

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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TABLE OF CONTENTS

	Page
DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	vi
LIST OF TABLES	vii
CHAPTER ONE	
INTRODUCTION	01
1.1 Background	01
1.2 Scope	01
1.3 Objectives of the research	01
1.4 Contents of the report	02
1.5 Input variable selection	02
CHAPTER TWO	
LITERATURE REVIEW	04
2.1 Subsoil profile of Sri Lanka	04
2.2 Properties of soil	04
2.3 Modulus of subgrade reaction	05
2.4 Equivalent spring theory of layered soil	07
2.5 Beams on elastic foundation theory	09
2.6 PLAXIS 3D numerical analysis	11
CHAPTER THREE	
METHODOLOGY	13
3.1 Dimension selection of footing and soil layers	13
3.2 Material properties	16
3.3 PLAXIS 3D model	17
3.4 Validation of PLAXIS 3D model	18
3.5 Equivalent modulus of subgrade reaction	24
3.6 Theory of beam on elastic foundation Hetenyi method	25

CHAPTER FOUR	
RESULTS AND DISCUSSION	27
4.1 Calculations	27
4.2 Result analysis	29
4.3 Discussion on results	48
CHAPTER FIVE	
CONCLUSION AND RECOMMENDATIONS	50
5.1 Conclusion	50
5.2 Recommendations	50
CHAPTER SIX	
REFERENCES	51
CHAPTER SEVEN	
APPENDIX	53
7.1 Hetenyi method equations	53
7.2 PLAXIS 3D settlement outputs for validation	55
7.3 PLAXIS 3D settlement, shear and bending moment outputs for strip footings	56
7.4 Settlement curves along footing	110
7.5 Settlement difference between PLAXIS 3D and weighted average equivalent subgrade modules applied in Heternyi method curve	137

LIST OF FIGURES

	page
Figure 1. 1 : Schematic sketch of the strip footing	3
Figure 2. 1 : Soil spring diagram of double layered soil.....	7
Figure 2. 2 : Winkler foundation consisting of independent springs.....	9
Figure 2. 3 : Coordinate system and indication of positive stress components (PLAXIS 3D Manual, 2017)	11
Figure 3. 1 : PLAXIS 3D inputs of strip footing	17
Figure 3. 2 : Sub soil profile and foundation of oil storage tank	18
Figure 3. 3 : PLAXIS 3D inputs of oil storage tank foundation	23
Figure 4. 1: Equivalent spring theory equivalent subgrade modulus k_{s1} verses H_1/B for $t=0.4m$	29
Figure 4. 2: Equivalent spring theory equivalent subgrade modulus k_{s1} verses H_1/B for $t=0.6m$	30
Figure 4. 3: Weighted average method equivalent subgrade modulus k_{s2} verses H_1/B for $t=0.4m$...	31
Figure 4. 4: Weighted average method equivalent subgrade modulus k_{s2} verses H_1/B for $d=0.6m$..	32
Figure 4. 5: Equivalent subgrade modulus k_{s1} with H_1/B for various footing thicknesses.....	33
Figure 4. 6: Equivalent subgrade modulus k_{s2} with H_1/B for $B=1.0m$ and various footing thicknesses(t).....	34
Figure 4. 7: Equivalent subgrade modulus k_{s2} with H_1/B for $B=1.5m$ and various footing thicknesses(t).....	35
Figure 4. 8: Equivalent subgrade modulus k_{s2} with H_1/B for $B=2.0m$ and various footing thicknesses (t).....	36
Figure 4. 9 : Equivalent spring theory settlement at edge of the footing verses H_1/B for $t=0.4m$	38
Figure 4. 10: Weighted average method settlement at edge of the footing verses H_1/B for $t=0.4m$.	39
Figure 4. 11: PLAXIS 3D settlement at edge of the footing verses H_1/B for $t=0.4m$	40
Figure 4. 12: Vertical settlement along footing (for $B=1.5m, L=18.0m, H_1=3.0m, H_2=3.0m$).....	41
Figure 4. 13: Settlement difference between PLAXIS 3D and weighted average equivalent subgrade reaction applied in Heteryni equation along footing (for $B=1.0m, L=12.0m, H_1=2.0m, H_2=2.0m$) .	43
Figure 4. 14: Settlement difference between PLAXIS 3D and weighted average equivalent subgrade reaction applied in Heteryni equation along footing (for $B=1.5m, L=18.0m, H_1=3.0m, H_2=3.0m$) .	44
Figure 4. 15: Settlement difference between PLAXIS 3D and weighted average equivalent subgrade reaction applied in Heteryni equation along footing (for $B=2.0m, L=24.0m, H_1=4.0m, H_2=4.0m$) .	45
Figure 4. 16: Bending moment along footing (for $B=1.5m, t=0.4m, L=18.0m, H_1=3.0m, H_2=3.0m$)	46
Figure 4. 17: Shear force along footing (for $B=1.5m, t=0.4m, L=18.0m, H_1=3.0m, H_2=3.0m$)	47
Figure 7. 1 : A finite beam subjected to a concentrated load.....	53

LIST OF TABLES

	Page
Table 2. 1 : Soil deformation parameters (Geotechnical control office 1982)	4
Table 2. 2 : Design parameters in Sandy soils (Geotechnical control office 1982).....	4
Table 2. 3 : Range of modulus of subgrade reaction k_s (Joseph E. Bowles 1997)	6
Table 3. 1 : Selected material properties for the present study	16
Table 3. 2 : Rod length correction factor η_2 for SPT correlation (Joseph E. Bowles 1997)	20
Table 3. 3 : Corrected SPT N_{70} ' values and soil parameters	21
Table 3. 4 : Corrected SPT N_{55} values.....	21
Table 3. 5 : Oil storage tank foundation actual settlement and PLAXIS 3D model settlement	23
Table 4. 1: Equivalent subgrade modulus for 0.4m footing thickness.....	27
Table 4. 2: Equivalent subgrade modulus for 0.6m footing	28
Table 4. 3: Equivalent subgrade modulus k_{s1} with H_1/B for various footing thicknesses(t)	33
Table 4. 4: Equivalent subgrade modulus k_{s2} with H_1/B for $B=1.0m$ and various footing thicknesses (t).....	34
Table 4. 5: Equivalent subgrade modulus k_{s2} with H_1/B for $B=1.5m$ and various footing thicknesses(t).....	35
Table 4. 6: Equivalent subgrade modulus k_{s2} with H_1/B for $B=2.0m$ and various footing thicknesses (t).....	36
Table 4. 7 : Settlement along footing (for $B=1.5m, L=18.0m, H_1=3.0m, H_2=3.0m$)	41