

Analysis of the Touch and Step Potential Characteristics of an Earthing System Based on Finite Element Method

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Abstract : A well-designed earthing/grounding system will not only provide an effective path for direct dissipation of faulty currents into the earth/soil, but also ensure the safety of personnels withing and around its immediate surrounding perimeter is free from the possibility of fatal electric shock. In order to achieve the latter, it is of paramount importance to ensuring that both the step and touch potentials are kept within the allowable tolerance set by standards IEEE Std-80-2000. In this article, the step and touch potentials of an earthing system are simulated and conformity verified using the Finite Element Method (FEM), and has been found to be 242.4V and 194.80V respectively. The effect of injection current position is also analyzed to observe its effect on a person within or in contact with any active part of the earthing system of the substation. The values obtained closely matches those of other published works which made using different numerical methods and/or simulations Genetic Algorithm (GA). This current study is aimed at throwing more light to the dangers of step and touch potential of earthing systems of substation and electrical facilities as a whole, and the need for further in-dept analysis of these parameters. Observations made on this current paper shows that, the position of contact with an energize earthing system is of paramount important in determining its effect on living organisms in contact with any energized part of the earthing systems.

Keywords : earthing/grounding systems, finite element method (fem), ground/earth resistance, safety, touch and step potentials, generic algorithm

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