Australian Standard®

Methods of testing soils for engineering purposes

Method 6.4.2: Soil strength and consolidation tests—Determination of compressive strength of a soil—Compressive strength of a saturated specimen tested in undrained triaxial compression with measurement of pore water pressure

PREFACE

This Standard was prepared by Standards Australia Committee CE-009, Testing of Soils for Engineering Purposes, to supersede AS 1289.6.4.2—1998.

The objective of this Standard is to set out the method for performing isotropically consolidated undrained (CIU) triaxial tests.

This revision is motivated by improvements in the equipment, instrumentation and computer control capabilities of recent triaxial test apparatus. More emphasis is placed on minimizing sample disturbance during specimen preparation as research since the last revision has emphasized the importance of minimal disturbance on soil strength and stiffness.

This revision describes the procedure for a single stage test. It doesn't preclude multi-stage tests, however the determination of c' and ϕ' has been removed. This revision also brings the Standard more in line with other international Standards.

METHOD

1 SCOPE

This Standard sets out a test procedure applicable to cohesive soils and a method for determining the compressive strength of a specimen of soil in a triaxial compression apparatus under conditions in which the cell pressure is maintained constant (see Appendix B1).

A typical test will involve a stage in which an all-round pressure is applied following which the sample is allowed to drain, a saturation stage in which pressures are increased to minimize the amount of air within the specimen, and a shearing stage performed at a constant rate of axial deformation. During the shearing stage, drainage of water from the specimen is prevented so that there is no change in the total water content of the specimen. The pore pressure is monitored throughout the test. The test described is limited to specimens in the form of right cylinders with height to diameter ratio of 2 ±2%.

The test method is limited to soil materials that can be trimmed to produce right circular cylinders that maintain their shape when unsupported. Undrained triaxial compression tests can be performed on materials which cannot stand unsupported however, special techniques are required for the specimen preparation, and differences in test procedure from this Standard may be required, for which information can be obtained from the reference sources (see Appendix B1).

The specific conditions of the test procedure, including the saturation procedure and the effective consolidation pressure, are specified by a geotechnical engineer who is responsible for ensuring the test method is appropriate for the data required.

Interpretation of the results to determine cohesion parameters and friction angles is beyond the Scope of this Standard. Guidance is provided in the reference sources given in Appendix B1.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS
1289 Methods of testing soils for engineering purposes
1289.2.1.1 Method 2.1.1: Soil moisture content tests—Determination of the moisture content of a soil—Oven drying method (standard method)

Bishop and Henkel, The Measurement of Soil Properties in the Triaxial Test

Head, K.H. and Epps, Roger, *Manual of Soil Laboratory Testing: Volume 2 Permeability, Shear Strength and Compressibility Tests*, 3rd ed, Taylor & Francis, U.K., 2011

Head, K.H. and Epps, Roger, *Manual of Soil Laboratory Testing: Volume 3 Effective Stress Tests*, 3rd ed, Whittles Publishing, U.K., 2014

3 DEFINITIONS

3.1 Sample

The soil submitted to the laboratory for testing.

3.2 Specimen

The portion of the sample upon which the test is performed.

4 APPARATUS

The following apparatus is required and shall be operated in a room in which the temperature is maintained at a constant level of 21 ±2°C:

(a) A triaxial test cell of dimensions appropriate to the size of the specimen, suitable for use with water as cell fluid and capable of withstanding a pressure of 1700 kPa. The cell shall be provided with a means of applying additional axial compressive load to the specimen through a loading ram.

The cell shall include a base pedestal of the same diameter as the test specimen. Where the base pedestal is not integral with the cell base it shall be secured to the cell base so that the pedestal is level and axially aligned with the loading ram.

The top cap shall be the same diameter as the test specimen and its mass will be such that the vertical stress due to the top cap shall not exceed 1% of the maximum deviator stress or 1 kPa, whichever is the greater. The top cap shall have either—

(i) a central seating which will not transmit moment (a ball and cone assembly is suitable) to receive the loading ram; or

(ii) a means of creating a rigid connection with the loading ram. In this case an internal load cell shall be used to measure the axial load.

