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Influence Zone of Strip Footing on Untreated and Cement Treated Sand Mat Underlain by Soft Clay (2nd reviewed)

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Abstract : Shallow foundation on soft soils without ground improvement can represent a high level of settlement. In such a case, an alternative to pile foundations may be shallow strip footings placed on a soil system in which the upper layer is untreated or cement-treated compacted sand to limit the settlement within a permissible level. This research work deals with a rigid plane-strain strip footing of 2.5m width placed on a soil consisting of untreated or cement treated sand layer underlain by homogeneous soft clay. Both the thin and thick compared the footing width was considered. The soft inorganic cohesive NC clay layer is considered undrained for plastic loading stages and drained in consolidation stages, and the sand layer is drained in all loading stages. FEM analysis was done using PLAXIS 2D Version 8.0 with a model consisting of clay deposits of 15m thickness and 18m width. The soft clay layer was modeled using the Hardening Soil Model, Soft Soil Model, Soft Soil Creep model, and the upper improvement layer was modeled using only the Hardening Soil Model. The system is considered fully saturated. The value of natural void ratio 1.2 is used. Total displacement fields of strip footing and subsoil layers in the case of Untreated and Cement treated Sand as Upper layer are presented. For Hi/B =0.6 or above, the distribution of major deformation within an upper layer and the influence zone of footing is limited in an upper layer which indicates the complete effectiveness of the upper layer in bearing the foundation effectively in case of the untreated upper layer. For Hi/B =0.3 or above, the distribution of major deformation occurred within an upper layer, and the function of footing is limited in the upper layer. This indicates the complete effectiveness of the cement-treated upper layer. Brittle behavior of cemented sand and fracture or cracks is not considered in this analysis.

Keywords : displacement, ground improvement, influence depth, PLAXIS 2D, primary and secondary settlement, sand mat, soft clay
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