

## **Lightning Protection**

Lightning is one of the most deadly and unpredictable natural phenomena known to mankind. Lightning originate around 4.5 km to 7.5 km above the ground. Rain drops carried upwards are converted into ice and, for reasons not widely agreed, this resulted in the separation of positive and negative ion. The negative charges move down in 50m sections called step leaders and continue to move and produce a channel along which charges are deposited. Eventually it encounters something on the ground that is a good conductor and a circuit is completed. The charges from the sky are discharged to earth via this circuit resulting in a flash and the discharge of energy.

Each lightning strike packs between 35k to 45k ampere of current and can generate as high as 50k degree C. Lightning strike falls somewhere on earth almost every second and can travel as far as 40 miles. It can and does strike a place twice, kill people, cause property damages and create fire. Lightning can also create abnormal transient high voltage in electrical systems. Thus lightning protection system are normally required to protect structures, surges in Electrical Systems, human beings and animals.

For protection against structure, two systems are available, the conventional system utilizing the cone of protection, Faraday cage and/or rolling sphere principle and the Early Streamer Emission (ESE) system utilizing the collection volume principle. Three elements are required for any lightning protection system against structure namely, air-terminal, down-conductor and ground-terminal. For the conventional system, the air-terminal can be a simple vertical conductor, a horizontal conductor (copper tape mesh) or a suspended air-terminal whereas a purpose design air-terminal to attract charges will be required for the ESE system. For the conventional system, the down-conductor can be copper down tape, reinforce steel bars or the building steel structure whereas special cable will be require for the ESE system The ground-terminal will however be the same for both conventional and ESE systems.

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The Electrical Blog is contributed by Electrical Division. If you would like to know more about this topic please contact the Division Hon. Secretary Ir S.K. Ho, [hosk@emsd.gov.hk](mailto:hosk@emsd.gov.hk).

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