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Estimation of Consolidating Settlement Based on a Time-Dependent Skin Friction Model Considering Column Surface Roughness

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Abstract : Improvement of soft clay deposits by the combination of surface stabilization and floating type cement-treated columns is one of the most popular techniques worldwide. On the basis of one dimensional consolidation model, a time-dependent skin friction model for the column-soil interaction is proposed. The nonlinear relationship between column shaft shear stresses and effective vertical pressure of the surrounding soil can be described in this model. The influence of column-soil surface roughness can be represented using a roughness coefficient R, which plays an important role in the design of column length. Based on the homogenization method, a part of floating type improved ground will be treated as an unimproved portion, which with a length of αH1 is defined as a time-dependent equivalent skin friction length. The compression settlement of this unimproved portion can be predicted only using the soft clay parameters. Apart from calculating the settlement of this composited ground, the load transfer mechanism is discussed utilizing model tests. The proposed model is validated by comparing with calculations and laboratory results of model and ring shear tests, which indicate the suitability and accuracy of the solutions in this paper.

Keywords : floating type improved foundation, time-dependent skin friction, roughness, consolidation
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