TRIAXIAL TESTING OF SOILS

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TABLE OF CONTENTS

INTRODUCTION

The triaxial compression machine appears to have been developed from an earlier machine designed at the Prussian Waterway Experimental Station (1). The purpose of the earlier machine was for studying the consolidation of clays under conditions of negligible side friction. In this first apparatus the surrounding liquid was entirely confined, and temperatures and leakage had to be closely controlled to obtain consistent results. Several investigations recognized that the apparatus could be used to measure the ratio of axial and lateral pressures both prior to and at failure. The first results of this investigation appear to be those of T. C. Stanton and F. M. Hveem (1). Positive control over the lateral pressure was later developed independently by L. Redulic working in Vienna and W. S. Housel (1) at the University of Michigan.

PURPOSE OF THE STUDY

Recently, the Department of Civil Engineering at Kansas State University purchased a triaxial testing machine. The machine was inoperative due to the breakdown of the gear box and some electrical problems. The operating techniques needed to be confirmed so that the machine could be used for instruction in laboratory classes. This report deals with the operation of the machine and the experiments on blow sand and silty clay in order to find the unit cohesion and friction angle of these soils.

SCOPE OF THE STUDY

In testing any sample of natural soil, the most important factor is the preparation of the undisturbed sample to determine the characteristics of the soil. However, it is extremely difficult to obtain and to prepare for a laboratory experiment any sample undisturbed from its natural state. The two tests performed for this investigation were on remolded samples. The samples were an oven-dried sand and a silty-clay compacted to the standard Proctor density. Two different samples were chosen to observe the difference in testing procedures and data results.

The sand was difficult to test in the triaxial machine because it would not stand alone when left without chamber pressure or a vacuum within the sample. The situation was corrected by placing the sample on the platen and vacuuming the sample between two porous stones.

The silty clay was difficult to prepare for testing because the Proctor mold and the soil adhered to each other and cracking of the sample resulted. With extreme caution one can obtain a sample without damaging the soil.

The testing was done under drained conditions. Research done by Wesley G. Holtz and Harold J. Gibbs (7) shows that only a small difference in results occurs between the drained and undrained cases. Exceptions are in the testing of clays and clay-dominated silts. The amount of time it takes to equalize pore water pressure would also allow creep action which affects the desired results.