



Pragati Electrocom Pvt. Ltd.

LIGHTNING AND THUNDER

Under normal conditions, the earth and the atmosphere maintain an electrical balance, constantly interchanging electrostatic charge. When stormy clouds are being formed, the hot air upward carries some of the electrons, from the ground to the cloud; thus, breaking the existing electrical balance. The negative charge increases in the clouds inducing a positive charge on the ground. When the cloud overflows with negative charge, it starts to create a lightning discharge.

The discharge moves towards the ground by impulses that last millionths of seconds. Due to electrostatic induction, the nearness of the negative downward discharge induces even greater amounts of positive charge on the earth beneath it. The voltage difference between ground and cloud keeps on increasing. Positive charged waves on the ground attempt to join the downward stepped discharge. One of these waves is developed earlier than the rest and reaches the lightning discharge. This quickest wave is called the UPWARD LEADER and plays a very important role in protection technique, because the lightning strike takes the path opened by the upward leader. The electric discharge, highly energetic, is able to reach temperatures of 30,000° C. We see it as a blinding light called lightning, or lightning flash when it is produced between clouds. Thunder is the sound produced by the explosion of gases generated by this heating, along the discharge channel. Thunder duration seems longer due to sound reflections and slower because of lower sound speed (340m/s) compared to light (300,000 Km/s).

PROTECTION

A necessity: It is fascinating to look at the flash of Lightning but only from a safe distance. At close proximity, we can imagine its powerful destructive potential, the power of destroying buildings, splitting trees and loss of life. We clearly feel helpless when confronted with this force of nature.

We cannot avoid thunderstorm or lightning but can always aim at protection against the dangers and damaging effects of direct lightning and indirect surges when handling electricity. Our need is to protect people and infrastructure. The experiment for such protections started in year 1752 when Benjamin Franklin used a pointed rod at the building top.

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METHODS

The Franklin Rod

Highly conductive metal rods of copper, stainless steel or copper coated mild steel with spikes on top in different shapes and configuration were the most conventional Lightning Protection devices used world over and were commonly known as Franklin Rods. The system offered a conical protection and the cone angle reduced with increase of height for a class I protection. At 20 meters height, the maximum available protection cone is of 45° for a Class III protection.

Drawbacks

Its coverage zone is very limited, and conditioned just by the height and required protection level.

Franklin Point functioning is not based on Discharge Formation Fundamentals. For bigger dimension installations number of rods with mesh network have to be worked out. The devices being passive in nature and having a limited protection zone, the research for more advanced terminal was pursued. The Early Streamer Emission terminal using Radio Active transmission came in use in year 1915. The same subsequently changed over to Electro Magnetic transmission after WHO stopped use of Radio Active element in environment.

ESE Terminals

Early Steamer Emission Terminals are available in the market in different shapes and configurations. These devices offer protection with relatively free of space charges, capable of creating photo ionization, which concentrates electric field to release free electrons on the approach of Lightning leader. The lightning is encountered not only at much higher heights than the highest point above the building tower, where otherwise a passive rod normally waits for lightning to strike, but also ahead in time. The basic gains of this kind of active device are, much larger area of protection, keeping the flash and fire away from installation and no induced voltages affecting the electrical and radio services.

Early Streamer Emission Terminal (ESE)



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ESE TERMINAL is a dynamic external lightning protection device, which is radio quiet and its operation only occurs during the lightning event. The system comes in two pieces which are screwed together and the total assembly is mounted on a Mast with the help of an adaptor. The unit is mounted one meter. above the highest point on the building or any installation under protection. The installation can be on a tower, rooftop or on the sidewall of the building. The adaptor has the provision of fixing the Down Conductor. The Down Conductor is taken through the Mast to the earth pit. A Lightning Counter is mounted through which the Down Conductor passes enroute to the pit. The Lightning Counter is positioned at a height /place normally just above the guard pipe, which can be easily monitored.

Working Principle

Lightning formation is preceded by an increase, higher than (10KV/m) in the ambient electric field. The triggering device of the ESE TERMINAL lightning conductor, which automatically turns into pre-control situation, directly accumulates this natural energy. Lightning conductor uses the atmospheric electric field as its only power supply, is totally autonomous and maintenance free.

Lightning discharge approach provokes an intense and sudden increase of the electric field, thus originating a lightning strike risk area. If this risk area takes place in the zone protected by the ESE TERMINAL, the sudden variation of the electric field simultaneously activates the inbuilt control system, which in synchronization with lightning approach provides the safest controlled discharge path to the earth.

The ESE TERMINAL offers a drum shape umbrella top protection to the site. Its operation and functioning can be tested at any time through the ESE tester. All ESE Terminals are certified for effective performance in all weather conditions because of NOREN sealing tested in accordance to UNE 21308 and IEC 61312. The system is tested to with stand multiple strikes of more than 100 kA of 10/350 μ s wave shape.

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maintenance
free.

The area of protection offered by any ESE Terminal depends upon the height of installation and the model selected.

SELECTION TABLE

NP	Level I			Level II			Level III		
Lightning rod model	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	Nimbus	
Rp (m)	CPT-1	CPT-2	CPT-3	CPT-1	CPT-2	CPT-3	CPT-1	CPT-2	CPT-3
h (m)									
2	17	24	32	23	30	40	26	33	44
3	25	35	48	34	45	59	39	50	65
4	34	46	64	46	60	78	52	67	87
5	42	58	79	57	75	97	65	84	107
6	43	58	79	58	76	97	66	84	107
8	43	59	79	59	77	98	67	85	108
10	44	59	79	61	77	99	69	87	109
15	45	59	80	63	79	101	72	89	111
20	45	60	80	65	81	102	75	92	113
45	45	60	80	70	85	105	84	98	119
60	45	60	80	70	85	105	85	100	120

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