Unified Strength Prediction Model for Cemented Soils

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ABSTRACT

Cementation, even in small amounts tends to alter the mechanical properties of soil significantly. Ordinary Portland Cement (OPC) is the widely used binding admixture, but there has been an increasing need for replacement owing to its carbon footprint. One such alternative is Calcium Sulfoaluminate cement (CSA), which has a higher initial strength gain and a lower carbon footprint than OPC. Since existing strength prediction models available from the literature were developed for conventional cement types such as OPC and Portland Blast Furnace Cement (PBFC), those are not applicable for predicting the strength evolution of soil treated by other types of cement (e.g., underpredicting the initial strength of CSA treated sand). This is because the prediction models available are either soil-specific or cement-specific. This paper proposes a unified model that works irrespective of cement and/or soil types by introducing a new design parameter, the slope parameter, to capture the time-dependent strength gain. The proposed model is validated by data collected from the literature on various soils and cement types and new experimental data. The three-parameter model can eventually predict the strength of cemented soils over a wide range of water-to-cement ratios.

Keywords: Calcium sulfoaluminate cement, cement treated soil, Ordinary Portland cement, strength prediction model

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