

## Influence of rainfall on the effectiveness of an earth electrode in a lightning protection system

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Each year, lightning is responsible for the deaths of roughly fifty people, injuries to several hundred, and property damage in millions of rupees in Sri Lanka. Damages due to lightning are still high in spite of the fact that some areas are protected with lightning protection systems. The main purpose of a lightning protection system is to give a low resistance path to the lightning strike to reach the earth. Hence the main requirement of a lightning protection system to function properly is the low earth resistance ( $<10$  ohm) of the earth electrode. The purpose of the present study was to identify the variation of earth resistance with rain fall. The study was conducted during the period of September 2002 to February 2003 which consisted of dry and rainy weather conditions. Three identical GI pipes with diameter 0.05 m driven into the ground to a depth of 1.8 m in the above three locations were used to simulate the earth electrode of a lightning protection system. Measurements of earth resistance were made using a digital earth resistance tester (Robin K4105) with two test leads and having a accuracy of  $\pm 2\%$  and  $\pm 0.1$  ohm bearing the IEC1010 & IEC529 safety standards. The fall of potential method was used to measure the earth resistance. Data obtained using simultaneous measurements of daily rainfall and earth resistance were analysed using STATISTICA software package.

The results indicate that the value of the earth resistance do vary with rainfall ranging from 95-49 ohm in sandy loam soil, 100 – 61 ohm in red inland soil and 11-10 ohm in a marshy land with white clay (Kaolin) layer underneath. It was also observed that in sandy loam soil (in Colombo) and red inland soil (in Maharagama) the earth resistance reduced to saturated levels of 50 ohm and 62 ohm, respectively after heavy rain falls (300 mL total over a period of 24 days), and no significant reduction of earth resistance was observed after that with increased rainfall. However, rainfall had very little influence on the variation of resistance in a marshy land with clay layer underneath. The results infer that when taking measurement of earth resistance at the time of installation of a lightning protection system to obtain the required level of  $<10$  ohm resistance, it should not be restricted only to a single measurement done at the time of installation. It is better to be measured monthly through out the year or at least during the dry period. This would ensure the proper functioning of a lightning protection system as intense lightning do occur during inter monsoonal periods prior to the onset of heavy rain i.e. at times when the resistance is high.

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