

**Numerical Modeling of Consolidation of Marine
Clay under Vacuum Preloading Incorporating
Prefabricated Vertical Drains**

by

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Master Degree of Science in Civil Engineering

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**Faculty of Science and Technology
University of Macau**

NUMERICAL MODELING OF CONSOLIDATION OF
MARINE CLAY UNDER VACUUM PRELOADING
INCORPORATING PREFABRICATED VERTICAL
DRAINS

by

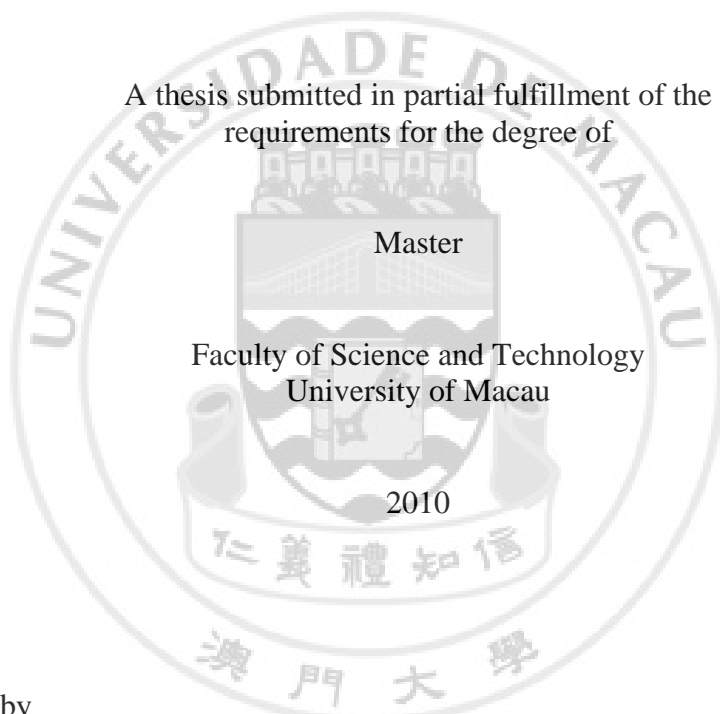
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A thesis submitted in partial fulfillment of the
requirements for the degree of

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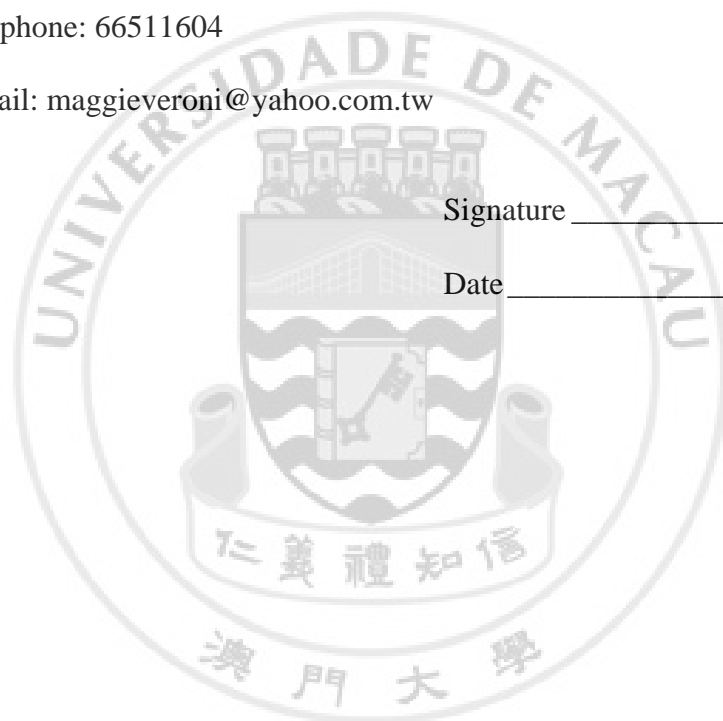
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Abstract

The thesis mainly studies consolidation behavior of the marine clay under vacuum preloading.

In this study, vacuum preloading is selected as the ground improvement method. Vacuum preloading, not only shown to be cheaper and faster than surcharge fill, but also reduces the danger of bearing capacity failure. To enhance the consolidation process, prefabricated vertical drains are incorporated with vacuum preloading. Besides vacuum preloading, surcharge preloading is also performed in the soil for comparing purpose.

The numerical results are modeled by a finite element program, CRISP. Modified Cam Clay and linear elastic models are adopted for different soil properties.

Settlements, lateral displacements and pore water pressure are studied under vacuum preloading and compared with the results of surcharge preloading. Combination of vacuum pressure with surcharge loading has shown advantages on increasing the overall effective loading, reducing the lateral displacement of the soil, as a result improves the damages caused in the nearby building.

A case study in the Terminal of Macau International Airport is also presented here. Three models under different loading condition are made for the simulation of the field settlement data provided by LECM. Model 3, with vacuum pressure varied with depth and time, gives similar results with the field data.

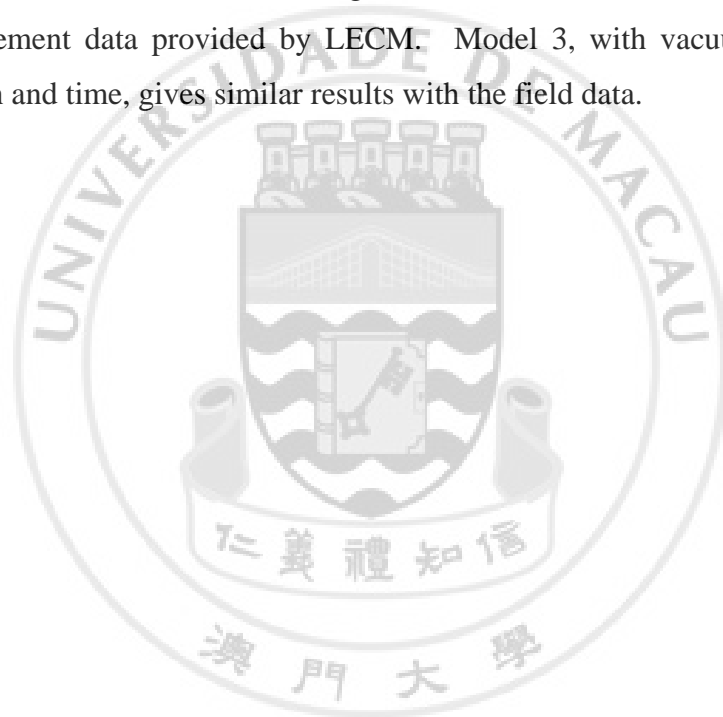
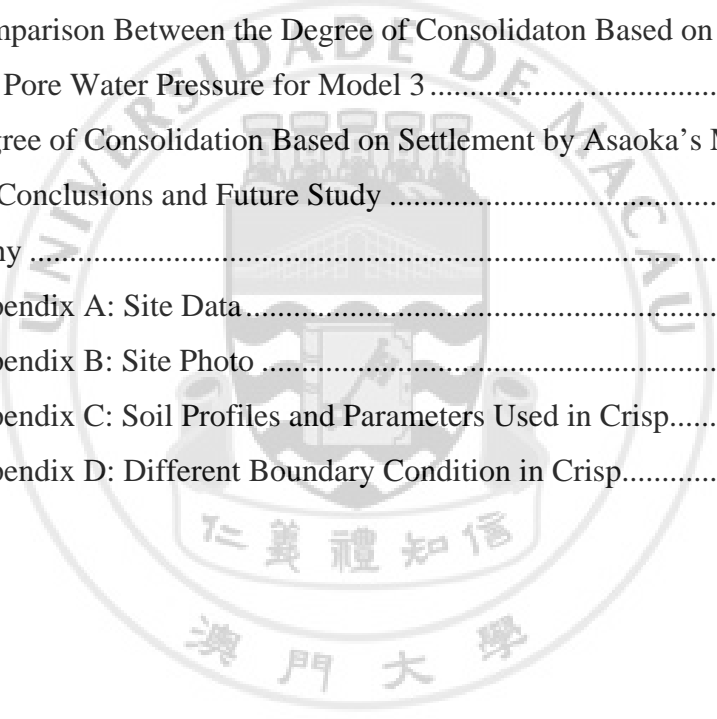


TABLE OF CONTENTS

List of Figures	iv
List of Tables	viii
Chapter 1: Introduction	1
Chapter 2: Literature Review and Background study	3
2.1 Consolidation and Consolidation Settlement	3
2.1.1 Components of Settlement	3
2.1.2 Compressibility of Granular Soils and Consolidation of Cohesion Soils	4
2.1.3 Oedometer Test	4
2.1.4 Calculation of Settlement from One-Dimensional Consolidation	5
2.2 Time Rate on Consolidation Behavior	7
2.2.1 Terzaghi's One-Dimensional Consolidation Theory	7
2.2.2 Assumptions in Terzaghi's Theory	8
2.2.3 Evaluation of Secondary Settlement	11
2.3 Constitutive Models	12
2.3.1 Linear Elastic and Plastic Models	12
2.3.2 Elasto-Plastic Soil Model	12
2.3.3 Critical State Model	13
2.3.3.1 CSSM Parameters	13
2.3.3.2 Critical State Line	15
2.3.3.3 Cam Clay	16
2.3.3.4 Modified Cam Clay	17
2.4 Vacuum Preloading	19
2.5. Surcharge V.S. Vacuum Preloading	20
2.6 Vertical Drains	20
2.6.1 Prefabricated Vertical Drains	20
2.6.2 Band Drain and Equivalent Cylinder Drain	21
2.6.3 Consolidation Theory with Vertical Drains	22

2.6.4 Conversion of 3D Drain Pattern to Equivalent 2-D System	25
2.7 Unit Cell Study of Equivalent Permeability Method	27
2.8 Degree of Consolidation	33
2.8.1 Degree of Consolidation Based on Settlement	33
2.8.2 Degree of Consolidation Based on Pore Water Pressure.....	35
Chapter 3: Site Investigation.....	37
3.1 Topography	37
3.2 Geological Profiles.....	37
3.2.1 Boreholes Distribution	37
3.3.2 Brief Description of the Strata	38
3.3 Parameters of Soil.....	41
3.4 Monitoring System.....	43
Chapter 4: Numerical Analysis of Consolidation	46
4.1 Modeling Using Finite Element Method	46
4.1.1 Introduction.....	46
4.1.2 The Finite Element Program CRISP	46
4.2 General.....	47
4.2.1 Soil Profiles and Parameters	47
4.2.2 Slurry Wall.....	50
4.3 Model Verification Using Unit Cylinder	51
4.3.1 Settlement Behavior Under Vacuum Pressure Compared to that of Surcharge Preloading	51
4.3.2 Degree of Consolidation Calculated by Theoretical Method and Crisp.....	54
4.4 Mesh Dependency.....	56
4.5 Investigate the Consolidation Behavior Under Surcharge and Vacuum Preloading	61
4.5.1 Settlement	61
4.5.2 Lateral Displacement	67
4.5.3 Combination of Surcharge and Vacuum Preloading	68
4.5.4 Pore Water Pressure.....	68

4.5.5 Degree of Consolidation	69
4.5.5.1 Degree of Consolidation Based on Settlement	69
4.5.5.2 Degree of Consolidation Based on Pore Water Pressure.....	69
4.5.5.3 Comparison Between Degree of Consolidation Based on Settlement and Pore Water Pressure	70
Chapter 5: Numerical Analysis with Field Data.....	71
5.1 Comparison Between Measured Field Data and Modeled Surface Settlements	71
5.2 Settlement	79
5.3 Comparison Between the Degree of Consolidaton Based on Settlement and Pore Water Pressure for Model 3	82
5.4 Degree of Consolidation Based on Settlement by Asaoka’s Method.....	83
Chapter 6: Conclusions and Future Study	85
Bibliography	87
Appendix A: Site Data.....	90
Appendix B: Site Photo	95
Appendix C: Soil Profiles and Parameters Used in Crisp.....	97
Appendix D: Different Boundary Condition in Crisp.....	103



LIST OF FIGURES

<i>Number</i>	<i>Page</i>
Figure 2.1: Compression index and recompression index	6
Figure 2.2: Laboratory compression curve	9
Figure 2.3: Consolidation for any location and time factor	10
Figure 2.4: Average degree of consolidation versus time factor	11
Figure 2.5: Different elasto-plastic soil models: a) Elastic perfectly-plastic; b) Elasto-plastic with strain softening; c) Elasto-plastic with strain hardening.....	13
Figure 2.6: Relationship between a) conventional σ_v' -e plot and b) CSSM V-ln(p') plot.....	15
Figure 2.7: Critical state line.....	16
Figure 2.8: Different assumptions for yield locus a) Cam clay; b) Modified Cam clay	18
Figure 2.9: Schematic of vacuum preloading consolidation (after Shang et al., 1998)	19
Figure 2.10: Different in pore water pressure and effective stress changes under a) Fill surcharge; b) Vacuum load	20
Figure 2.11: Equivalent cylinder drain and band drain (Kjellman 1948).....	22
Figure 2.12: Conversion of axisymmetric unit cell into plane strain (Indraratna and Redana., 1997)	26
Figure 2.13: Unit cylinder using equivalent permeability method	28
Figure 2.14: Finite element mesh of unit cell	30
Figure 2.15: Vertical settlements versus duration with original and equivalent permeability using approach 1	31
Figure 2.16: Vertical settlements versus duration with original and equivalent permeability using approach 2	32
Figure 2.17: Schematic illustration of Asaoka's method (Asaoka, 1978).....	33

Figure 2.18: Schematic illustration of pore water pressure distributions versus depth under vacuum load	36
Figure 3.1: Site layout of MIA-South Apron Extension (Phase 2).....	37
Figure 3.2: Layout of borehole distribution in MIA-South Apron Extension (Phase 2)	38
Figure 3.3: Soil profile along longitudinal line 8-8	40
Figure 3.4: Soil profile along longitudinal line 9-9	41
Figure 3.5: Consolidation parameters v.s. depth a) Unit weight; b) Void ratio; c) Compression index; d) Swelling index; e) Vertical coefficient of consolidation; f) Horizontal coefficient of consolidation.....	43
Figure 3.6: Photos of monitoring system in the site	45
Figure 3.7: Layout of settlement plates.....	45
Figure 4.1: Layout of vertical drains on section 4-4.....	49
Figure 4.2: Soil Profile of section 4-4.....	50
Figure 4.3: Details of slurry wall: a) Overlapping of double layers slurry wall; b) Dimensions of slurry wall.....	51
Figure 4.4: Settlement versus duration curve under a) Surcharge preloading; b) Vacuum preloading.....	52
Figure 4.5: Total pore water pressure versus duration curve under a) Surcharge preloading; b) Vacuum preloading	53
Figure 4.6: Degree of consolidation calculated by theoretical and CRISP.....	55
Figure 4.7: Geological profile for numerical modeling.....	56
Figure 4.8: With 5m soil around treatment area a) Surcharge preloading; b) Vacuum preloading.....	58
Figure 4.9: With 25m soil around treatment area a) Surcharge preloading; b) Vacuum preloading.....	59
Figure 4.10: With 30m soil around treatment area a) Surcharge preloading; b) Vacuum preloading.....	60
Figure 4.11: Surface settlement profile for a) Surcharge preloading; b) Vacuum preloading	62

Figure 4.12: Settlement at line AA' along different elevation against duration for a) Surcharge preloading; b) Vacuum preloading	63
Figure 4.13: Settlement along line AA' at time=300days for a) Surcharge preloading; b) Vacuum preloading	64
Figure 4.14: Settlement curves at elevation of 6m at line AA' for surcharge preloading and vacuum preloading	65
Figure 4.15: Settlement curves at elevation of -2m at line AA' for surcharge preloading and vacuum preloading	65
Figure 4.16: Settlement curves at elevation of -13m at line AA' for surcharge preloading and vacuum preloading	66
Figure 4.17: Settlement curves at elevation of -16m at line AA' for surcharge preloading and vacuum preloading	66
Figure 4.18: Lateral displacement distribution along line AA' for surcharge preloading and vacuum preloading	67
Figure 4.19: Lateral displacement distribution with depth along line AA' for different loading cases	68
Figure 4.20: Total pore water pressure versus time along line AA' for vacuum preloading	69
Figure 5.1: Shaded region of the site for the comparison between measured field data and modeled surface settlement	72
Figure 5.2: Location of settlement plates of group 1 and group 2 in the soil model ..	73
Figure 5.3: Stage of vacuum loading	74
Figure 5.4: Vacuum variation along the depth.....	74
Figure 5.5: Settlement curves of field data group 1 compared with the model predictions by CRISP.....	76
Figure 5.6: Settlement curves of field data group 2 compared with the model predictions by CRISP.....	76
Figure 5.7: Surface settlement profile.....	79
Figure 5.8: Contour plot of settlement and the corresponding values for different region	80
Figure 5.9: Settlement along line BB' at different elevation against time duration.....	81

Figure 5.10: Settlement along line CC' at different elevation against time duration ...	81
Figure 5.11: Predicted ultimate settlement at SP10 by Asaoka's method	83
Figure 5.12: Predicted ultimate settlement at SP9 by Asaoka's method	84
Figure A.1: Settlement graph in SP7, SP9 and SP12.....	92
Figure A.2: Settlement graph in SP8, SP11 and SP14.....	93
Figure A.3: Settlement graph in SP10 and SP13	94
Figure B.1: Photo during vacuum preloading.....	95
Figure B.2: Photo of vacuum pumping apparatus	95
Figure B.3: Photo of membrane around the site area.....	96
Figure B.4: Photo of vacuum measurement.....	96
Figure C.1: Geological Profile I.....	97
Figure C.2: Geological Profile II	98
Figure C.3: Marine layer.....	99
Figure C.4: Alluvium layer	99
Figure C.5: Prefabricated vertical drains in Marine layer.....	100
Figure C.6: Prefabricated vertical drains in Alluvium layer.....	100
Figure C.7: Sand layer on top	101
Figure C.8: Prefabricated vertical drains in sand layer.....	101
Figure C.9: Slurry Wall.....	102
Figure C.10: In-situ stress set up.....	102
Figure D.1: Boundary condition	103
Figure D.2: Pore water pressure=0 at 3m	103
Figure D.3: Soil model deformation	103

LIST OF TABLES

<i>Number</i>	<i>Page</i>
Table 2.1: The equivalent permeability used in approach 1	29
Table 3.1: Summary of geological information based on borehole log.....	40
Table 3.2: Summary of consolidation parameters	42
Table 4.1: Dimensions of drain board type SPB-C.....	48
Table 4.2: Modified Cam Clay parameters of different material properties.....	48
Table 4.3: Isotropic elastic parameters of different material properties	49
Table 4.4: Degree of consolidation, U%, calculated by theoretical method and CRISP	55
Table 4.5: Characteristics of 2D mesh.....	56
Table 4.6: Comparison between degree of consolidation calculated using settlement and pore water pressure	70
Table 5.1: Comparison of results between actual measurement and model 3 by CRISP in group 1	77
Table 5.2: Comparison of results between actual measurement and model 3 by CRISP in group 2.....	78
Table 5.3: Comparison between degree of consolidation calculated using settlement and pore water pressure at line <i>BB'</i>	82
Table 5.4: Comparison between degree of consolidation calculated using settlement and pore water pressure at line <i>CC'</i>	82
Table A.1: Locations of settlement plates.....	90
Table A.2: Measured settlement and ground level measured at SP7, SP9 and SP12..	91
Table A.3: Measured settlement and ground level measured at SP8, SP11 and SP14	92
Table A.4: Measured settlement and ground level measured at SP10 and SP13	93

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