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Stabilisation of a Soft Soil by Alkaline Activation

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Abstract : This paper investigates the changes in the strength development of a high water content soft soil stabilised with alkaline activation of fly ash (FA) to use in deep soil mixing (DSM) technology. The content of FA was 20% by dry mass of soil, and the alkaline activator was sodium silicate (Na2SiO3). Samples were cured for 3, 7, 14, 28 and 56 days to evaluate the effect of curing time on strength development. To study the effect of adding slag (S) to the mixture on the strength development, 5% S was replaced with FA. In addition, the effect of the initial unit weight of samples on strength development was studied by preparing specimens with two different static compaction stresses. This was to replicate the field conditions where during implementing the DSM technique, the pressure on the soil while being mixed, increases with depth. Unconfined compression strength (UCS), scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS) tests were conducted on the specimens. The results show that adding S to the FA based geopolymer activated by Na2SiO3 decreases the strength. Furthermore, samples prepared at a higher unit weight demonstrate greater strengths. Moreover, samples prepared at lower unit weight reached their final strength at about 14 days of curing, whereas the strength development continues to 56 days for specimens prepared at a higher unit weight.

Keywords : alkaline activation, curing time, fly ash, geopolymer, slag
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