

The impact of substation grounding grid design parameters in non-homogenous soil to the grid safety threshold parameters

ABSTRACT

It is important to ensure that a grounding system is designed with a low magnitude of earth resistance, so the protection system can divert the large fault current to earth effectively. The performances and protection level of a grounding system need to be acknowledged as the condition of soil structure changes with different soil characteristics. At present, there is a lack of systematic guide or standards for grounding grid designs that consider non-uniform soil and its impact on the grounding systems. By computing the grid safety threshold parameters consisting of the grid impedance, step, and touch voltages, a comparison has been made between uniform soil and two-layer soil models. Where the competence and level of safety of the grounding systems depend on the soil attributes, the significant impact of various soil conditions is seen. The evaluations on performance and safety assessment in two-layer soil conditions hold the novelty and originality as there is no such comparison and discussion have been made to date. These comparisons would help in forecasting the behavior and safety of the grounding system in various soil environments, which would provide engineers with additional expertise to design an effective and secure grounding system. This research would contribute to the existing body of knowledge by differentiating and predicting the performance of a grounding system when the characteristics of the soil differ significantly from uniform soil as most of the standards and guidelines only consider uniform soil while designing a grounding system, owing to its complexity at the site.