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Use of coir dusts in vertical drains as a substitution for sand

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This research project studied the applicability of soft ground improvement with an introduction of coir dust in vertical drains as a filling material with sea sand, as a useful means of reducing and optimising waste.

As a developing country, Sri Lanka has already launched major development projects, therein utilizing undesirable grounds is unavoidable due to limited usable land. Normal practices like removing and replacing of soil as well as pile foundation in overcoming undesirable conditions of the soft ground may not be economically and environmentally feasible for a developing country like Sri Lanka. At the same time, solid waste management has become a major concern all over the world as it appears with many issues. Waste reduction, reuse and recycle have become major issues in recent days. As a major coconut producing country in the world, Sri Lanka produces annual net waste of coir dust around 527,800 t. Having considered the means of reducing and reusing the coir waste in a useful manner, the applicability of ground improvement with an introduction of coir dust in the vertical drains as filling materials with sea sand was studied in this research.

The permeability characteristics of mixed materials of coir dust and sea sand as well as sea sand were analysed and a comparison made of consolidation behaviour of high plasticity clay with vertical drains under two conditions - vertical drains filled with sea sand alone and the drains filled with mixed materials. Those without vertical drains were also discussed. The results of consolidation tests showed that the soil improved with vertical drains consist of coir dust accelerate the consolidation process compared to the unimproved soil. It was observed that the coefficients of permeability of mixed samples were within the range of 10^{-2} cm s^{-1} which is a typical value for sand drains.

The optimum percentage of coir dust to be used in vertical drains with sea sand as filling materials was finally established by considering the permeability and consolidation characteristics with a cost analysis for practical applications.

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