UNIVERSITI TEKNOLOGI MARA

GEORESISTIVITY INDEX OF COMPOSITE GEOSTRATA AT DIFFERENT CONDITIONS

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ABSTRACT

A geotechnical engineering exploration begins with a site investigation of the subsurface to determine the ground stabilization for the proposed construction. There are two types of techniques that have been used widely in site investigation; destructive techniques for examples testing material from samples extracted through the drilling method and non-destructive techniques for example the resistivity method. The conventional destructive techniques have the disadvantages of sampling disturbance that would affect the data accuracy because of disturbance and contaminant. For non-destructive technique, it is known to be optimum, insitu condition and higher accuracy of data. In this study, a non-destructive innovative laboratory technique of georesistivity technique has been developed for geocharacterization of laboratory scale material and georesistivity tank modeling with stratified materials. The main objectives of this study are to determine the physical properties and georesistivity index of geomaterials, to determine the 2D georesistivity profiling of stratified soil and hard layer, and to correlate the georesistivity index with physical properties of materials. It is found that the resistivity of geological samples depends on several factors. These include the amount of water present in the pores and its porosity. The dominant factors that typically determine a sample's resistivity are the amount of the fluid as conductor where dry material will be more resistive than wet material. From the pilot study, it is found that the presence of clay minerals, such as montmorillonite, results in low resistivity and the materials contains water soluble minerals, such as salt, also result in a low resistivity from the addition of water. Generally, in scientific fundamental every mineral has its own resistivity index. Chemical reactions involving different mineral phases of the sample may also affect its resistivity. If the samples contain significant concentrations of interconnected metallic minerals, such as pyrite, a low resistivity may be observed. For sulfide minerals, it produces dissolved iron and sulfate ions when it reacts with water that increases the conductivity of the fluid. Two types of samples have been tested in this study; cement mortar and soil samples. From the results obtained, it can be found that the most minerals composite in the soil samples are clay minerals such as muscovite and nacrite. Based on the pilot study, the clay minerals would give low resistivity value because this mineral can absorb water easily. The others results are resistivity which resistivity value decreases when the values of moisture content and porosity are increases. Tank modeling with stratified soils and hard layer were the second stage of this study. Resistivity survey was conducted with cement mortar which represent hard layer, different layers of soil with different thickness and percentage of moisture content. The minimum electrode spacing that was applied in this test is 0.04m and the size of tank that was used is 183cmLx39cmWx150cmH. The results were interpreted by using Res2DINV software where the images of the subsurface for the different materials were derived. Based on the results obtained, the results of georesistivity index are mainly depending on moisture content that filled in the pore space and composition of clay mineral that affects to the soil mass.

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