LIGHTNING PREVENTION SYSTEMS, INC

Static Dissipation Air Terminals Preventing Lightning Attachments


Towers


Plant Facilities


Mission Critical


Buildings


Utilities

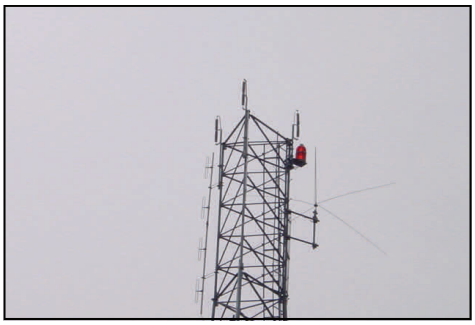
LPS Products are used throughout the world on thousands of applications on many types of structures

ALS-1000 Air Terminal on weather tower

ALS-100 Air Terminal on NJ Expressway sign

ALS-1000 Tower System

ALS-100 air terminals Singapore Rail Line



ALS-1000 air terminals on communication tower

US Navy Amphibious Base ALS-1000s

ALS-100 air terminals NASA fuel Facility

Orbital Sciences Taurus Rocket

Famous Armstrong Tower

Lightning Prevention Systems, Inc. PO Box 353 West Berlin, NJ 08091
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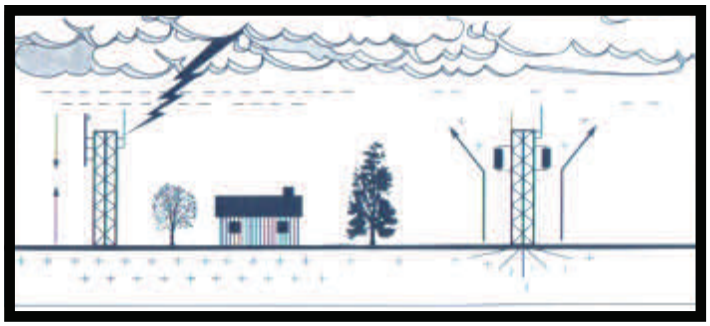
How Prevention Works Verses Protection



POSITIVE CHARGES DISSIPATE INTO THE ATMOSPHERE, NEUTRALIZING THE CHARGE ON THE STRUCTURE, MAKING IT LESS ATTRACTIVE TO LIGHTNING

The basic premise behind the use of air terminals and lightning rods is to provide a more favorable path for lightning to travel other than a structure or key piece of equipment. By placing the air terminals in strategic positions, it is widely held that lightning (seeking the path of least resistance) will strike the terminal and subsequently be directed to ground, BEFORE it strikes a building or structure. However, damage to the contents or operation of the structure remains at risk.

The lightning rod goes into a corona (point discharge) producing a stream of positively charged ions approximately 10 to 15 meters above the tip. During the "blind" travel of the stepped leader, which is negatively charged, a path of least resistance is sought and provided by the corona of the lightning rod. After the connection of the stepped leader to the rod, a return stroke is created followed by another dart leader and a subsequent return stroke. This series of strokes can often occur up to seven times during one strike, in rare cases up to twenty five. In any case, the rod has completed its task but there is one major flaw in its mechanics:

The attraction of the rod gas brought over 12,000 to 20,000 amps at 100.000 volts within a few feet of the sensitive equipment you want protected. A common occurrence during a lightning strike is that of voltage spikes and transient surges created as a result of the magnetic field, brought on by the interaction of charges. Even though the standard air terminal (rod) has provided a path for the lightning to travel, it CANNOT control the direction of the side flash that induces the spikes and surges. These spikes and surges will find their way into transmission and wave guides, phone lines, electrical service lines, and cable TV lines, as well as, date lines; eventually overloading circuits or vaporizing and damaging sensitive components in electronic equipment. The resulting loss of use of your operation can cost by the hour, may not be covered by insurance and represents safety concerns.

In the ancient days of the vacuum tube, lightning rods performed their task excellently, but with the delicate nature of modern microprocessor based equipment now being installed in the immediate vicinity of tower sites, switching stations, communications buildings, schools and hospitals, lightning rod protection is obsolete. This equipment won't stand up to the transient voltages and currents created when the rod gets struck, even if the structure is properly grounded.

The solution is simple; PREVENT the structure from being struck at all!

Why Lightning Occurs in Nature: Ionic emission is natures way of neutralizing a highly charged area, be it cloud, an object, or the ground surface area. In order for nature to neutralize a highly charged area (lightning) there has to be three conditions present 1) a generally negatively charged thunder cloud, 2) a generally positively charged surface area underneath it, and 3) a path between the two charges.

How the ALS Prevents: The lightning rod, which uses the point discharge (corona effect) to attract the stepped leader of a thundercloud, is constantly dissipating ions into the atmosphere. By multiplying the number of discharge points thousands of times, the ALS Series dissipation based system, or Charge Transfer System, was developed to gather the static build up or electrical charge on an object and rapidly dissipate the charge into the atmosphere. The wind and circulation of air particles typically blow these accumulated ions into the atmosphere thereby neutralizing the charge of the object. On a continuous operational basis, the ground charge never reaches a high enough value to be attractive to a lightning strike.

The preventive theory, which acts on the inverse properties of nature is proven every time a lightning strike occurs. Nature neutralizes a cloud by dissipating ions to the earth's surface; Lightning Prevention Systems neutralizes your property by dissipating ions into the atmosphere. By sufficiently depleting the amount of charge on the earth's surface and on the surrounding area, two of the three elements necessary for a strike to occur have been eliminated, thus a lightning strike has been prevented, avoiding the impacts that result otherwise.

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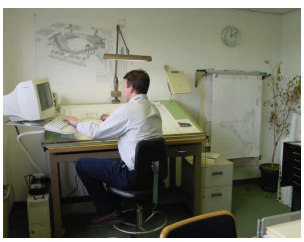
ALS Dissipation Air Terminals

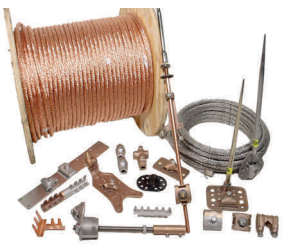
The ALS- Dissipation air terminals are designed to take place or the Franklin type lightning rod. All materials are made of high grade materials made in America. The system simply uses the same components as the standard UL system but replaces each individual lightning rod. The ALS air terminals are made to adapt to hundreds of different applications.

ALS-100

ALS-1000

PART #	MATERIALS & DIMENSION	Application
ALS-100	2” brush diameter, 14” height. 1/2” OD thread . All stainless steel construction	Buildings and applications requiring UL & NFPA compliance.
ALS-1000	48” x 3” diameter stainless steel . 5 lbs	Designed to mount on communication tower leg or lightning mast/pole.





Lightning Prevention Systems stocks all UL listed cable, Mounting bases, Fasteners, Ground rods and all other materials to perform a complete system. LPs also offers a free design service and installation drawings

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Building Installation Instructions

Design: The following standards of the latest issue :
(1) Underwriters Laboratories, Inc. UL96A

Materials: All materials and components shall be UL listed, comply in weight, size and composition with UL 96 and Lightning Prevention Systems, Inc static dissipating ALS-100 air terminals. All materials shall be copper, bronze, or stainless steel. Aluminum components shall be used in locations where system components are mounted to aluminum & galvanized surfaces to avoid corrosion of dissimilar metals. Class I materials shall be used on structures not more than 75 feet in height. Class II materials shall be used on structures over 75 feet in height.

I**nstallation:** All equipment shall be installed in a neat, workmanlike manner. All components shall be installed to look inconspicuous as possible. The system shall consist of a complete conductor network at the roof and include air terminals, connectors, splicers, bonds, down leads and proper ground terminals. Provide and install a complete lightning prevention system in compliance with the specifications and standards of the most current editions of the Underwriters Laboratories Lightning Protection Standard UL96 and ALS air terminals specified by Lightning Prevention Systems, Inc

Air Terminal Spacing: ALS-100 Air terminals shall be at least 10" higher than the object its protecting. ALS air terminals shall be spaced on perimeter roof edge or ridges at intervals not exceeding 20 feet. Air terminals spacing in mid roof areas shall not exceed 50 ft. On roof top units, roof perimters, ridges, and vent stacks air terminals shall be attached so that no outside edge or corner is more than 2 feet from the air terminal. Mounting bases shall be fastened with masonry anchors on masonry locations, Stainless steal screws on metal and wood locations, and adhesive type on non-penetrative surfaces & roofs.

Cable: Cable shall maintain a horizontal or downward course without any sharp bends. Cable shall be fastened with masonry anchors on masonry locations, Stainless steal screw on metals and wood locations, and adhesive type on non-penetrative roofs. Cable shall be fastened at intervals not exceeding 3 ft.

Down lead Cable: Down leads shall connect from perimeter cable runs at intervals not exceeding 100 feet to ground system. Structural steel may be used in lieu of down conductors if its thickness is 3/16" or thicker. Cad weld connections shall be made at bottom of column not exceeding intervals of 60 feet, through roof connections to steal at perimeters shall not exceed 100 ft. Structures utilizing wood or masonry framing: Systems down conductors must be concealed within structures walls ran in 1" conduit. On existing structures cable should be ran on exterior walls concealed in 1" conduit.

Ground System: Ground rods shall be 10' in length and ¾" diameter, spaced 2ft from foundation & driven 12 inches below grade. The ground system must meet the resistance of 5 ohms or less. This may be accomplished, depending on soil conditions, by a triad/crows foot configuration, added lengths, backfill materials, or chemical/electrolytic ground terminals. The resistance of the ground system must be tested in order to accomplish the proper ground configuration

Bonding: All other grounds such as electric shall be directly bonded to LPS ground system. Incoming water, gas, sewer, sprinkler etc shall be directly bonded to LPS ground system with main size cable and proper UL listed connectors. Metal objects that show continuity with 6 feet of main conductors shall be bonded with #6 stranded secondary conductor.

Counterpoise: In new construction and where applicable a ground loop must be installed completely around structure interconnecting 3/4" x 10' ground rods, down leads, electric ground, water main, and structural steal at least 24 inches away from structure at 12 inches below grade.

Surge Protection: UL listed Surge Protection shall be installed on Incoming Electric, Telephone, Data Lines, and roof mounted antennas or cameras.

Zones of Protection: Air terminals or single mounted terminals on high roofs or structures shall provide a zone of protection to lower objects as followed.
(1) Elevation 0'-25': a 2:1 zone of protection
(2) Elevation 26'-50': a 1:1 zone of protection
(3) Elevation 51'-or greater: 150' radius rolling sphere

Typical components recommended from LPS catalog. LPS recommends using all exothermic splice connections for ground connections. Copper cable for buildings under 75' high: LPS-32S. Aluminum cable for buildings under 75' high: LPS-A28. Copper cable for buildings over 75' high: LPS-40. Aluminum cable for buildings over 75' high: LPS-A30. Add letter A after LPS in part number for the following products to be aluminum. Secondary Bonding cable: LPS-22 Cable to cable mechanical connections: LPS-297A. Cable to flat surface fastener: LPS121A. Cable to flat surface adhesive fastener for non penetrative surfaces: LPS-265P. Cable to round tower leg fastener: LPS-DWC. 3/4" x 10" ground electrode: LPS-GR34. Cable to ground mechanical connector: LPS-53. #6 cable to 2/0 cable mechanical connector: LPS-297. ALS-1000 mount to round tower leg: MK-1. ALS-100 air terminal flat & vertical surface mount: LPS-60UB.

Towers, Masts, & Camera/Light Poles Installation Instructions

Operations
ALS Dissipation Air Terminal System: Lightning Prevention Systems neutralizes your property by dissipating ions into the atmosphere with its point discharge dissipation air terminals. By sufficiently depleting the amount of charge on the earth's surface and on the surrounding area, two of the three elements necessary for a strike to occur have been eliminated, thus a lightning strike has been prevented, avoiding the impacts that result otherwise.

Air Terminal
Tower Sites: Self-Supporting and Guyed: Towers 100-300 ft. require three ALS-1000 Element at highest mounting point possible, one element per leg . Towers over 300 ft. require one element per leg for each additional 250 ft. (or less) of tower height. For example; a 400 ft. 3-legged tower requires three (3) elements at the 200 ft. level and three (3) elements at highest mounting point possible. Crows nest shall have a ALS-100 clamped on each lightning rod.

Monople Towers, Camera Light Poles, Mast, & Catenary: Mast & monopole towers 100 ft. or less require one ALS-1000 Element at highest mounting point possible with the elevations mast height to provide a 1:1 zone of protection for any top mounted antennas or equipment. ALS 100's should be added to corners of antenna mounts or brackets if the ALS-1000 height cannot be achieved to provide a zone of protection. Elevation masts can be bent and offset to maintain clearance for a rotating camera etc. Mast heights for open area protection should be determined as to the zone of protection of a 150ft. radius sphere. Catenary systems and overhead wires apply to the 150 ft radius sphere.

Down Conductor
Tower Sites: Self-Supporting and Guyed : The electrical down wire is to meet or exceed 2/0 stranded bare copper wire. Solid copper wire should not be used as the down wires for maintenance purposes. The down wire is placed on a tower leg from the tower top to the Collector Ring at the bottom fastened every 3 feet. Each Dissipater Element on that leg is connected to the main down wire with bare stranded 2/0 copper cable.

Monople Towers, Camera Light Poles, Mast, & Catenary: The electrical down wire is to meet or exceed 2/0 stranded bare copper wire. Solid copper wire should not be used as the down wires for maintenance purposes. The down wire is a single lead connecting the ALS unit to the ground ring fastened every 3 feet. Guys and overhead ground wires that connect mast to mast on catenary systems should be all tied or spliced into the down conductor. If structure is metal and a wall thickness of 3/16" or greater it may serve as the down conductor. Two bond connections from base of mast or pole to ground ring shall be utilized

Collector Ring (Ground Loop)
Tower Sites: Self-Supporting
The wire for the Collector Ring should meet or exceed 2/0 stranded bare copper wire.
The Collector Ring is to form a continuous 360-degree circle at the base of the tower,
approximately 12" from the tower legs foundation.

Tower Sites: Guyed
The wire for the Collector Ring should meet or exceed #2/0 stranded bare copper wire.
The Collector Ring is to form a continuous 360-degree circle at the base of the tower, approximately 12" from the tower legs.
The guy anchor piers should have a separate Collector Ring forming a continuous 360-degree
Circle approximately 6" from the piers. A conductor should then be connected from the
collector ring to the guy.

Monople Towers, Camera Light Poles, Mast, & Catenary: The wire for the Collector Ring should meet or exceed 2/0 stranded bare cooper wire.
The Collector Ring is to form a continuous 360-degree circle at the base of the structure

Collector Radials
Tower Sites: Self-Supporting And Guyed
The wire requirements for the Collector Radials are to meet or exceed #10 solid bare copper wire. For each tower site there are to be eight (8) equally spaced radials extending away from the tower approximately 1/3 the total height of the tower. For example, a 300' tower would require eight (8) radials approximately 100' in length.
***NOTE:** Radials are not to be less than 100' long no matter what the height of the tower.
***NOTE:** In certain instances it is impossible to run lengths of 100' in particular directions, this can be compensated for by extending the lengths of the other radials.
***NOTE:** In other instances it is impossible to run Collector Radials at all due to limited space, this can be compensated for by adding a GROUND-GRID SYSTEM at the base of the tower or adding more Ground Rods along the Collector Ring.

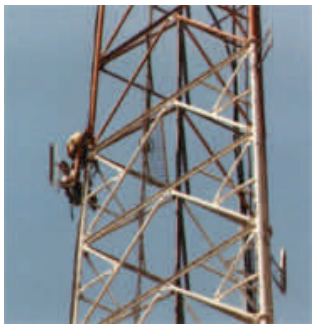
Monople Towers, Camera Light Poles, Mast, & Catenary: Does not apply

Grounding
Tower Sites: Self-Supporting and Guyed
Soil testing should take place in order to install the appropriate ground resistance of 10 ohms or less. This may be accomplished by using enhancing backfills, chemical electrodes, and longer ground rods. Grounding must exceed all local standards for communication towers. Each tower leg must be exothermically welded and bonded to the collector system. For towers with a base circumference of less than 50 ft. utilize three- (3) ¾ X 10' copper clad ground rods. These are to be tied into the collector ring at the midpoint between each tower leg. For towers with a base circumference of more than 100 ft. utilize six (6) ¾ X10' copper clad Ground Rods. These are to be tied into the Collector Ring and equally spaced along the Collector Ring. Each guy wire and guy anchor location shall be bonded and grounded utilizing a ¾ X10' copper clad ground rod. A ground test well should be installed in order to test ground resistance annually. All other grounds shall be tied into LPS ground system

Monople Towers, Camera Light Poles, Mast, & Catenary
Two ground electrodes shall be installed on the ground ring spaced on each opposite side with a ¾ X10' copper clad ground rod. The connection from cable to ground rod shall be of the exothermic type. If mast is steel its base shall be exothermically welded to the ground system with a 2/0 stranded cable. Soil testing should take place in order to install the appropriate ground system to obtain resistance of 10 ohms or less. This may be accomplished by using enhancing backfills, chemical electrodes, and longer ground rods. Ground test well should be installed in order to test ground resistance annually. All other grounds shall be tied into LPS ground system

Typical components recommended from LPS catalog. LPS recommends using all exothermic splice connections from cable to cable and cable to ground rods. For 2/0 cable to cable mechanical connections: LPS-297A. Cable to flat surface fastener: LPS121A. Cable to flat surface adhesive fastener for non penetrative surfaces: LPS-265P. Cable to round tower leg fastener: LPS-DWC. 3/4" x 10" ground electrode: LPS-GR34. Cable to ground mechanical connector: LPS-53. #6 cable to 2/0 cable mechanical connector: LPS-297. ALS-1000 mount to round tower leg: MK-1. ALS-100 flat or vertical surface mount: LPS-60UB.

HERE'S WHAT SOME CUSTOMERS SAY ABOUT LIGHTNING PREVENTION SYSTEMS…



" ……I Wanted to tell you about one storm that came roaring into town. The weather service issued a severe thunderstorm warning for the area, and the storm track looked like it was going to head directly over us. I was watching the storm as it approached from a window that overlooks the swamp where our antenna system is located. Lightning was all around, when all the sudden there was a tremendous flash, and a bolt of lightning struck the ground about a thousand feet behind our antenna array system. Our continental transmitter cycled off, then back on, and continued on. I thought we been struck, but investigations of ATU's afterwards, showed no signs of lightning damage.

Our ALS systems have been in place for over 6 years now. I'm not sure how many direct strikes were averted, but from our experience, they are well worth the investment."

MICHAEL SEGUIN
CHIEF ENGINEER
WVMT-AM WXXX-FM

"An evaluation of data from several users offered convincing imperial evidence of the effectiveness of the ALS– 3000 system in preventing lightning attachments. Based upon these reports, we recommend incorporation of the ALS-3000…"

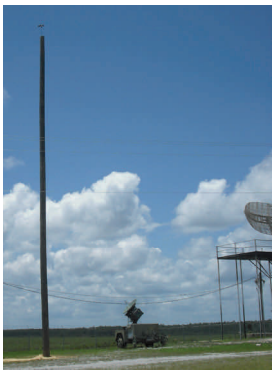
Mr.Orvis Adams
TRW Space & Technology Group

"…Over the years we've sustained lightning damage to our communication equipment. However, since the installation of the ALS-3000 we have not experienced any strikes to the protected tower."

Capt. Stevenson
Sheriffs Dept.
Onondaiga County, NY

" We installed the ALS-6000 along with extensive ground radials. The manufacturer supplied us with references from users which we checked out. All were very positive as to the effectiveness of the system in eliminating lightning strikes. I observed the tower through one storm, and there where no strikes. So far it appears that the system is doing what it was designed to do."

Mr. Hanneman
WDAC



" The continued success and extreme effectiveness of the ALS static dissipater is predicated on several aspects of its construction. Thorough testing and engineering evaluation established that the basic design, manufacturing of the ALS 100 and 1000 static dissipaters provide distinct advantages for lightning protection. Distributed energy dissipation is the basis on which the ALS was designed. The ALS core consists of four twisted conductors along which the dissipation points emanate. This technique distributes the energy along that core. This unique and most important feature of the ALS style dissipater achieves a high degree of efficiency by providing the static charge a path of low resistance and high conductivity. The ALS provides more points of dissipation for a given area not available in any other configuration.

Al Gross
Fellow IEEE
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