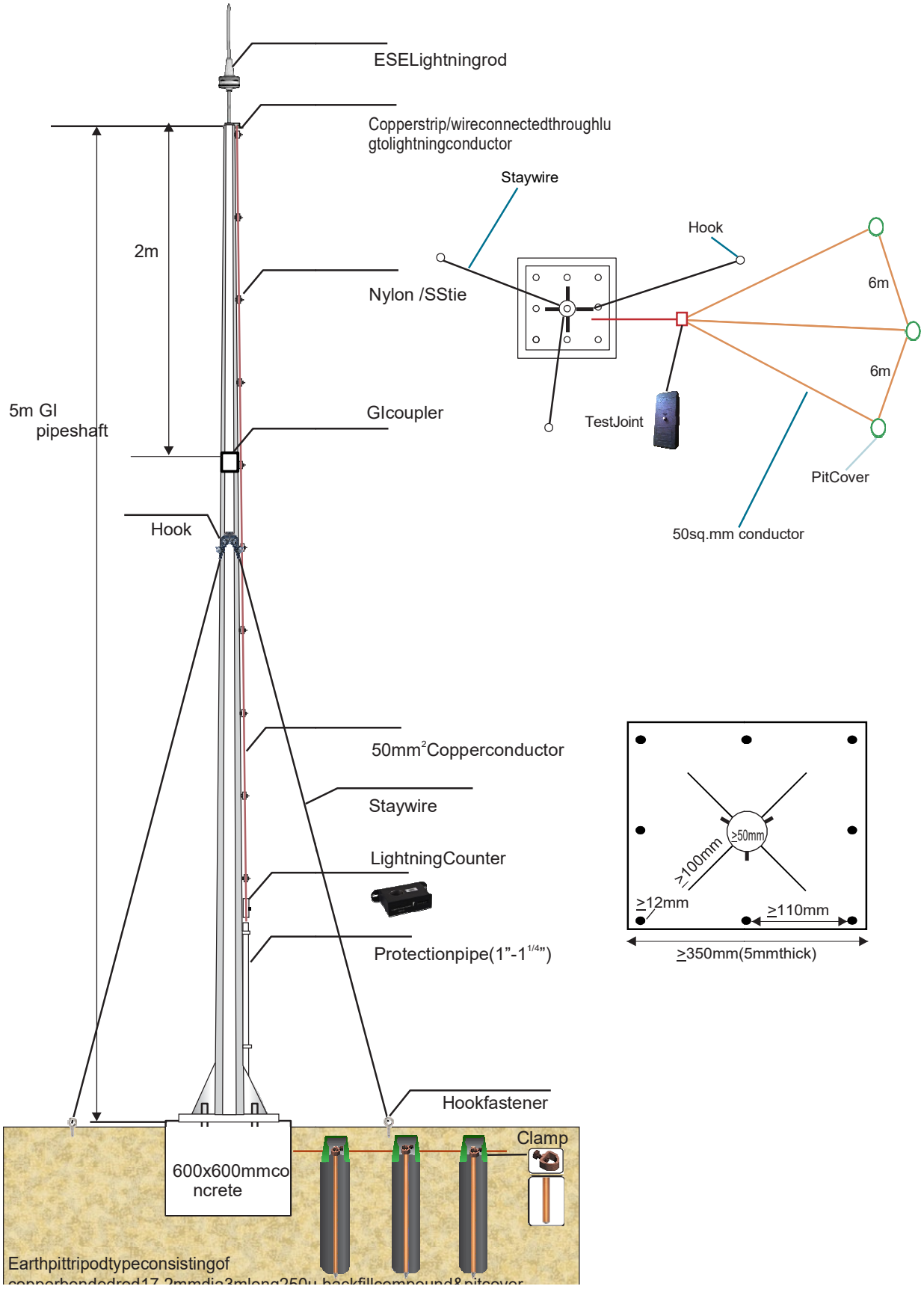
Oilandgaspipelines

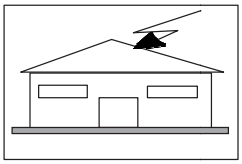
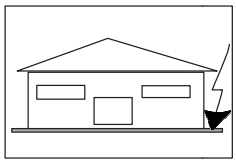
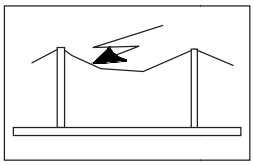
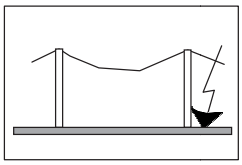
Verylargesystemswhichareexposedtoundesirableeffectsoflightningstrikes,inductionfromparallel lines of MV, HV or stray current near railways. These events negatively affect thetechnologies which are necessary for their trouble-free operation. Our products ensure the bestpossibleprotectionofsuchtechnologiesandsignificantlyincreasetheirreliability.

- Protectionof230/400Vpowersystemandsystem,upto1000V
- Protectionofaccesssecurityandfirealarmsystems,signalandcommunicationlines

LIGHTNINGCONDUCTORINSTALLATIONDIAGRAM



Sourcesofdamage,typesofdamageandtypesoflossaccordingtothepointofstrike

Pointof strike	Source ofdamage	Structure: Type ofdamage	Structure: Typeofloss
	S1	D1 D2 D3	L1, L4 2)L1, L2, L3,L4 L11), L2, L4
	S2	D3	L11), L2, L4
	S3	D1 D2 D3	L1, L4 2)L1, L2, L3,L4 L11), L2, L4
	S4	D3	L11), L2, L4

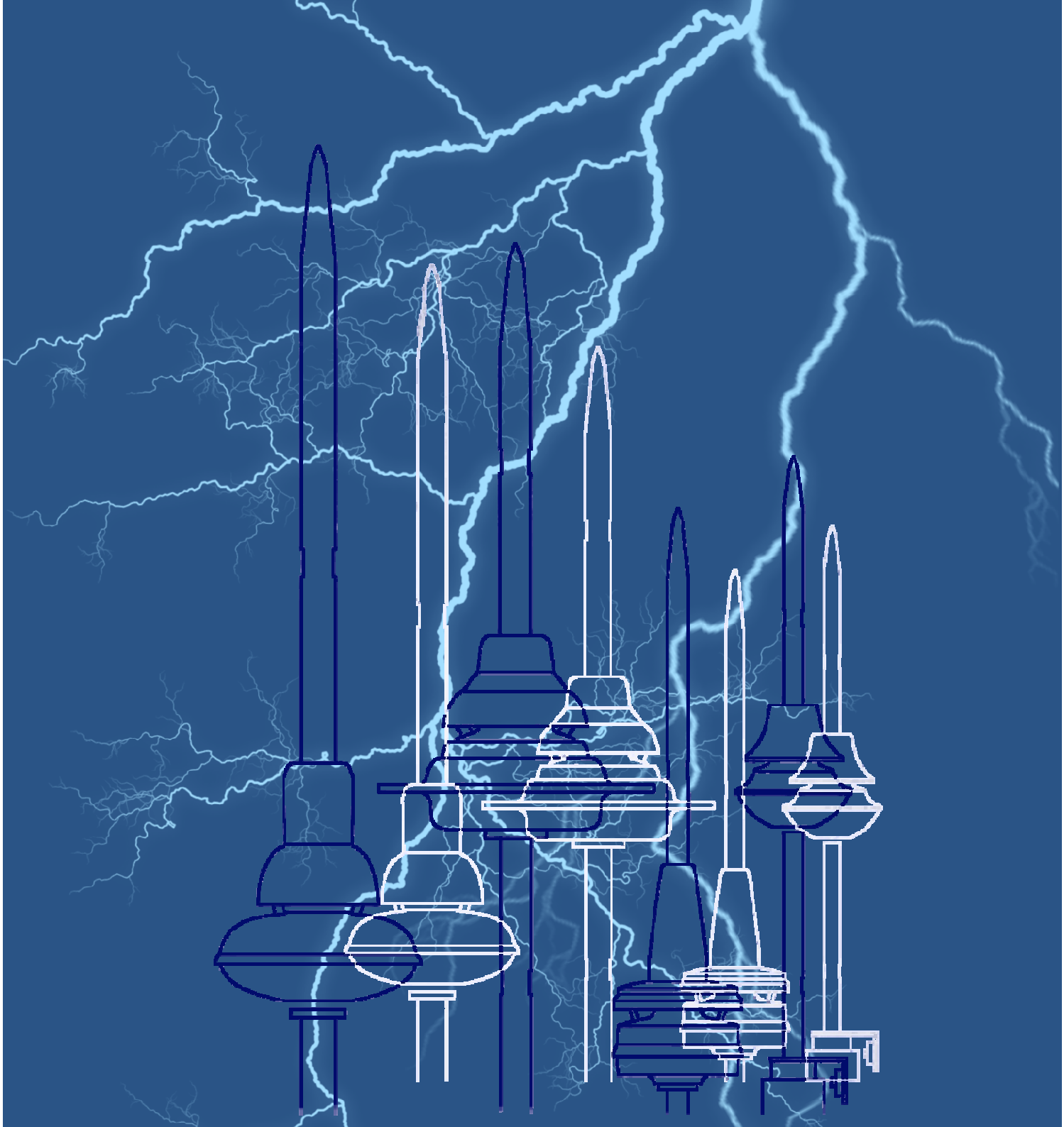
1) Onlyforstructureswithriskofexplosion,andforhospitalsorotherstructure wherefailuresofinternalsystemsimmediatelyendangershumanlife.

2) Onlyforpropertieswhereanimalsmaybelost.

- S1:Lightninghittingtoastructure;
- S2:Lightninghittingnearastructure;
- S3:Lightninghittingtooverheadlowvoltageline;
- S4:Lightninghittingneartooverheadlowvoltageline;
- D1:injurytolivingbeing;
- D2:physicaldamage;
- D3:failureofelectricalandelectronicsystems;
- L1:lossofhumanlife;
- L2:lossofservicetothepublic;
- L3:lossofculturalheritage;
- L4:lossofechonomicvalue(structureanditscontent)

Documentationverificationandmaintenance

The entire lightning protection system layout drawing should be prepared including positioning of ESE,Lightning Counter, down conductor, equipotential bonding arrangements and earthing systems.Periodic verification of above system should be done once in a year preferably before rainy season anddeficienciesiffoundshallberectifiedanddocumented.



SABOSYSTEMSPVTLTD

(ISO9001 : 2008 Certified)

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