SEFCO®

SCIENTIFIC LIGHTNING RODS of SEFCO-KEC

The safest and most effective
Early Streamer Emission (ESE)
System for Lightning Protection

KEC 0 KEC 1 KEC 2 KEC 3

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LIGHTNING PROTECTON ESE SYSTEM

EFFECTS OF LIGHTNING

Statistics indicate that approximately 5000 thunderstorms happen on earth simultaneously with danger for persons structures and material. The average intensity of a lightning flash is estimated to be of 20000 amps. however lightning intensities of up 200000 amps were registered. Each year about two million flashes of lightning occur all over the peninsulas and the regions, causing death to persons and animal. In industry the damage and failures due to lightning are estimated to be in the range of thousands of millions of commercial foreign currencies.

The frequency and the intensity of thunderstorms in an area are determined by the characteristics of the area. however the risk of lightning can vary within a certain region. The knowledge about the area with high lightning risk is an important information in order to effectively determine the most appropriate type of lightning protection

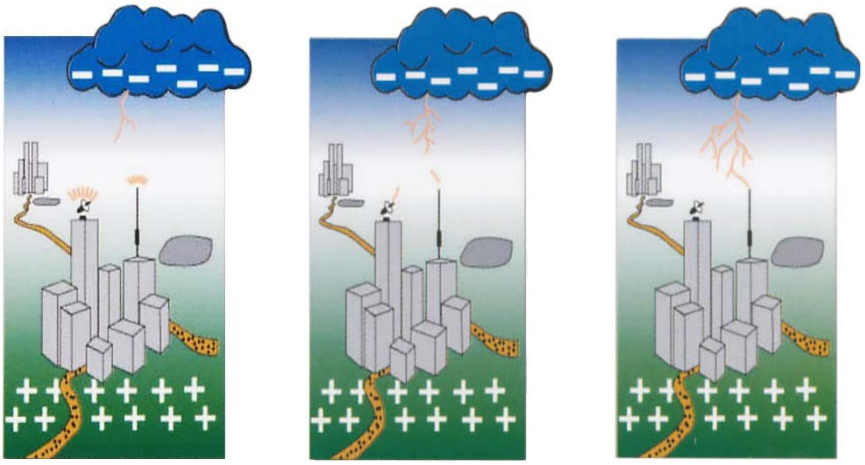
The effects of lightning area be produced by direct lightning strokes or by indirect causes. While a direct stroke may generate disastrous consequences for structures, persons and animals, indirect effects produced by lightning are frequently noticed and usually they produce significant economic losses. Indirect effects of lightning are observed when the lightning flash strikes close to a structure and produces by induction surge voltages in the electrical conductors.

LIGHTNING FLASHES

Under certain atmospheric conditions the load within a cloud get separated. where the negative loads move to the bottom of the cloud and the positive loads to the top of it. The electrical loads to the top of it. The electrical potential within the cloud can reach the range of millions of volts.

On the surface of the earth this effect is produced in a similar way, however with opposite polarity.

The electrical field between the bottom of the cloud and the surface of the earth under the cloud can become so strong that small electrical discharges from the cloud will be produced which are called downward leaders. When these discharge reach the surface of the earth an up-going steam of positive load is generated. When the up-going steam meet with the discharges, then the circuit become closed and discharge current between 10 to 200 kA can be produced.



In the illustrations on the left it is shown how the small discharge from cloud and the up-going stream, which finally lead to the flash of lighting are initiated.

Protection against lightning

The decision to protect an installation against lightning by means of a Lightning Protection System (LPS) depends on parameters such as the probability of lightning the area, its intensity and the potential consequences for people, material and the function of the installation.

In order to provide an appropriate protection the installation has to be equipped with two types of protection an external

protection against a direct impact to lightning stroke (lightning

rod, wire air termination system or mosh air termination system), and an internal protection against surge voltage produced by lightning strokes in the proximity or on conductors. of the electrical network.

The external and the internal protection require a good earthing system to evacuate the lightning current and equal potentiality within the earthing system, both of the protection system and of the electrical circuits to be protected.

PROTECTION AGAINST DIRECT LIGHTNING STROKES

For the protection of structures, persons or objects a Lightning Protection System (LPS) is needed, which attracts lightning Stroke and leads the lightning currents to earth.
Among the structures which require a LPS are buildings, open areas accessible to the public, structures which are dangerous to The environment due to the possible emission of contaminated substances, historical buildings, etc…
The following systems are currently used for the external protection against lightning.

SINGE ROD AIR TERMINATION SYSTEM : The lightning rod is located Higher than any other point of the area or structure to be protected and its objective is to intercept the discharge earth

Capturing lightning rod with mast. One or more down conductors. A disconnector on each downconductor to test the resistivity of the structure. A protection element against mechanical forces in the final two meters of the downconductor. An earth electrode for each down conductor. Equipotential bonding of the earth electrodes and general earth termination system.

WIREAIR TERNINATION SYSTEM : The protection is formed by one or more air-wires located above the installation or area to be protected. The conductors are connected to earth through masts on each side. The protected area is the area within the masts or down-conductors.

One or more air-wire conductors.
A mast on each end of the conductor.
An earth electrode for each downconductor.
Equipotential bonding of the earth electrodes and general earth termination system.

MESHAIR TERMINATION SYSTEM : The system consist of several capturing point connected with each other through conductors.
A network is formed which is extended with conductors leading to earth.

Multiple capturing points.
A connecting mesh for the capturing point. For each capturing point one down- conductor.
One earth electrode for each down- conductor.
Equipotential bonding of the earth electrodes and general earth termination system.

LIGHTNING ROD WITH FEEDING DEVICE SEFCO-KEC

Advantages of a system with feeding device.

The SEFCO-KEC system releases electrical discharges with opposite to the lightning strokes. This way the system achieves to attract the lightning flash and to raise the strike point to altitude higher than the structure to be protected. The effect is that a larger protection area is created than obtained with standard lightning rods.

In the figure it can be seen that the protection area obtained with this system is much larger than that obtained with other protection devices so that with a single capturing element the protection of building and installations with large size can be achieved.

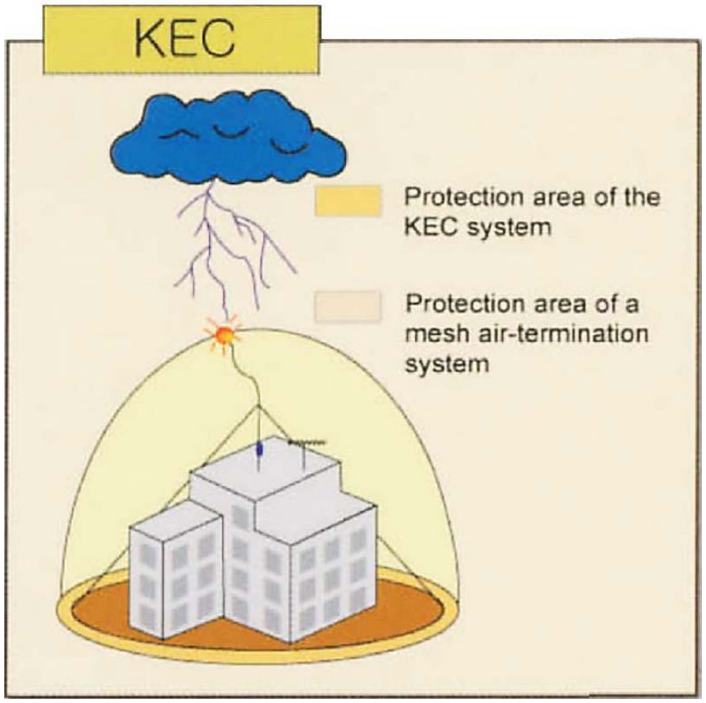
A lightning rod of type SEFCO-KEC is not like a sing capturing point of a mesh air-termination system but rather like all these capturing points which would be needed to protect the area. An important cost saving can be achieved due to the saving of materials such as the number of down-conductors, earth terminations, equipotential bonding etc…
The system also offers advantages compared to other systems in the protection of open areas such as sport fields etc…

As consequence the SEFCO-KEC system has several important advantages and a reduced cost compared to other passive capturing system.

AN EFFECTIVE FEEDING DEVICE

ADVANTAGES

In the instant when a lightning flash goes to earth a discharge on any raised structure is produced. Passive protection systems such as a mesh air-termination system only capture the discharges which the protected structure would receive, due to the lack of a capturing system which attracts the lightning stroke.
The feeding device of type SEFCO-KEC releases electrical discharges to the air in order to create a discharge path for the lightning stroke assuring this way an improved efficiency in the capturing of lightning.



WORKING PRINCIPLE

By means of the feeding device, the system emits a high voltage signal with a certain frequency and amplitude. Its efficiency is obtained by creating an up-going path up to the down-going path of the lightning stroke. This way a striking point on an altitude higher than the protected structure is created which increases the radius of the protected area if compared with a standard lightning rod.

ENERGY AUTO

The feeding device does not need any auxiliary power supply such as other lightning capturing systems. The SEFCO-KEC obtains the energy for the generation of the high voltage signals from the electro-magnetic field which is automatically created during thunderstorms (between 10 to 20KV/m)

The values determined in the tests correspond to average values. These values are evaluated in the standards NF C17-102 or in UNE 21 186 according to the random nature of

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INSTALLATION GUIDE

1. CAPTURING HEAD: the peak has to be located 2m, above the highest part of the area to be protected.

2. ADAPTOR ELEMENT: it has to provide the electrical contact between the capturing point and the down going conductor. It is put on the mast on light poles, pillars etc…

3-5. MAST-MAST FIXATION: the mast provides the appropriate height corresponding to the area to be protected by the lightning rod and is usually mounted with 2 or 3 fixings depending on its length.

6. DOWN-CONDUCTOR: it leads the current of the lightning stroke from the capturing head to the earth electrode. The Conductors can be of sheet, plain twist, twisted or round cable, and the minimum area has to be 50 mm²

Each lightning rod has to have at least on down-conductor, except in the following cases, where two down-conductors are

Needed : - structures higher than 28 m.
- the horizontal projection is larger than the vertical projection

The path has to be the most rectilinear possible with the shortest distance. avoiding curves. The covering radius should not be less than 20cm. The down conductor should avoid crossing or the proximity of electrical or telecommunication networks.

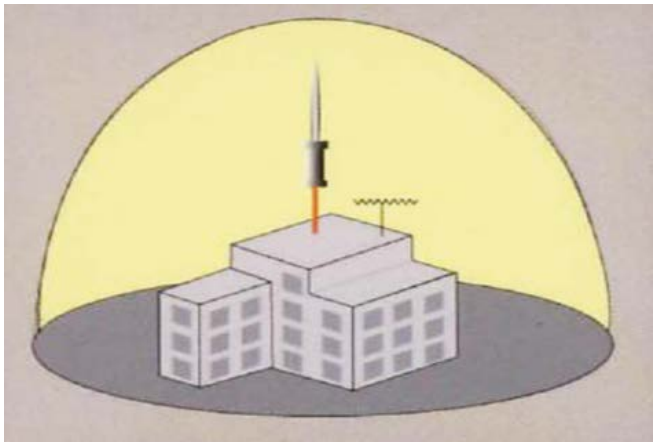
When the crossing cannot be avoided, then the line has to be inside of a metallic shield which needs to be extended 1 m. on each side of the crossing, Cornices or elevations should be avoided. A maximum height of 40 cm. is allowed with an angle of up to 45

7. CONDUCTOR HOLDING FIXTURES: Independent of the fixture type, three fixtures per meter are used for the down-conductor. The fixtures must not be in direct contact with inflammable material

8. DISCHARGE COUNTER: This counter is installed above the control joint, and In on cases 2 m. Above the ground. It is mounted on the down-conductor.

9. TEST JOINT: Each down-conductor has to incorporate a test joint, which allows to disconnect the earth electrode and then allows to measure the resistivity. The test joint is mounted two meters above the ground.

10. PROTECTION PIPE: It is put between the ground and the control joint in order to protect the down-conductors against mechanical forces. The pipe is of metallic material and as a length of 2 m. It is mounted with three fixtures.



SCIENTIFIC LIGHTNING RODS of SEFCO-KEC

SELECTION OF THE SEFCO-KEC MODEL

NP : Protection level

Rp : Protection radius

h : Height of the top of the SEFCO-KEC on the surface to be protected3

*The top of the lightning rod has to be 2m above any other point of the structure.

PROTECTION LEVEL

According to the standards NF C17-102 and UNE 21186-96 three protection levels are considered:

Level I : Level with maximum security. Recommended for buildings and areas with person in them, areas with high number of lightning per year, Isolated unprotected areas, etc.

Level II : Level with high security: Recommended for the protection of person and structures in areas with medium-low number of lightning per year, areas within an urban zone, etc.

Level III : Level with standard security. Recommended for the protection of structures in areas with low number of lightning per year, structures of reduced height, etc.

Remark : It is recommended for security reasons to consider level I.

SELECTION EXAMPLE

The selection table provides directly the SEFCO-KEC model and the height where the SEFCO-KEC needs to be installed in order to obain a certain protection radius (Rp).

LEVEL OF PROTECTION	LEVEL I				LEVEL II				LEVEL I				LEVEL IV			
MODEL	K0	K1	K2	K3	K0	K1	K2	K3	K0	K1	K2	K3	K0	K1	K2	K3
h(m)	RADIUS OF PROTECTION RM (m)															
2	10	17	24	32	12	19	26	35	15	23	30	40	17	26	33	44
3	15	25	35	48	17	28	39	52	22	34	45	59	26	39	50	65
4	21	34	46	64	24	39	52	70	30	46	60	78	34	52	67	87
5	26	42	58	79	31	48	65	87	38	57	75	97	43	65	84	107
6	26	43	58	79	31	49	66	87	38	58	76	97	44	66	84	107
8	27	43	59	79	32	50	67	88	40	59	77	98	46	67	85	108
10	28	44	59	79	33	51	67	89	42	61	77	99	49	69	87	109
15	29	45	59	80	34	52	68	90	46	63	79	101	53	72	89	111
20	30	45	60	80	35	53	69	90	49	65	81	102	57	75	92	113
45	30	45	60	80	37	55	71	92	55	70	85	105	68	84	98	119
60	30	45	60	80	37	55	71	93	55	70	85	108	70	85	100	120

Ordering information				
Model No.	S-KEC-0	S-KEC-1	S-KEC-2	S-KEC-3
Part No.	103001	103002	103003	103004
Dimension (mm)	Ø89x190+(20x485)	Ø89x260+(20x485)	Ø89x280+(20x485)	Ø89x300+(20x485)
Weight (kg)	4 kg.	4.8 kg.	5.2 kg.	5.6 kg.
Packing unit	1 pc(s).			

Contact us

You can find the address of your local sales organisation on the home page

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