

Liquefaction Potential Assessment Using Screw Driving Testing and Microtremor Data: A Case Study in the Philippines

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Abstract : The Philippine Institute of Volcanology and Seismology (PHIVOLCS) is enhancing its liquefaction hazard map towards a detailed probabilistic approach using SDS and geophysical data. Target sites for liquefaction assessment are public schools in Metro Manila. Since target sites are in highly urbanized-setting, the objective of the project is to conduct both non-destructive geotechnical studies using Screw Driving Testing (SDFS) combined with geophysical data such as refraction microtremor array (ReMi), 3 component microtremor Horizontal to Vertical Spectral Ratio (HVSr), and ground penetrating RADAR (GPR). Initial test data was conducted in liquefaction impacted areas from the Mw 6.1 earthquake in Central Luzon last April 22, 2019 Province of Pampanga. Numerous accounts of liquefaction events were documented areas underlain by quaternary alluvium and mostly covered by recent lahar deposits. SDS estimated values showed a good correlation to actual SPT values obtained from available borehole data. Thus, confirming that SDS can be an alternative tool for liquefaction assessment and more efficient in terms of cost and time compared to SPT and CPT. Conducting borehole may limit its access in highly urbanized areas. In order to extend or extrapolate the SPT borehole data, non-destructive geophysical equipment was used. A 3-component microtremor obtains a subsurface velocity model in 1-D seismic shear wave velocity of the upper 30 meters of the profile (V_{s30}). For the ReMi, 12 geophone array with 6 to 8-meter spacing surveys were conducted. Microtremor data were computed through the Factor of Safety, which is the quotient of Cyclic Resistance Ratio (CRR) and Cyclic Stress Ratio (CSR). Complementary GPR was used to study the subsurface structure and used to inferred subsurface structures and groundwater conditions.

Keywords : screw drive testing, microtremor, ground penetrating RADAR, liquefaction

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