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# Relationship between Stratigraphic Condition and Load Bearing Capacity: a Case Study from Peraliya

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## ABSTRACT

Foundation & Waterwell Engineering (Pvt) Ltd. conducted drilling investigations for the proposed Tsunami Museum at Peraliya, on relatively flat 120 m x 120 m terrain close to the coast. Five borehole locations (BH-1, BH-2, BH-3, and BH-4 and BH-5) were drilled to identify the sub soil stratification and load bearing capacity at the site. Depths of the boreholes varied in BH-1, BH-3 and BH-5 as 14.0 m, 15.0 m and 12.4 m, respectively, with bedrock level. Similarly, the BH-2 and BH-4 were drilled up to 21.0 m to depth. Load bearing capacity was tested at 1.0 m interval depths in all bore holes by in-situ Standard Penetration Test (SPT). Also soil samples were collected by the Standard Split Tube Sampler to analyze the grain size distribution, moisture content, specific gravity and carbonate content. All drilling and field test procedures were carried out in compliance with BS 5930 and BS 1377 standards. The sub-surface stratification across the site can be generated from the five boreholes drilled. All boreholes exhibited similar sub-surface soil types though some variations in consistency or relative density were observed.

In each borehole the stratigraphic changes were noted by careful observation of returned wash water. The soil types of each stratum were determined by analyzing the soil recovered in the Standard Split Tube Sampler. Results from the SPT ('N' Value) were used to determine the load bearing capacity at each depth. In all boreholes, the near surface horizon is dark grayish clayey-sand down to 0.60 m depth. The SPT was not done for this horizon, because SPT was carried out at 1.0 m intervals. From 0.60 m level to about 3.90 m depth grayish loose fine- to medium-sand with some seashells were observed in BH-1, BH-2 and BH-3. But towards the BH-4 and BH-5, this stratum extended to about 3.0 m depth. The SPT 'N' values in this horizon varied from 1 to 5. Reddish-brown lateritic clay with some sand was encountered up to 5.5 - 6.5 m depth in boreholes BH-1, BH-3 BH-4 and BH-5. In BH-2 this horizon extended down to 8.5 m. The SPT 'N' values increased in this horizon, but in some points it was not considerably increased due to clay content. From 8.5-9.0 m depth to end level of all boreholes, silty-clay or sandy-clay of completely decomposed rocks were encountered. But in boreholes BH-2 and BH-4 traces of mica appeared. The SPT 'N' values of decomposed rock horizon have considerably increased, except at some points where these values have been lowered due to the clay content.

Based on stratigraphy, SPT test values and other laboratory tests such as particle size distribution, moisture content, Attenberg limits, specific gravity etc. in soil samples, it is possible to conclude that the upper soil layers at the site are very weak down to about 4.0 m depth, and consequently shallow foundations cannot be employed without ground improvement by soil replacement or perhaps by dynamic compaction. In view of shallow ground water table at site, soil replacement down to such a depth is not feasible and the possibility of having dynamic compaction or preloading can be considered.