Consideration of Ground Deformation Characteristics in Vacuum Consolidation and Application for Design

真空圧密工法による地盤変形特性に関する察と設計への応用

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要　旨

真空圧密工法の施工事例から、従来設計手法による沈下と強度増加の予測値が実測値と一致しない場合があり、この特殊な載荷条件下での地盤変形を適切に考慮すべきであることが分かってきた。真空圧載荷時の地盤収縮による水平土圧の変化を考慮することによって、有効応力増加の深さ方向の分布と地盤変形を求めることができる。そして、真空圧密の領域外への影響を考慮することで、その影響範囲と地盤変位を評価しようとする簡易な手法が提案されている。本論文では、その簡易手法の適用性を数例の実測データを用いて調べた。その結果、提案式への入力に若干の修正を加えれば実測値とさらによく一致し、少なくとも一次設計に対して本手法が有用であることが分かった。

キーワード：地盤改良、真空圧密工法、変形特性、主動土圧、有効応力、負の過剰間隙水圧

Summary

Experience from vacuum consolidation practice revealed discrepancy between actually measured and predicted settlement and strength increment obtained by conventional designs, which can be overestimated or underestimated depending on the depth involved. It addresses the necessity of proper consideration of ground deformation under this peculiar loading. By considering the change in lateral earth pressure condition associated with inward compression of the ground under application of vacuum load, effective stress increment in the soil at any treatment depth and their distribution are established, which indicates a variation of deformation characteristics along depth. Based on that, equations have been derived for approximately estimating the vacuum induced displacement and strength increment with appropriate deformation at the corresponding depth being taken into account. On the other hand, considering the influence of vacuum consolidation beyond the treatment boundary, an approximation method is proposed to evaluate the influence zone and predict the displacement at various distances within that zone. In this paper, applicability of the proposed approach and equations are examined using data from several actual vacuum consolidation cases. As a result, some modification for the input in proposed equations are suggested for a better agreement between calculated and measured data. It suggests about the usefulness of the approach at least in preliminary design.

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