**Experiment No. 02**

**Determination of shear strength parameters (cohesion and angle of internal friction) by shear box test.**

**Designation:**

* ASTM D 3080-03

**Scope:**

* This test method covers the determination of shear strength of a soil sample under direct shear.
* Test conditions including normal stress and moisture environment are selected which represent the field conditions being investigated.
* This test method provides data useful in determining strength and deformation properties of cohesive soils.
* The results of the test may be affected by the presence of soil or rock particles.

**Apparatus:**

* *Shear Device*
* Shear Box
* *Triaxial Compression Chamber*
* Porous Inserts
* Loading devices
* *Deformation Indicator*
* Shear force measurement device
* *Sample Extruder*
* *Specimen Size Measurement Devices*
* *Timer*
* *Balances*

**Schematic diagram of triaxial chamber**

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**Procedure:**

* Place a soil specimen in a relatively flat box, which may be round or square (Fig.)
* A normal load of specific (and constant) magnitude is applied
* The box is "split" into two parts horizon- tally (see Fig.), and if half the box is held while the other half is pushed with sufficient force, the soil specimen will experience shear failure along horizontal surface A.
* This procedure is carried out in a direct shear apparatus (Fig.), and the particular normal load and shear stress that produced shear failure are recorded.
* The soil specimen is then removed from the shear box and discarded, and another specimen of the same soil sample is placed in the shear box.
* A normal load differing from (either higher or lower than) the one used in the first test is applied to the second specimen, and a shearing force is again applied with sufficient magnitude to cause shear failure.
* The normal load and shear stress that produced shear failure are recorded for the second test.
* After failure remove the sample from the triaxial chamber and find out its moisture content for further calculations.
* The procedure is repeated for the new specimen for a different (either higher or lower) lateral pressure. The axial load at failure and the lateral pressure are recorded for the second test.

**Graph Preparation:**

* The results of these two tests are plotted on a graph, with normal stress (which is the total normal load divided by the specimen’s cross-sectional area) along the abscissa and the shear stress that produced failure of the specimen along the ordinate (see Fig.).
* The same scale must be used along both the abscissa and the ordinate.
* *A straight line drawn connecting these two plotted points, is extended to intersect the ordinate.*
* The angle between this straight line and a horizontal line (φ in Fig.) is the angle of internal friction (φ in Eq.), and the shear stress where the straight line inter- sects the ordinate (c in Fig.) is the cohesion [c in Eq.].
* *These values of* φ *and c can be used in Eq. to determine the given soil’s shear strength for any load (i.e., for any effective inter granular normal pressure,).*
* *In theory, it is adequate to have only two points to define the straight- line relationship of Fig. In practice, however, it is better to have three (or more) such points through which the best-fitting straight line can be drawn.*