

Geophysical and geotechnical characterisation of foundation beds at Kuchiyaku, Kuje Area, Abuja, Nigeria

Author(s): ET Faleye, GO Omosuyi

The geoelectrical and geotechnical parameters of foundation soils in Kuchiyaku, Kuje area, Abuja, Nigeria were determined. The exercise was aimed at evaluating the competence of near surface geomaterials to bear civil engineering loads. The study combined 20 Schlumberger Vertical Electrical Soundings (VES), in-situ tests involving 19 Standard Penetration Tests (SPT), 15 Cone Penetration Tests (CPT), and multiple Atterberg's laboratory tests (liquid and plastic limits). The VES interpretations delineated topsoil, weathered basement and the fractured/fresh bedrock within the study area. The layer resistivity ranges from 199 to 1947 Ohm-m for topsoil, 32 to 540 Ohm-m for weathered basement and 495 to 16986 Ohm-m for fresh/fractured bedrock. High resistivity values (>500 Ohm-m) suggest geotechnical competence. Maximum depth to bedrock is about 31m. The cone penetration probed maximum depth of 6.4m at CPT 13 and 10m depth was reached by the standard penetration test via sample holes. The geophysical interpretation results correlated well with the results of CPT, SPT and laboratory Atterberg's tests in the study area. High CPT and SPT values have direct correlation with high resistivity values where there is no much differential in soil fluid content, while areas with high liquid and plastic limits correlate with resistivity low zones, apparently suggesting high groundwater saturation. The Atterberg's limits observed from borehole samples revealed useful knowledge of the soils' engineering properties. The investigation reveals that the near surface foundation materials in the area is generally geotechnically competent.

Keywords: Cone penetration test; Depth sounding; Foundation beds; Geotechnics; Standard penetration test

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