

Soil mechanics II

CIVIL ENGINEERING VIRTUAL LABORATORY

Experiment no 5

Core cutter experiment

OBJECTIVE

To determine the field density of a soil sample by Core cutter method.

APPARATUS USED

- i) Cylindrical cutter(of known volume)
- ii) Trowel
- iii) Tray
- iv) Balance
- v) Straight edge
- vi) Square metal tray , 300 mm x 300 mm x 40mm having about 100 mm diameter hole at its centre



Core cutter Apparatus

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DEFINITION

Field density is defined as the weight of unit volume of soil present at a site. It plays an important role in design of foundations for all types of structures, embankments, dams and water retaining structure.

Void ratio of a given soil sample is the ratio of the volume of voids to the volume of soil in the given soil mass.

Void ratio by core cutter method is given as

$$e = \frac{G_s \times \gamma_{water}}{\gamma_{dry}} - 1$$

Where G_s = specific gravity of soil particles

γ_{water} = unit weight of water

γ_{dry} = dry density of soil

PROCEDURE

- i) The internal volume (V) of the core cutter in cc should be calculated from its dimensions which should be measured to the nearest 0.25mm.
- ii) The core cutter should be weighed to the nearest gram (W_1).
- iii) A small area, approximately 30cm square of the soil layer to be tested should be exposed and levelled. The steel dolly should be placed on top of the cutter and the latter should be rammed down vertically into the soil layer until only about 15mm of the dolly protrudes above the surface, care being taken not to rock the cutter. The cutter should then be dug out of the surrounding soil, care being taken to allow some soil to project from the lower end of the cutter. The ends of the soil core should then be trimmed flat in level with the ends of the cutter by means of the straightedge.
- iv) The cutter containing the soil core should be weighed to the nearest gram (W_2)

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v) The soil core should be removed from the cutter and a representative sample should be placed in an air-tight container and its water content (w)

OBSERVATIONS AND CALCULATIONS

	sample 1	sample 2	sample 3
Mass of core cutter, W_1 (gm)			
Mass of cutter + soil from field, W_2 (gm)			
Wet density, (gm/cm ³) $\gamma_t = \frac{W_2 - W_1}{V}$			
Dry density, (gm/cm ³) $\gamma_d = \frac{\gamma_t}{1 + w}$			

PRECAUTION

- 1) Steel dolly should be placed on the top of the cutter before ramming it down into the ground.
- 2) Steel dolly should be placed on the top of the cutter before ramming it down into the ground..
- 3) Before removing the cutter, soil should be removed around the cutter to minimize the disturbances
- 4) While lifting the cutter, no soil should drop down

REFERENCES

1)IS: 2720 (Part XXIX) – 1975

2)IS:

2720 (Part XXVIII) – 1974

QUIZ

- i. Out of wet density, dry density, and saturated density, which one of them is maximum and minimum? Explain.
- ii. What are the main factors which affect dry density of soil? Explain.

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- iii. Beside the density what other properties do you need to calculate the void ratio and degree of saturation of soils?
- iv. What are the other methods to calculate the field density of soil?
 - v) what is the condition for maximum and minimum void ratios ?