INVESTIGATION ON THE EQUIVALENT MODULUS OF SUBGRADE REACTION OF LAYERED SOIL

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement of any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

'Modulus of subgrade reaction' is the ratio between the pressure applied on the soil and the corresponding settlement. There is no theoretical relationship found to obtain equivalent subgrade modulus of layered soil. Top dense sand layer thickness, bottom loose sand layer thickness, strip footing width and thickness are changed and equivalent modulus of subgrade reactions are obtained by equivalent spring theory and weighted average method. These, equivalent subgrade modulus are separately applied in Heteryni method equations in order find vertical settlement, bending moment and shearing force along the medium length footings. PLAXIS 3D numerical models are developed for same footing parameters and soil properties to compare the Heteryni method outputs.

Equivalent subgrade modulus using equivalent spring method is constant with top soil layer thickness for a given footing width and footing depth. Weighted average method equivalent subgrade module is non linearly increasing with top dense sand layer thickness for a given footing and bottom loose sand layer thickness. Equivalent subgrade module for thinner footing depth is always greater than the thicker footing for a given footing width and soil profile in both spring theory and weighted average method. Settlement along footing obtained by equivalent spring method equivalent subgrade modulus applied in Heteryni method equation is highly varying from weighted average method equivalent subgrade module applied in Heteryni method equation and PLAXIS 3D model settlement output. Equivalent spring method is considered as unsuitable to calculate the equivalent modulus of subgrade reaction for layered soil stratum. Settlement difference between PLAXIS 3D method and weighted average method equivalent subgrade module applied in Heteryni method equation shows up to 45 percentages and this difference cannot be negligible.

This study will shed a light in the theoretical relationship of equivalent subgrade module research field as this would be the first attempt to check the behavior and suitability of equivalent subgrade modulus of layered soil stratum.

Keywords*: equivalent subgrade modulus, layered soil, strip footing, PLAXIS 3D, beams on elastic foundation, Hetenyni method, finite element method*

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