

Subsurface Exploration for Soil Geotechnical Properties and its Implications for Infrastructure Design and Construction in Victoria Island, Lagos, Nigeria

Authors : Sunday Oladele, Joseph Oluwagbeja Simeon

Abstract : Subsurface exploration, integrating methods of geotechnics and geophysics, of a planned construction site in the coastal city of Lagos, Nigeria has been carried out with the aim of characterizing the soil properties and their implication for the proposed infrastructural development. Six Standard Penetration Tests (SPT), fourteen Dutch Cone Penetrometer Tests (DCPT) and 2D Electrical Resistivity Imaging employing Dipole-dipole and Pole-dipole arrays were implemented on the site. The topsoil (0 - 4m) consists of highly compacted sandy lateritic clay(10 to 5595 Ω m) to 1.25m in some parts and dense sand in other parts to 5.50m depth. This topsoil was characterized as a material of very high shear strength (\leq 150kg/m²) and allowable bearing pressure value of 54kN/m² to 85kN/m² and a safety factor of 2.5. Soft amorphous peat/peaty clay (0.1 to 11.4 Ω m), 3-6m thick, underlays the lateritic clay to about 18m depth. Grey, medium dense to very dense sand (0.37 to 2387 Ω m) with occasional gravels underlies the peaty clay down to 30m depth. Within this layer, the freshwater bearing zones are characterized by high resistivity response (83 to 2387 Ω m), while the clayey sand/saline water intruded sand produced subdued resistivity output (0.37 to 40 Ω m). The overall ground-bearing pressure for the proposed structure would be 225kN/m². Bored/cast-in-place pile at 18.00m depth with any of these diameters and respective safe working loads 600mm/1,140KN, 800mm/2,010KN and 1000mm/3,150KN is recommended for the proposed multi-story structure.

Keywords : subsurface exploration, Geotechnical properties, resistivity imaging, pile

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