APPLICATION OF NON-DESTRUCTIVE METHODS FOR TESTING OF INDEX PROPERTIES OF GNEISSIC ROCKS IN LARGE-SCALE GEOTECHNICAL INVESTIGATIONS

MASTER OF ENGINEERING IN GEOTECHNICAL ENGINEERING

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DECLARATION

The work included in the thesis in part or whole has not been submitted for any other academic qualification at any institution.

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ABSTRACT

There is an abundance of gneissic rock formations found in Sri Lanka. Gneiss is a banded rock with fairly continuos segregation of different minerals.

Foundations of most of the large-scale civil engineering structures are extended up to or into the fresh gneissic rocks. Especially, the foundation of dams, bridges and high rise buildings are extended into fresh rock.

In such large-scale geotechnical investigations, boreholes are advanced up to the interested depth of exploration and rock coring is compulsorily done using rotary core drilling machines. Borehole logging is followed by arranging the laboratory testing programme for testing of soil and rock materials.

Hence the identification of engineering behaviour of gneissic rocks at the detailed investigation stage is a prime necessity in such projects.

Laboratory testing of a large number of rock samples is time consuming and expensive. The general practice of selection of representative rock samples on visual inspection followed by laboratory destructive testing may not lead to a precise interpretation of engineering properties of the entire subsurface rock strata.

Non-destructive testing of gneissic rock is identified as a fast and effective method of selection of representative rock samples for a laboratory-testing programme.

A 100m deep exploratory rock core of diameter 54mm was selected for this research. More than two hundred samples were prepared and subjected to three different non-destructive tests, followed by destructive tests.

Depending on the results of the study, samples having distinct characteristics could easily be identified.

In particular, the strata having low compressive strength were clearly identified and hence those samples could be specified for destructive tests.

The findings of this research will be immensely helpful to organise laboratory-testing programmes on rock samples effectively and economically especially in large-scale geotechnical investigations.

PREFACE

This report is on "Application of non-destructive methods for testing of index properties of gneissic rocks in large – scale geotechnical investigations". This study is based on analysis of index properties of rocks by non-destructive and destructive testing methods. The report is organised into eight chapters and three appendices.

Chapter 1 of the report briefly describes the necessity and importance of this study for the industrial benefits. This chapter includes the objectives of the study and also a concise description of the selected site.

The methodology and borehole logging are described in Chapter 2 and Chapter 3 of the report respectively.

Chapter 4 of the report gives the laboratory-testing programme and Chapter 5 gives a concise description on the instruments used in this study.

Chapter 6 of this report describes the non-destructive tests carried out, whereas Chapter 7 of the report describes the destructives tests carried out in this study.

The concluding remarks and recommendations are given in Chapter 08 of the report.

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CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	*Description*
ASTM	American Standard of Testing Material
BS	British Standards
CCS	Cylinder Compressive Strength
ER	Electrical Resistance Test
ISRM	International Society of Rock Mechanics
LQL	Lanka Quarries Ltd.
QFG	Quartzo-Feldspathic Gneiss
QBG	Quartzo Biotite Gneiss
R	Resistance
SD	Slake Durability Test
SDI	Slake Durability Index
SMH	Schmidt Hammer Rebound Hardness Test
TCT	Triaxial Compression Test
UCS	Unconfined Compressive Strength
UPV	Ultrasonic Pulse Velocity

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