

Assessing the Potential of a Waste Material for Cement Replacement and the Effect of Its Fineness in Soft Soil Stabilisation

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Abstract : This paper represents the results of experimental work to investigate the suitability of a waste material (WM) for soft soil stabilisation. In addition, the effect of particle size distribution (PSD) of the waste material on its performance as a soil stabiliser was investigated. The WM used in this study is produced from the incineration processes in domestic energy power plant and it is available in two different grades of fineness (coarse waste material (CWM) and fine waste material (FWM)). An intermediate plasticity silty clayey soil with medium organic matter content has been used in this study. The suitability of the CWM and FWM to improve the physical and engineering properties of the selected soil was evaluated dependant on the results obtained from the consistency limits, compaction characteristics (optimum moisture content (OMC) and maximum dry density (MDD)); along with the unconfined compressive strength test (UCS). Different percentages of CWM were added to the soft soil (3, 6, 9, 12 and 15%) to produce various admixtures. Then the UCS test was carried out on specimens under different curing periods (zero, 7, 14, and 28 days) to find the optimum percentage of CWM. The optimum and other two percentages (either side of the optimum content) were used for FWM to evaluate the effect of the fineness of the WM on UCS of the stabilised soil. Results indicated that both types of the WM used in this study improved the physical properties of the soft soil where the index of plasticity (IP) was decreased significantly. IP was decreased from 21 to 13.64 and 13.10 with 12% of CWM and 15% of FWM respectively. The results of the unconfined compressive strength test indicated that 12% of CWM was the optimum and this percentage developed the UCS value from 202kPa to 500kPa for 28 days cured samples, which is equal, approximately 2.5 times the UCS value for untreated soil. Moreover, this percentage provided 1.4 times the value of UCS for stabilized soil-CWA by using FWM which recorded just under 700kPa after 28 days curing.

Keywords : soft soil stabilisation, waste materials, fineness, unconfined compressive strength

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