Relationship between S-wave velocities and geotechnical properties of alluvial sediments

Tomio Inazaki[1]

[1] PWRI

Shear wave velocities of surficial unconsolidated sediments were investigated in correlation with geotechnical properties determined by laboratory testing. The S-wave velocity data, all of them were accurately measured in boreholes using the PS suspension logging tool, were collected from two regions, seven sites, 128 boreholes, and more than 6,000 points. We tried to obtain the original waveform data wherever possible and reanalyzed them to have high quality and precision on S-wave velocities. N-values obtained by in situ Standard Penetration Test (SPT), bulk densities, solidities, and mean grain sizes measured by the standard soil test, and elastic constants determined by tri-axial dynamic loading tests were correlated with the S-wave velocities at the same horizons in the same boreholes. Lithofacies based on detailed core investigation were taken account of in the correlation analysis.

Conventionally, S-wave velocities were correlated to N-values. However the dynamic range and measurement accuracy of SPT is too low to compare with S-wave velocity data obtained using the suspension logging tool. So it is possible to estimate N-values from S-wave velocity data using an empirically synthesized equation, but it is very hard to estimate S-wave velocities only from the low quality SPT data. A clear relationship was recognized between S-wave velocities and solidities, and it varied with lithofacies and depositional age. This means that S-wave velocity is a good indicator for the evaluation of depositional environments.