

## **Effect of non-homogeneous soil characteristics on substation grounding-grid performances: a review**

### **ABSTRACT**

Designing an effective grounding system for AC substations needs predetermination of ground resistance and ground potential distribution caused by fault current's presence in the ground. Therefore, it is necessary to have a suitable grounding grid structure in the soil properties in which the grid is buried. Though the soil composition where the grounding grid is located is typically non-homogeneous, the soil is often presumed to be homogeneous due to the complexities of grounding system analysis in non-homogeneous soil. This assumption will lead to inaccuracies in the computation of ground resistance and ground potentials. Although extensive research has been done on non-homogeneous soil structure, comprehensive literature on grounding system performance in non-homogeneous soil is yet to be reviewed. Thus, this paper reviews the effect of non-homogeneous soil on the grounding system, with different soil characteristics in horizontal and vertical two-layer soil structure and the horizontal three-layer soil structure. In addition, the effect of design parameters on the grounding performance in non-homogeneous soil conditions for non-transient fault conditions is also studied. The significance of this study is that it provides a comprehensive review of grounding performance as grounding design changes and their effects as soil layers and their corresponding features change. This knowledge will be useful in developing safe grounding designs in non-homogeneous soil.

**Keyword:** Homogeneous soil; Non-homogeneous soil; Two-layer soil; Three-layer soil; Soil characteristics; Substation grounding