THE MEASUREMENT OF SOIL PROPERTIES IN THE TRIAXIAL TEST

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PREFACE

The part played by laboratory testing in the successful application of soil mechanics to civil engineering problems depends both on the uniformity of the natural strata and on the experience and skill of the engineer.

In certain classes of problem, laboratory tests serve mainly to illustrate the principles on which a judgment may be based or to set broad limits to the probable behaviour of the soil. In many cases, however, the uniformity of the soil conditions or the importance of the project will justify a more accurate analysis, particularly if this is coupled with field measurement of the pore pressure—the factor most difficult to assess from laboratory data alone. Three classes of problem are of particular note in this respect:

(1) The design of water-retaining structures, such as earth dams and embankments, where failure could have catastrophic results, but where an over-conservative design is very costly.
(2) The examination of the long-term stability of cuts and natural slopes, where large-scale earth movements may involve adjacent engineering works and buildings.
(3) The foundation of engineering works or buildings on deep clay strata.

Current methods of stability and deformation analysis call for a range of test data which can be obtained conveniently only with the triaxial apparatus. This is due to the recognition of the advantages, in routine work as well as in research, of carrying out the analysis in terms of effective stresses and explicitly determined pore pressures.

This book is therefore restricted to a treatment of the triaxial test alone, and of the ways of meeting the various problems which arise in its use in the laboratory.

It cannot be repeated too often that the results are of practical significance only if the geology of the site is understood and if the samples are truly representative of the natural strata or fill, but it is outside the scope of the present treatment to elaborate on this theme.

The book is divided into four parts. In Part I the basic principles underlying strength and deformation measurement are briefly discussed in relation to the practical problems commonly encountered in soil mechanics. Part II contains descriptions of the principal features of the triaxial apparatus, including the pore-pressure, volume-change and load-measuring equipment.

Part III presents the procedure for carrying out standard tests, which should be within the competence of a well-equipped laboratory carrying out either research or commercial testing. This section includes, for example, all the types of triaxial test likely to be called for by a consulting engineer dealing with soil problems.

In Part IV special tests are described. These are likely to be encountered only in a research laboratory. In many cases these tests consist of an extension of the procedures described in Part III and do not require a detailed treatment. It is felt, however, that it may be of some value to indicate the range of tests which have been successfully performed in the triaxial apparatus and the additional problems entailed.