17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 80

Correlation between Cone Tip Resistance and Shear Wave Velocity at Quaternary Alluvium

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Abstract

Several correlations were envisaged in the literature to find out shear wave velocity (V_s) using cone penetration test (CPT) data, but still, a considerable discrepancy is found when CPT correlations are compared for the studied site. A comparison study is conducted with the previously given correlations which also shows the requirement of developing a new correlation for the site. Empirical correlations have been derived in this study from measured field data at 5 sites in the IIT Patna Campus for the estimation of shear wave velocity using CPT data. The shear stress-related parameter, i.e., shear wave velocity is defined in terms of various parameters obtained from the CPT. Various parameters such as cone tip resistance (q_c), soil behaviour Index (IC), effective stress (σ_0'), and depth (z) are correlated with V_s because some factors are interrelated, like the soil layer's ageing, effective confining stress, etc. Regression analysis is carried out to correlate V_s with q_c, I_C, σ_0' and z. Empirical correlations are developed for a site and validated with the rest of the other locations in the campus area. This research will help to predict the subsurface material properties by reducing the overall time and cost of an investigation. By using this correlation, important soil parameters used in design can be obtained more accurately with only CPT data.

Keywords: Shear wave velocity, CPT, Correlation, Penetration tests, Quaternary alluvium