

Streamer-Delaying Structural Lightning Protection

UNDERSTANDING THE LIGHTNING STRIKE COMPLETION MECHANISM

Various mechanisms create a stratified charge in a storm cloud. The charge on the base of the cloud induces an opposite charge on the surface of the earth beneath it. As the storm cloud builds, it increases the potential difference between the cloud base charge and the ground charge, with the cloud base charge trying to pull the ground charge off the surface of the earth.

When the dielectric of the air is overcome and lightning is going to strike, the process begins with the formation of stepped leaders branching down from the cloud. These stepped leaders propagate in jumps of about one hundred and fifty feet at a time, towards the ground. These stepped leaders are the tendril-like branches extending down from the cloud which are visible in a photograph of a lightning strike. We see a lightning strike in two dimensions, but the field of stepped leaders is actually three dimensional.

When the stepped leaders are within five hundred feet or so of the ground, the electric field intensity on the ground becomes so strong that objects and structures on the ground begin to break down electrically and respond by shooting streamers up toward the stepped leaders. When a streamer connects with a stepped leader, the ionized path



becomes the channel for the main lightning discharge, and a lightning strike occurs.

DELAYING FORMATION OF STREAMERS

Change in streamer initiation time, is a concept describing the influence air terminals have on the formation of streamers. ΔT is the change in time, as compared to a conventional lightning rod, of the release of the streamer from a particular air terminal. ΔL is the change in length, or more importantly height, of the streamer, and is derived from ΔT . The earlier a streamer is emitted, the longer it is relatively, and the more of a head start it has over other streamers from the same area. Therefore it has a better chance of reaching the stepped leaders first, and completing the strike to the air terminal. Conversely, an air terminal that delays the formation of streamers, or exhibits a negative ΔT and ΔL , is less likely to complete the strike to itself.



STREAMER DELAYING TECHNOLOGY

Lightning Master Streamer Delaying Air Terminal technology is based on the Point-Discharge Formula given below:

$$E = \frac{Q}{4\pi \epsilon r^2}$$

$$D = \frac{Q}{4\pi \epsilon r^2}$$



SPHERE

E = electric field intensity

where: Q = charge (in coulombs)

ϵ = permittivity of space

r = radius

The Lightning Master Streamer-delaying lightning protection system employs the basic conventional system with modified air terminals which are designed to reduce the incidence of direct strikes to the protected structure. All of the components used in this type of system are UL Listed, and the system is designed to meet UL 96A and NFPA 780.



Lightning Master is a full service, full spectrum static solutions and lightning and transient protection company serving the oil and gas and chemical industries since 1984.

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Streamer-Delaying Structural Lightning Protection

About Lightning Master

Lightning Master is a full service, full spectrum static solutions and lightning and transient protection company **servicing the oil and gas and chemical industries since 1984**. Our complete line of products and systems is backed by our worldwide support and customer service. Lightning Master has become recognized internationally as the industry leader in lightning and static protection.

Unparalleled Customer Service · We're with you every step of the way

Site Survey and Evaluation

- Our field engineers create a detailed report with the findings and recommendations on your site
- Our team of experienced engineers perform forensic analysis of lightning and static damage

System Design

- We custom-tailor site-specific protection
- We help you write specifications and best practices that meet your specific needs

Products

- Bonding and Grounding
- Surge Protective Devices
- Structural Lightning Protection
- LMC In-Tank Static Dissipators*

Customer Service

- Turn-key installation by Lightning Master-employed crews
- Training, supervision, and ongoing support of Customer personnel or contractors
- Lightning Master approved installation contractors (in selected areas)

*PATENT PENDING

Industry Leaders

Lightning Master Principals serve as members of the National Fire Protection Association NFPA 780, Committee on Lightning Protection, the American Petroleum Institute API 545, committee on lightning protection for hydrocarbon storage tanks. They also served as principal members of NFPA 781, Committee on Lightning Protection using Early Streamer Emitting (ESE) Air terminals and the Institute of Electrical and Electronics Engineers IEEE 1576, committee on lightning protection using charge transfer (static dissipation) systems.



Technology Development

- Lightning & Static Protection Systems for Salt Water Separation/Disposal Tanks & Batteries*
- Flowback Tank Static Protection Systems*

*PATENT PENDING