SOME PROPERTIES OF COMPACTED RESIDUAL GRANITE SOIL

GAN KOK HO

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FACULTY OF ENGINEERING
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by

GAN KOK HO

Supervisor: MR. OOI TEIK AUN
SENIOR EXECUTIVE ENGINEER
P.W.D. Headquarter
Kuala Lumpur

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Thesis partner: Mr. Teoh Kim Seng

SYNOPSIS

The main object of this thesis is to investigate into some properties of compacted residual granite soils. Two types of compaction, namely, Standard Proctor and Modified AASHO Compactions were used for the present investigation.

The first part of this thesis covers the determinations of the consolidation characteristics. Consolidation tests were carried out in a soaked oedometer as recommended in B.S. 1377: 1967. The compression index, Cc, which is an important parameter in estimating the settlement of foundations, can be obtained from the tests. It was found that at optimum moisture content the soil has the lowest compression index.

The second part includes the determination of shear strength characteristics of soil specimens compacted at different moisture contents. Consolidated drained triaxial compression tests were carried out in accordance with Bishop and Henkel (1962). Moulding moisture content and compactive effort were found to affect the cohesive strength but the angle of internal friction does not change significantly.

The compacted residual granite soil used in this study exhibits the characteristics of an over-consolidated soil.

CONTENTS

1. INTRODUCTION

Residual granite soils are found abundantly in Peninsular Malaysia where the warm temperature and well distributed rainfall are favourable conditions for rapid rock decomposition. These soils can be conveniently divided into the coastal, lowland and the highland types, Ledgarwood (1963), which are further classified into six grades ranging from Grade I fresh granite to Grade VI residual soil, Moye (1955). The texture, mineralogy, structural configuration and the engineering properties of these soils vary considerably with respect to the chemical composition of the parent rock and the degree of weathering. As a result of these unusual characteristics of decomposed soils, their properties cannot be adequately represented by conventional method of classification such as the Unified Classification System or AASHO Classification.

Nowadays, compacted soils have been confidently used throughout the world to support more conventional structures, ranging in weight from massive embankment, earth dam and heavy building through stub bridge abutment down to light residential housing. This is made possible through advanced knowledge of the processes of compaction and the resulting properties of these compacted soils. Therefore, for satisfactory and economical design of these structures, a clear understanding of the behaviour of compacted soil is necessary. Lambe (1958), Seed and Chan (1959), Yoshinaka & Kazama (1973), Barden (1974) have written a number of papers on the engineering properties and structures of compacted

clay. The contribution by Lambe (1958) has led us to recognise the importance of microstructure problem. According to his concept, the structures on the dry and wet sides of optimum moisture content are explained respectively in terms of flocculation and dispersion of particles. Seed and Chan (1959) supported his concept.

As the number and size of embankment, earth dams and other earth structures being designed and constructed have increased, it is important for one who attempts to solve soil problems in this field to have a clear idea of the important phenomenon of consolidation. The triaxial compression tests give different results depending on the stage of consolidation of the soil sample. Therefore, in order to intepret these results, the stage of consolidation must be known. Consolidation tests also give direct measurement of permeability which can be applied to solve problems of seepage, settlement and stability. But, the most important data available in this test is used to predict the amount of settlement in structures. It is also essential that the shear strength parameters in terms of effective stress be determined in the laboratory to simulate the conditions which occur in the field.

Ting and Ooi (1972) studied the engineering properties of insitu residual granite soil of Sungei Besi. The soil used for the present investigation was also obtained from the same place. The object of this thesis project is to investigate the 1-D consolidation characteristics of compacted granite soils using different compactive efforts. Shear strength parameters

in terms of effective stresses were also determined from a series of consolidated drained triaxial tests. Holtz and Ellis (1963) pointed out that although there is a marked difference between the structures of laboratory compacted and field compacted soils, the test data obtained from laboratory compacted soils are more conservative and may be safely used in solving field problems.