Forward

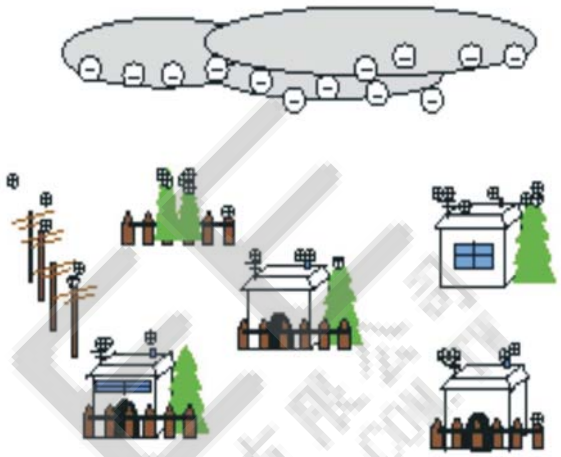
Lightning Protection

- The protected cover range is according to the ESE's rule NF C 17-102.
- VEGA is made from SUS316. It has anti-acid, anti-alkali,anti-corrode, and match the Taiwanese climate when it uses in lightning protection.
- High voltage proof : 1400KV
- High current proof : 210KA

VEGA

VEGA Early Streamer Emission Lightning Conductor

THE FORMATION OF LIGHTNING



In normal condition, the electrical balance in the atmosphere remains stable. However, when Storm clouds develop, positive and negative Charges split inside the cloud, producing a high electric field at the atmosphere.

When this electric field reaches a value around 10kV/m, a discharge starts from the cloud, forming the downward leader. This leader approaches to the ground with steps that last microseconds. Any element on the area placed below can be stricken by the lightning.

The charges of the clouds and the downward leader induce a positive charge on the ground and on every element placed onto it. This charge is concentrated at these elements, especially on metallic parts. Then corona discharges appear around them, thus the positive charges are attracted in the electric field. One of them will develop to meet the downward leader. At this moment the path for the lightning is created and that element will receive the strike.

THE PRINCIPLE OF *VEGA*

Variations in the electric field produced by the lightning storm are the source that gives the power to the lightning conductor: no other external supply is needed.

The inner triggering device of ***VEGA*** works with this energy. Thanks to the high voltage impulses generated by the internal device, the lightning conductor will emit the upward leader earlier than any other element inside its protection area, connecting with the downward leader and becoming then the preferred point of impact for the lightning.

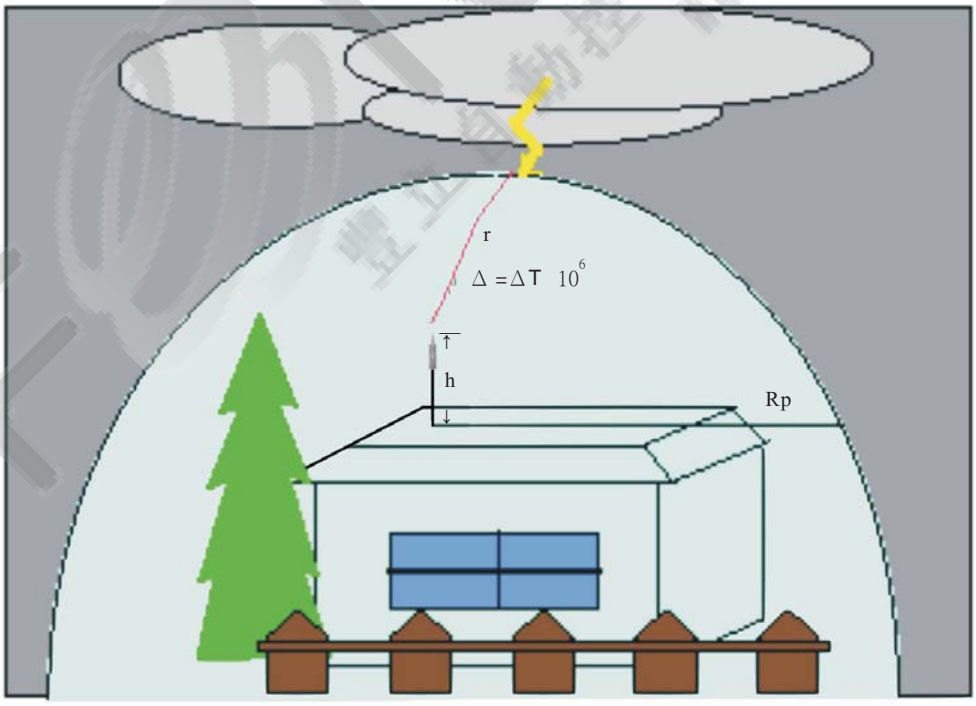
For a correct working of the triggering device, insulation between the armatures of the electroatmospheric capacitor must be ensured, even in snow and heavy rain condition ***VEGA*** has incorporated interior double waterproof a protection covering, in order to avoid any connection that could reduce the efficiency of the lightning conductor.

In any case, the air terminal must always be placed at least two meters over any other element in the protected area, and the installation must provide a safe path to earth.

PROTECTED AREA

The main characteristic of an Early Streamer Emission (ESE) Lightning Conductor is its ability to start the upward leader earlier than any other element in its protected area. This parameter is called average gain in time of upward leader emission (ΔT).

The average gain of upward leader emission is the parameter that fixes the radius of protection of the ESE air terminal.



According to NF C 17-102（Version 2011）, the radius of protection is calculated as follows:

$$Rp(h) = \sqrt{2rh-h^2+\Delta(2r+\Delta)} \quad \text{for } h \geqq 5m$$

And

$$Rp = h \times Rp(5)/5 \text{ for } 2m \leqq h \leqq 5m$$

where:

Rp(h)(m) is the protection radius at a given height h

h(m) is height of the ESEAT tip over the horizontal plane through the furthest point of the object to be protected.

r(m) 20 m for protection level I

30 m for protection level II

45 m for protection level III

60 m for protection level IV

Δ(m) $\Delta = \Delta T \times 10^6$

Field experience has proved that Δ is equal to the efficiency obtained during the ESEAT evaluation tests

Two Powers of ionization are available

Designation	Reference	ΔT(μs) According Lab.Test	To adopt ΔT(μs) According NFC17-102
PROTEL 30	VEGA 030S	80	60
PROTEL 60	VEGA 060S	92	60

Radius of Protection of VEGA 030S and 060S

Model	Protection Level	Radius of protection of the VEGA units following NF C17-102 (in meters) h(Meters)												
		2	3	4	5	6	8	10	15	20	25	30	45	60
030S	Level I	31	46	62	78	78	79	79	79	80				
	Level II	34	51	68	86	86	87	87	88	89	89	90		
	Level III	38	58	77	97	97	98	98	100	101	103	103	105	
	Level IV	42	63	84	106	107	108	109	111	113	114	116	119	120
060S	Level I	31	46	62	78	78	79	79	79	80				
	Level II	34	51	68	86	86	87	87	88	89	89	90		
	Level III	38	58	77	97	97	98	98	100	101	103	103	105	
	Level IV	42	63	84	106	107	108	109	111	113	114	116	119	120

CONFIGURATION

The VEGA lightning collector are composed by two main components :

* Protector head is cylinder shape. A sharp point is on it and Impulse generator is inside. It can plus the "Failure Monitor" to survey the system function.
*Air Device (RLC circuit component).

OPERATION PRINCIPLE

The VEGA utilizes "Nature Physics" to reach early collection and emission function. It takes the head body and sharp point to generate ionization, absorption and reflection energy to accomplish the charge arrange uniformly and energy exchange slowly within storm cloud. It prevents the cloud charge to concentrate excessively then to reduce the formation of lightning strike.

先進的

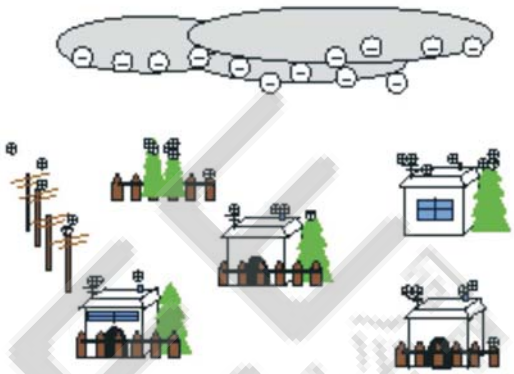
VEGA 提早放射離子式避雷針

- 保護理論依據法國最新電避雷針國家標準NF C 17-102
- VEGA 採 SUS 316 材質，耐酸鹼及鹽害，適合台灣地區使用
- 耐衝擊電壓測試1400KV
  耐衝擊電流測試210KA

VEGA

VEGA 提前放電式避雷針

閃電的形成



在正常的狀況下，大氣中的電荷分布是呈現平衡的狀態。當雲層形成的時候，雲裡的正負電荷便會分開，因而在大氣中產生極大的電場。

當電場達到約10kV/m時，放電的現象便由雲層中展開，形成向下的前導電荷。這前導電荷會在短短幾個微秒裡以步級方式到達地面。任何位於其下的物質都有可能遭受到雷擊。

雲中的電荷以及前導電荷會在地面、或者位於地面的所有物質上，誘導產生正電荷，這些正電荷會集中在這些物質上，特別是金屬的部份。然後，在這些物質的周圍會產生電暈放電（CORONA DISCHARGES）的現象，而其上的正電荷便會被電場所吸引。其中一部份電荷會和向下的前導電荷相會，閃電的路徑於是形成，而該物質便會遭受雷擊。

VEGA的原理

雷雨所引發的電場變化是避雷針的電力來源，所以並不需要外接電源；而VEGA內部的觸發裝置便是利用這個能量。

由於這個內部的觸發裝置會產生高壓脈衝，所以相較於其他位於避雷針保護區內的物質，避雷針會提前放出向上的前導電荷。這個前導電荷於是與向下的前導電荷結合，而成為閃電的最佳觸發點。

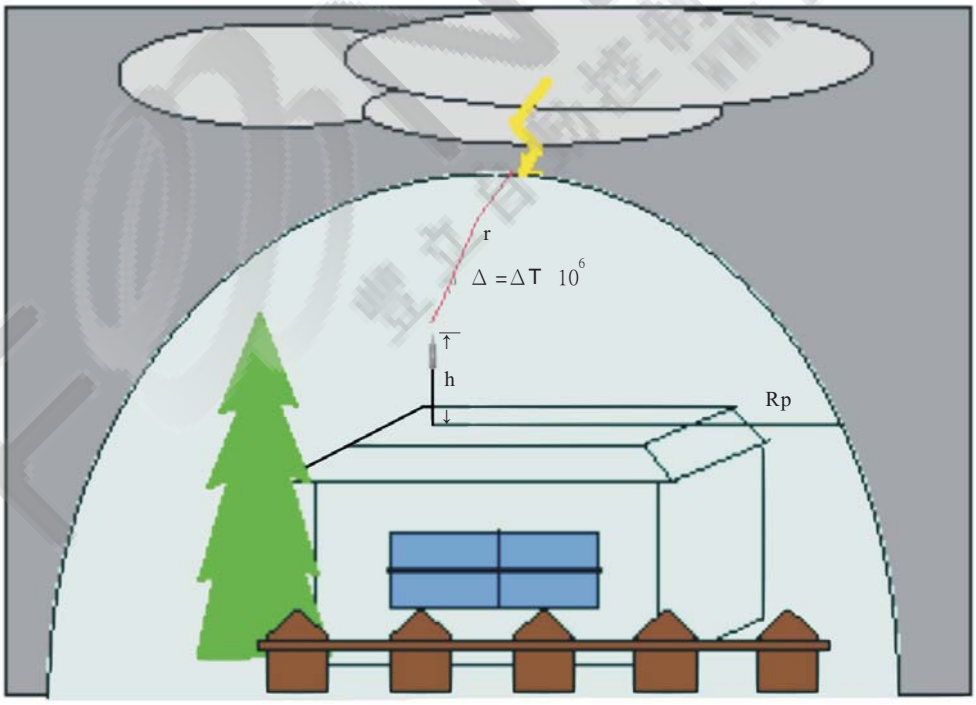
為使觸發裝置能正常運作，大氣電場感應電容的電極間必須維持良好的絕緣即使是在下雪或者是大雨的環境下也必須是如此。VEGA已具有內部雙層防水保護裝置，以避免產生任何接觸，而導致避雷針的效率降低。

在各種情況下，避雷針端，至少要比保護區中的其他物體高出兩公尺。同時，安裝時還要提供良好接地的通路，以便把雷擊電流連接至大地。

保護範圍

提早放電式避雷針主要的特性是在於相較於其它位於避雷針保護區內的物件避雷針會提前放出向上的前導電荷的能力。這參數稱為發射向上前導電荷的平均提前激發時間ΔT（Average gain in time）。

放射向上前導電荷的平均提前激發時間是決定提早放電式避雷針有效保護半徑範圍的參數。



依據NF C 17-102(2011年版)，有效保護半徑範圍的計算公式如下：

$$Rp = \sqrt{2rh-h^2+\Delta(2r+\Delta)} \quad \text{for } h \geq 5m$$

And

$$Rp = h \times Rp(5)/5 \quad \text{for } 2m \leqq h \leqq 5m$$

Rp(h)(m)　是指特定高度h的保護半徑

h(m)　是尖端與通過受保護物體最遠端的水平面之間的高度

r(m)　保護等級 Ⅰ 為20公尺

保護等級 Ⅱ 為30公尺

保護等級 Ⅲ 為45公尺

保護等級 ⅠV為60公尺

Δ(m)　$\Delta = \Delta T \ \ 10^6$

現場驗證證　△等效避雷針評估測試取得的效率值

二種型號避雷針提前激發時間表

編　號	型　號	提前激發時間ΔT(μs) 依據測試結果	採用提前激發時間ΔT(μs) 依據 NF C17-102
PROTEL 30	VEGA 030S	80	60
PROTEL 60	VEGA 060S	92	60

VEGA 030S and 060S 保護半徑選定表

設計型號	保護層級	VEGA保護半徑依據法國NFC17-102（公尺） h安裝高度（公尺）												
		2	3	4	5	6	8	10	15	20	25	30	45	60
030S	Level I	31	46	62	78	78	79	79	79	80				
	Level II	34	51	68	86	86	87	87	88	89	89	90		
	Level III	38	58	77	97	97	98	98	100	101	103	103	105	
	Level IV	42	63	84	106	107	108	109	111	113	114	116	119	120
060S	Level I	31	46	62	78	78	79	79	79	80				
	Level II	34	51	68	86	86	87	87	88	89	89	90		
	Level III	38	58	77	97	97	98	98	100	101	103	103	105	
	Level IV	42	63	84	106	107	108	109	111	113	114	116	119	120

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