

**ESTIMATION OF APPARENT GROUND RESISTIVITY
IN VERTICALLY LAYERED SOIL**

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Degree of Master of Science in Electrical Installations

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Dissertation submitted in partial fulfillment of the requirements for the
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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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Abstract

Soil resistivity and grounding system resistance play key roles in designing earthing systems, safe operation of electric power systems and lightning protection systems. Also, it is beneficial in evaluating the degree of corrosion of underground pipelines.

Most of the researches contributed to this area are based on horizontal 2 layers and horizontal multi layers, but the results are still misinterpreted with the presence of vertical layers. Therefore, the knowledge of the ground structure and determination of soil resistivity with the vertically layered soil are critical in the overall design of the earthing systems in terms of safety, reliability and cost.

In this research, three vertically layered soil models were proposed including two vertical layer soil, three parallel vertical layer soil and three perpendicular vertical layer soil. Then a set of equations were derived to determine the apparent soil resistivity for each soil model using the method of images and Wenner four-point method. The results were further analyzed using MATLAB and compared with field measurements to check the accuracy and efficiency.

The results show that the apparent soil resistivity of vertically layered soil was affected by the direction of electrodes array and the distance between measuring electrodes and interface between the vertically layered soil.

Keywords: vertically layered soil, vertical layer soil apparent resistivity, method of images, grounding, earthing, wenner method, multi layered ground, multilayer soil

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List of Abbreviations

Abbreviation	Description
IEEE	Institute of Electrical and Electronics Engineers
BS	British Standards

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