

UNIVERSITI TEKNOLOGI MARA

**PULLOUT BEHAVIOUR OF ANCHOR BLOCK
UNDER SATURATED AND UNSATURATED
SOIL CONDITIONS**

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Thesis submitted in fulfillment of the requirements
for the degree of

Doctor of Philosophy

Faculty of Civil Engineering

December 2011

ABSTRACT

There have been many cases of wall failure by bulging. The potential causes of this type of wall failure are might due to the over-estimate the shear strength at the lower part of wall, the influence of a hydrostatic pressure at lower part of the retaining wall and the soil in the retaining wall transformed from unsaturated to saturated condition. This is anticipated to be the cause of wall bulging. This illustrates the importance of applying the right shear strength which can be achieved through the curved surface envelope shear strength model. This also gives the implication that the application of the curved surface envelope shear strength model will be more conservative than the Terzaghi's, 1936 model.

This thesis presents the results of an investigation into soil-reinforcement interactions under saturated and unsaturated conditions by means of pullout tests. Especially for this purpose, an apparatus able to contain 2 cubic meter sample of backfill material was designed by the author in order to perform real scale tests. The pullout tests were conducted on granular material, silica sand. The properties related to this backfill material, including gradation curve, proctor curve and specific gravity are presented in this thesis. An anchor block attached to steel rod act as reinforcement were used in conjunction with the silica sand.

The testing program has been designed to evaluate the soil-reinforcement interlock capacity by means of pullout testing. A few series of pullout tests were conducted on various water content of backfill material under various vertical pressures. Once the vertical load was applied, a second hydraulic actuator was started to pull the anchored rod out from the box at a rate of 1 mm/min. The test was continued until constant or decreasing pullout force was obtained and a maximum of about 200 mm travel was recorded. The test data, including the vertical load, the pullout force and displacement, were collected. The applied vertical pressure were 50, 100, 200 and 300 kPa and the backfill material were varies from dry, 1%, 2%, 6%, 12% of water content as well as under the saturated condition.

Prior to the pullout tests, the soil water characteristic curve were developed by the pressure plate extractor apparatus which gave a result of residual suction of 10 kPa. The variations of shear strength with relate to suction for saturated and unsaturated tested sand was developed in this study. The shear strength variation with respect to suction was found to be non-linear for the entire test which in accordance to the curved-surface envelope soil shear strength model (CSESSM) of Md. Noor and Anderson, 2006. Consolidated drained triaxial test were conducted on the soil specimens, both under saturated and unsaturated conditions with different moisture content of 1%, 2%, 6% and 12% which were adopted according the soil-water characteristics curve done in this study.

ACKNOWLEDGEMENT

In the name of ALLAH, the Most Gracious and Most Merciful. Praise to ALLAH as He had given me strength and patience during this research. I wish to express my sincere grateful to my supervisor, Assoc. Prof. Dr. Mohd Jamaludin Bin Md. Noor and co-supervisor Assoc. Prof. Dr. Mohamed Ahmed Hafez Jaheen who kindly guides me in this research and monitoring my progress besides assisting me in sorting out many problems in accomplishing this research project.

I am also very grateful to MOSTI for providing me with a scholarship and I am greatly indebted to the Advanced Soil Mechanic Laboratory assistance, Mr. Fuad, Mr. Akhbar and Mr. Haidi for their willingness to extend their working hours for me to do my laboratory works and to my dear friends for their continuous support throughout this research. Warmest thank also goes to my fellow postgraduate students especially Mr. Isma (3-D plot), Mr. Basha (Awards), Mr. Joe (Papers) and Mr. Pooya (Excel) in providing me with the necessary information and assistance in various circumstances.

I owe much to my beloved parents and family who support and in offensively allow me to sacrifice time which I should be spending with them. Finally, I wish to thank all friends and family members especially to my wife Diyana Sharina, my children's; Adriana, Adam, Alif and Ariana which involved direct or indirectly in making this research a great success.

Adnan Derahman
December 2011

TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF SYMBOLS	xx

CHAPTER 1: INTRODUCTION

1.1	Background to the Research	1
1.2	Problem Statement	2
1.3	Research Objectives	7
1.4	Scope and Limitation of Research	8
1.5	Significance of Research	9

CHAPTER 2: LITERATURE REVIEW

2.1	Retaining Walls	11
2.2	At Rest Earth Pressure	12
2.3	Active Earth Pressure	13
2.4	Passive Earth Pressure	14
2.5	Reinforced Earth Wall	15
2.6	Anchored Earth Wall	17
	2.6.1 External Stability	19
	2.6.2 Internal Stability	20
	2.6.2.1 Tensile Failure	20
	2.6.2.2 Pullout Failure	21
2.7	Triaxial Test	25

CHAPTER 2: LITERATURE REVIEW (Continued)

2.7.1	Multistage Triaxial Test	27
2.8	Soil Water Characteristic Curve (SWCC)	28
2.9	Shear Strength with respect to Suction	39
2.10	Membrane Penetration	42
2.11	Independent Stress State Variables	47
2.12	Shear Strength Model	50
2.13	Non-linearity of Failure Envelope	57
2.14	Curved-Surface Envelope Soil Shear strength Model (CSESSM)	61
2.15	Previous Pullout Test	66

CHAPTER 3: METHODOLOGY

3.1	Introduction	84
3.2	Test Equipment	86
3.2.1	Pressure Plate Extractor	86
3.2.2	Triaxial Cell	87
3.2.3	Pullout Test Apparatus	101
3.3	Laboratory Testing	102
3.3.1	Physical Properties Test	103
3.3.1.1	Proctor Compaction Test	103
3.3.1.2	Small Pyknometer Method Test	104
3.3.1.3	Dry Sieving Method	105
3.3.2	Pressure Plate Extractor Test	107
3.3.3	Multistage Consolidated Drained Triaxial Test	109
3.3.3.1	Multistage Consolidated Drained Triaxial Test (Saturated Conditions)	110
3.3.3.2	Multistage Consolidated Drained Triaxial Test (Unsaturated Conditions)	113
3.3.4	Pullout Test	115