THE UNIVERSITY OF BIRMINGHAM

CURVE HOPPING IN TRIAXIAL COMPRESSION TEST

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Past investigators of the shear strength of sands have concentrated on the undrained shear strength of saturated sands and drained strength of sands separately. These have given a fundamental understanding of the factors contributing to the strength of sands. However, not many works have been done on the behaviour of sands while it is sheared in drained and undrained mode at the same time.

In this project, the shear strength of saturated sand in drained and undrained modes were investigated using the samples of fine uniform sub-angular Redhill sand. Saturated sand specimens were sheared in drained, undrained and drained-undrained modes in conventional triaxial compression tests. The results for every series of the tests were observed and compared.

It was found that in drained tests the shear deformation was accompanied by strong dilation; while in undrained tests the deformations led to development of large negative pore water pressure. The drained-undrained tests showed that the behaviour of the sand 'hopped' between the drained behaviour and undrained behaviour when the drainage valve was opened and closed repeatedly. The effective angle of shearing resistance obtained from each test agree quite close with each other (ϕ' approx. = 36°).

The behaviour of the sand when interpreted in terms of Critical State Soil Mechanics showed that the sand behaved as a heavily overconsolidated material. In drained-undrained test, the plot in q'-p'-v space showed that the path hopped between constant volume plane and 3:1 slope drained plane. The critical state parameter M agree with published values but Γ and λ did not and must be found experimentally.

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Chapter 1 Introduction

1.1 Introduction

The equation that has formed the basis for most of the work on the shear strength of sand is the Coulomb equation, $s = \sigma \tan \phi$. The shear strength parameter ϕ has proven to be an important parameter to geotechnical engineers faced with numerous practical problems. There are four principal methods of loading the soil employed in strength testing: direct shear, triaxial compression, torsional and vane test. Of these tests, the triaxial test predominates and is widely used in engineering practice because of its versatility. Past investigators of the shear strength of sands have concentrated on the undrained shear strength of saturated sands and the drained strength of sands. These have given a fundamental understanding of the factors contributing to the strength of sands. However not many works have been done on the behaviour of sands while it is sheared in drained and undrained mode at the same time.

1.2 Aims of present work

The aims of this work are to :

1.21 To run series of triaxial compression tests on saturated sands specimen in drained, undrained and drained-undrained modes