Approximations of Geomechanical Parameters and In-Situ Testing From Standard Penetration Test Results

Correlation Study

Abstract

Measurements of in-situ data for geomechanical parameters are very essential part of geotechnical engineering design, but the time and the budgets are major issues. The design engineer must make critical decisions at several steps throughout the design stages to obtain the most reliable and realistic soil and rock property information. Because of that, the empirical equations are increased in use during the early stages of engineering design work. In any geotechnical investigations, most probably, will be involved in using Standard Penetration Test (SPT). It is a very popular test among geotechnical engineers. Therefore, it will be economically very useful if the results of SPT as N-values could be used to calculate the other geomechanical parameters. The sites of investigation are the Zawia Combined Cycle Power Plant, West Mountain Power Plant at Rowies, Tripoli and Tunisa. The data were collected from 13 boreholes, and more than 160 points. Which gave wide reliable results. Field investigations include Cross-Hole, Down-Hole seismic techniques, Standard Penetration Test SPT, Cone Penetration Test CPT and pressuremeter test PMT. The variation of seismic waves velocity (Vs & Vp) and dynamic modulus (shear modulus, young modulus, and bulk modulus) of sand and weak rock were studied and some correlations were developed. Also the effects of depth on the correlations were investigated. The correlations compared with previous relationships. The results showed that the power function provides the best fit for correlation between seismic wave’s velocity and dynamic modulus data with SPT N-value. The correlation coefficient \(r\) range 0.77-0.54 for sand and for weak rock. Range is 0.82-0.58. The multiple power regression analysis enhanced the correlation coefficient of sand and weak rock to ranges 0.82-0.58 and 0.97-0.92 respectively. These results are higher than the previous results. A single value of geotechnical parameters is very difficult to determine because the properties of material vary from point

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Masters – 2010
to point in the way that, it depends on a set of conditions so geotechnical parameters (seismic waves velocity and dynamic modulus) were determined between an upper and lower limits. The results of statistical analysis of relationship between SPT N-value and Cone Penetration Test (tip resistance qc) for all available data show that a linear regression with zero intercept as best fit correlation. of $r=0.77$. This result is equivalent to previous work. The logarithmic regression gave the best fit for the correlation analysis between the pressuremeter modulus EPMT and N value by $r=0.81$. The relationship between the limit pressure PL and N value was shown that, the linear regression was the best fit. The best-fit regression indicated a logarithmic relationship between the pressuremeter modulus (EPMT) and limit pressure (PL), with $r=0.81$ and 0.66 respectively.