RELATIONSHIP BETWEEN STRENGTH AND STRESS - STRAIN BEHAVIOUR OF COHESIONLESS SOILS IN TRIAXIAL AND PLANE STRAIN

VIJAY KUMAR TOKHI

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CERTIFICATE

This is to certify that the thesis entitled"RELATIONSHIP BETWEEN STRENGTH AND STRESS-STRAIN BEHAVIOUR OF COHESIONLESS SOILS IN TRIAXIAL COMPRESSION AND PLANE STRAIN" being submitted by Mr. V.K. Tokhi to the Indian Institute of Technology, Delhi for the award of the degree of DOCTOR OF PHILOSOPHY is a record of the bonafide research work carried out by him. Mr. V.K. Tokhi has worked under my guidance for the submission of this thesis which to my knowledge has reached the requisite standard.

The thesis or any part thereof, has not been submitted to any other University or Institution for the award of any degree or diploma.

(Prof. T. Ramamurthy)
Soil Mechanics and Foundation Engineering
Department of Civil Engineering
Indian Institute of Technology
New Delhi

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ABSTRACT

Appropriate parameters are a pre-requisite to evolving any rational design in geotechnical engineering. For this, tests on representative soil specimens are conducted under simulated conditions in the laboratory to obtain these parameters. In geotechnical engineering design, the triaxial compression test has been widely used to obtain the strength and stress-deformation characteristics. This test, however, simulates axisymmetric stress conditions which occur only infrequently in practice. In general the three stresses in a stressed element are different, however, a more commonly encountered situation is that of plane strain or nearly plane strain condition. The soil parameters in plane strain are different than those obtained in a triaxial test and it is desirable to use the parameters obtained from plane strain tests in situations where such a condition exists. However, equipment for plane strain testing of soils is not available in most laboratories.

This thesis attempts to solve the above problem for sands tested in drained condition. It endeavours to make predictions for the below mentioned parameters in plane strain from the results of triaxial compression test alone.

(i) Peak strength, for which three approaches have been presented. The associated value of $b=(\sigma_2'-\sigma_3')/(\sigma_1'-\sigma_3')$ is also predicted,

(ii) Stress-axial strain curve upto peak in plane strain and also at any value of b (less than b for plane strain condition) ,

(iii) Volumetric strain curve for which two approaches are presented, and

(iv) Relationship between axial and lateral strains in plane strain.

In addition to predicting the above characteristics in plane strain exclusively from results of triaxial compression tests, a failure criteria is also developed which is valid for the cases where $\phi_p' \geqslant \phi_e' \lesseqgtr \phi_c'$.

All the above predictions are shown to give good agreement with the available experimental data.

CONTENTS

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