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Laboratory experiments to investigate the suitability of low-replacement sand compaction piles for developing countries

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Strength parameters of a sand compaction pile are normally checked by standard penetration test (SPT). Empirical equations, which are derived from numerous data obtained from uniform sand, are adopted for evaluating the internal friction angle (□′) value of the sand pile. However, constraint conditions of a sand pile in the clay improved with sand compaction piles (SCPs) are considered to be very different from that in the uniform sand. Due to simplicity, speed, continuous profiling and amenability to theoretical modeling, cone penetration tests (CPT) can be used to evaluate □′ for SCP.

In this research, laboratory tests were done with a miniature cone, which consisted of two strain gauges to measure tip resistance and probe resistance, inserted into a sample of saturated sand in a triaxial set-up. Before inserting the cone the sample was consolidated under different confining pressures such as 50, 100, 200 and 400 kPa and then the cone was penetrated at a constant rate to find out the ultimate cavity expansion pressure and the volume change of the sample. These tests were done with two different relative densities of 60% and 72% Toyoura sand. It was observed that the laboratory test results for the ultimate cavity expansion pressure were in good agreement with the cavity expansion theory proposed by Nawagamuwa (2002).

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