

## Effectiveness of Earthing System in Vertical Configurations

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**Abstract :** This paper presents the measurement and simulation results by Finite Element Method (FEM) for earth resistance ( $R_{DC}$ ) for interconnected vertical ground rod configurations. The soil resistivity was measured using the Wenner four-pin Method, and  $R_{DC}$  was measured using the Fall of Potential (FOP) method, as outlined in the standard. Genetic Algorithm (GA) is employed to interpret the soil resistivity to that of a 2-layer soil model. The same soil resistivity data that were obtained by Wenner four-pin method were used in FEM for simulation. This paper compares the results of  $R_{DC}$  obtained by FEM simulation with the real measurement at field site. A good agreement was seen for  $R_{DC}$  obtained by measurements and FEM. This shows that FEM is a reliable software to be used for design of earthing systems. It is also found that the parallel rod system has a better performance compared to a similar setup using a grid layout.

**Keywords :** earthing system, earth electrodes, finite element method, genetic algorithm, earth resistances

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