

TABLE OF CONTENTS

Abstract	i
Declaration	iii
Certificate of the supervisor	v
Acknowledgements	vii
Table of Contents	ix
List of Figures	xiii
List of Tables	xxi
List of Abbreviations and Symbols	xxiii
CHAPTER 1: INTRODUCTION	1
1.1 Introduction	1
1.2 Geocell reinforced soil	1
1.3 Need for research	3
1.4 Objectives	4
1.5 Thesis organization	5
CHAPTER 2: REVIEW OF LITERATURE AND SCOPE OF THE PRESENT STUDY	7
2.1 Introduction	7
2.2 Unreinforced foundations	7
2.3 Studies with planar reinforcement	11
2.4 Studies with geocell reinforcement	17
2.5 Summary of literature review and scope of the present study	33
CHAPTER 3: MATERIALS AND METHODOLOGY	37
3.1 Introduction	37
3.2 Material used	37
3.2.1 Sand	38
3.2.2 Geocell reinforcement	42
3.3 Experimental Programme	47
3.4 Test description	49

3.4.1 Test set-up	49
3.4.1.1 Monotonic load/Static load tests	51
3.4.1.2 Repeated load tests	52
3.5 Preparations of test specimens and procedure	53
3.5.1 Preparation of sand bed	53
3.5.2 Test procedure	53

CHAPTER 4: UNREINFORCED AND GEOCELL-REINFORCED

SAND BED UNDER STATIC LOADS	55
4.1 Introduction	55
4.2 Unreinforced sand beds	56
4.3 Geocell-reinforced sand beds	67
4.3.1 Effect of footing shape	68
4.3.2 Effect of depth of geocell reinforcement position	73
4.3.3 Effect of geocell pocket size	78
4.3.4 Effect of height of geocell mattress	84
4.3.5 Effect of geocell-reinforcement width	90
4.3.6 Effect of variation of relative density of subgrade sand for 70% infill sand density (D_r , <i>infill</i> = 70%)	96
4.3.7 Effect of relative density of infill sand	102
4.4 Summary	104

CHAPTER 5: UNREINFORCED AND GEOCELL-REINFORCED

SAND BED UNDER REPEATED LOADS	107
5.1 Introduction	107
5.2 Effect of geocell reinforcement layer	108
5.2.1 Effect of initial static load level	111
5.2.2 Effect of number of load cycles	112
5.2.3 Effect of depth of geocell reinforcement position	114
5.2.4 Effect of geocell pocket size	117
5.2.5 Effect of height of geocell mattress	120
5.2.6 Effect of geocell-reinforcement width	122
5.2.7 Effect of relative density variation	125

5.3 Summary	127
CHAPTER 6: REGRESSION MODEL	131
6.1 Regression analysis	131
6.1.1 Development of regression model	131
6.1.2 Validation of the model	135
6.1.3 Comparison of regression model with analytical methodologies	138
6.2 Scale effects	139
6.3 Practical implications of this study	140
CHAPTER 7: SUMMARY AND CONCLUSIONS	143
7.1 Summary of the thesis	143
7.2 Conclusions	144
7.3 Scope for future research	147
REFERENCES	149
Appendix 1: Theoretical calculation of ultimate bearing capacity of sandy soil	161
Appendix 2: Calculation of shape factor of footing	163
Appendix 3: Theoretical calculation of ultimate bearing capacity of geocell-reinforced sand beds	165
LIST OF PUBLICATIONS	171