DESIGN OF GROUNDING SYSTEM FOR A.C. SUBSTATIONS WITH CRITICAL CONSIDERATION OF THE MESH, TOUCH AND STEP POTENTIALS

Hachimenum Nyebuchi Amadi
Department of Electrical and Electronic Engineering
Federal University of Technology, Owerri, **NIGERIA**
Email: amadihachy@gmail.com

ABSTRACT

Substations are a vital part of the electric power system and therefore require properly designed grounding systems to ensure protection of persons working in the vicinity of earthed facilities from danger of electric shock, safeguard of equipment against unnecessary breakdowns and maintain steady functioning of the entire electrical system. When electricity is generated remotely and there are no return paths for earth faults other than the earth itself, there is often a risk that earth faults can cause dangerous voltage gradients in the earth around the site of the fault (called ground potential rises). In other words, someone standing near the fault can receive a dangerous electrical shock owing firstly to the presence of a dangerous potential difference between the earth and a metallic object that a person is touching and secondly the presence of another dangerous voltage gradient between the feet of a person standing on earth. The objective of designing a safe grounding system is to provide easy and shortest path to the flow of fault currents without exceeding the operation and equipment limits and therefore adversely affecting the continuity of service. This paper proposes a suitable grounding system design for alternating current (A.C.) substations based on the relevant IEEE Standards and International best practices. The paper elaborates the step-by-step calculations necessary to determine the values of the mesh, touch and step potentials suitable for a good grounding system model for the A.C. electrical substation. The proposed design ensures protection of substation personnel from danger and affords safe operation of the entire substation facilities and increased overall system reliability.

Keywords: Earthing, Grounding systems, Soil Resistance, Soil Resistivity, Substation.