CE-422
Water Resource Engineering ll Lab

Experiment -01

Experiment No. 1

DETERMINATION OF SOIL BULK DENSITY BY FIELD METHOD

Objective:

1) To determine the bulk density of soil.
2) To plot moisture content by weight and moisture content by volume and then determine the soil bulk density from the graph.

Bulk density

The bulk density of a soil is defined as the ratio of the mass of dried soil to the total volume of soil. In other words, it is the mass of a dry soil per unit bulk volume, the latter being determined before drying. It is expressed as

$$\rho b = \frac{Ms}{Vt} = \frac{Ms}{Vs+Va+Vw}$$

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Here, ρb = bulk density; gm/cc

Ms= Mass of solid; gm

Vt= Total soil volume; cc

Vs= Volume of solid; cc

Va= Volume of air; cc

Vw= Volume of water; cc

Scope of the Test :

Bulk density is an important soil physical property considering its influence on the water holding capacity and hydraulic conductivity of soil. It is influenced by the structure, texture and compactness of the soil. The bulk density of uncultivated soils usually varies between 1.0 and 1.6; however compact layers may have a bulk density of 1.7 to 1.8.

When working with the irrigated soils, it is necessary to know their bulk density in order to account for the water applied in irrigation, since it is impractical to measure, by direct means, the volume of water, which exists in the form of soil moisture in a given volume of soil. It is necessary to measure the weight of water in a given weight of soil by observing the loss of weight in drying and then convert the weight percentage so obtained to a volume percentage by use of the bulk density

Procedure:

1) The usual method of determining the bulk density or apparent specific gravity of a soil is to obtain an uncompacted soil sample of known volume. Core samplers are commonly used for this purpose. The sampler that has a cutting core is driven into the soil and an uncompacted core obtained within the tube.

2) The samples are carefully trimmed at both ends of the cylinder.

3) They are dried in an oven at 105°C-110°C for about 24 hours until the moisture is driven off and the sample is then weighted. The volume of a soil core(V_t) is the same as the inside volume of the core cylinder.

4) The weight of the soil in grams divided by the volume of soil core in cc is the bulk density of soil.

5) From the data, calculate moisture content by weight.

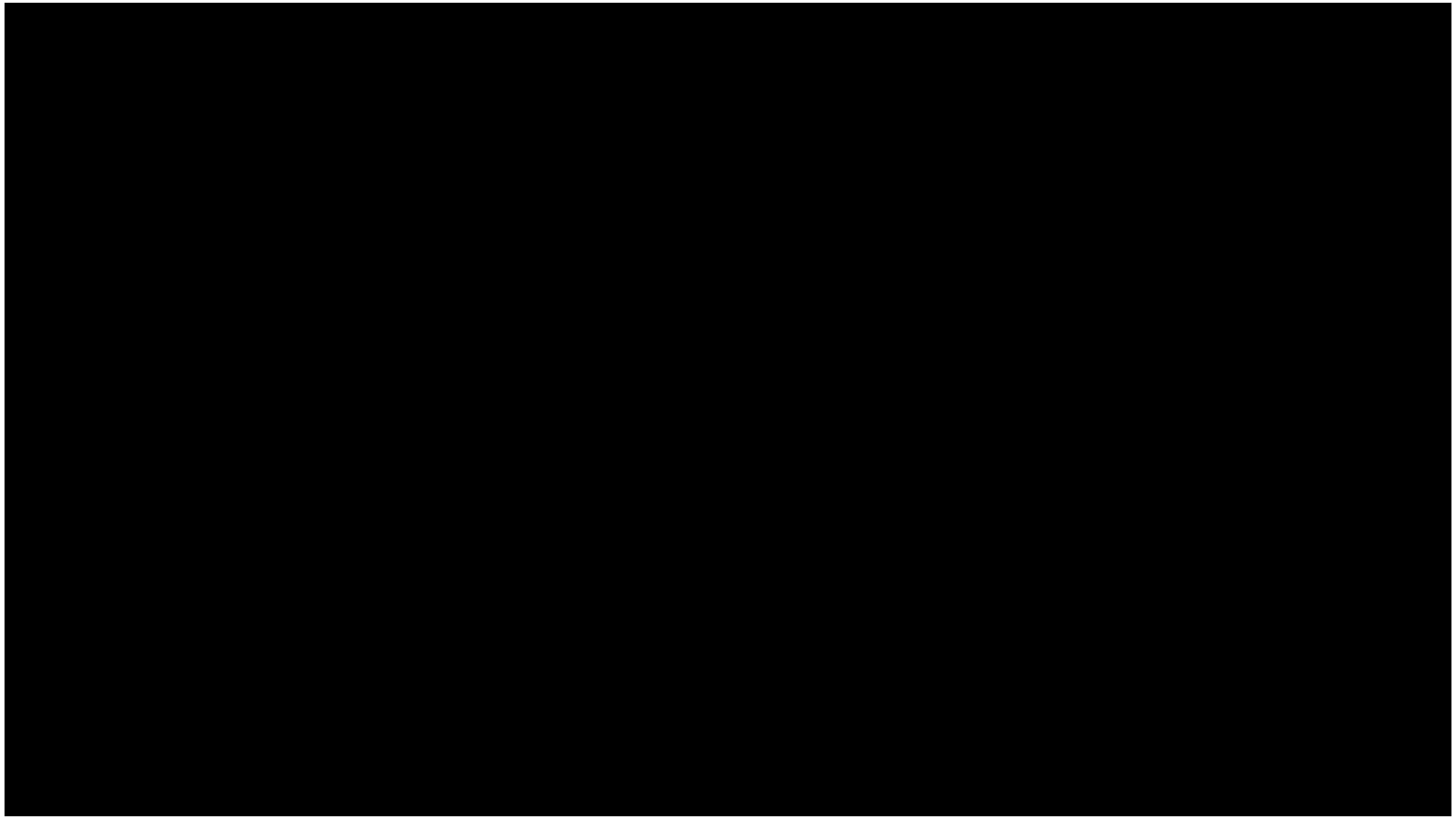
6) Find moisture content by volume by multiplying the m/c by weight with bulk density.

$$\text{Moisture content by weight} = \frac{M_W - M_d}{M_d}$$

here,

M_W = weight of wet soil

M_d = weight of dry soil



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Serial No.	**Volume of Cylinder (c.c)**	**Weight of beaker (gm)**	**Weight of beaker+wet soil (gm)**	**Weight of Wet soil (gm)**	**Weight of beaker+ dry soil (gm)**	**Weight of dry soil (gm)**	**Moisture content by weight (%) (θ_m)**	**Bulk Density ρ_b**	**Moisture by content volume (%)**

Moisture content by volume = Moisture content by weight × bulk density(gm/cc)

Qualitative Curve

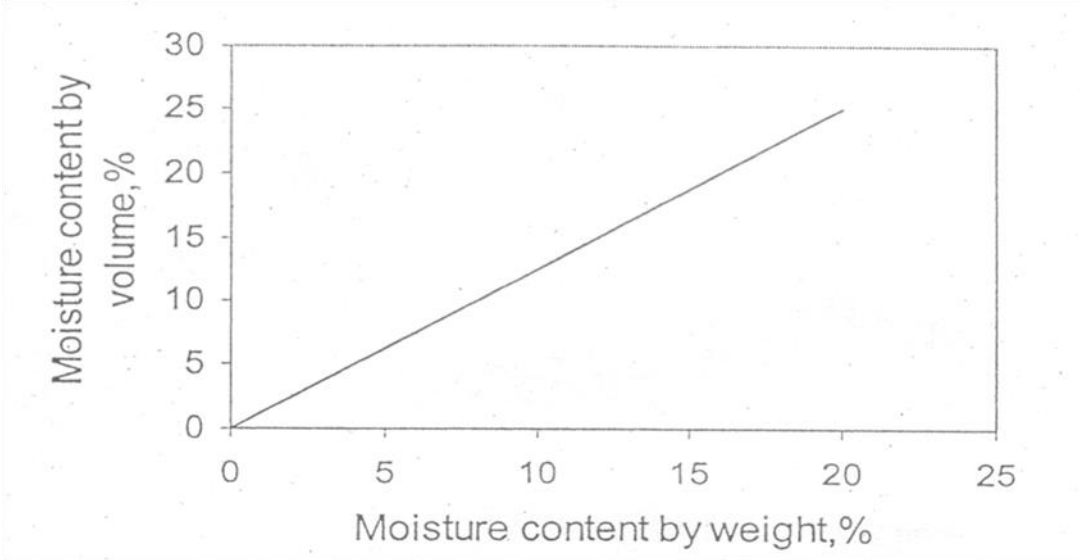

Figure.1: Moisture content by volume Vs moisture content by weight