

Moisture content experiment

[Environment](#), [Nature](#)



Need And Scope Of The Experiment

In almost all soil tests natural moisture content of the soil is to be determined. The knowledge of the natural moisture content is essential in all studies of soil mechanics. To sight a few, natural moisture content is used in determining the bearing capacity and settlement. The natural moisture content will give an idea of the state of soil in the field.

Apparatus

1. Containers (Tin or Aluminum) with lids.
2. Balance, sensitive to 0. 01gm
3. Oven with accurate temperature control at $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$)

Discussion

1. Moisture Content (w) It is defined as “ the ratio of the mass of the ‘ pore’ or ‘ free’ water in a given mass of material to the mass of the solid material”. $w = \frac{M_w}{M_s} \times 100$
 M_w = Mass of water in grams
 M_s = Mass of solid particles in grams (i. e. oven dried weight of soil)
2. Representative quantity of Test Specimen

NOTE-1

If it is suspected that gypsum is present in the soil, the soil sample should not be subjected to a temperature beyond 80°C . Otherwise gypsum would lose its water of crystallization, thereby affecting the results of moisture content. Oven drying at 80°C may, however, be continued for a longer time in order to ensure complete evaporation of free water present in the sample.

NOTE-2

To assist the oven drying of large test samples, it is advisable to use containers having large surface area and break up the material into smaller aggregations.

NOTE-3

Since some dry materials may absorb moisture from moist specimens; the dried specimens should be removed before placing new wet soil samples in the oven.

Procedure

1. Take sufficient number. of empty, clean containers and mark them (if they are not marked) with an identifying number or code.
2. Weigh the container and record the weight as M1 to the nearest 0.01gm.
3. Take representative sample from different depths (0.25, 0.5, 0.75m) from the field.
4. Quickly place the representative sample of the wet soil in the container.
5. Immediately weigh the container with the wet soil sample to the nearest 0.01 gm. Record the weight as M2. In case it is not feasible to determine the weight immediately, cover the container with a lid.
6. Place the container with the soil sample in the drying oven at constant temperature of $110 \pm 5^\circ\text{C}$ for 24 hours (till constant weight is achieved).
7. After 24 hours remove the container from oven and weigh to the nearest 0.01 gm. Record the weight as M3.

Comments

1. Oven drying is a time taking process and not much accurate as speedy moisture meter.
2. It needs caring for long time in order to get the good results.
3. It needs attentions in case if some other material like Gypsum is present in the soil. In such cases temp. should have to be controlled otherwise the material may react and loose its water of crystallization which effects the results.
4. Above value of moisture content lies in Normal moisture content range.
5. Date: 09-02-2013 Experiment 1(b) To determine moisture content of a soil sample by speedy moisture meter.

Apparatus

1. Speedy moisture meter (also called calcium carbide pressure moisture tester)
2. Built-in scale for weighing
3. Two 1. 25 inches (3. 175 cm) steel balls
4. Cleaning brush and cloth
5. Scoop for measuring calcium carbide reagent
6. Calcium carbide reagent

Introduction

The calcium carbide gas moisture tester provides a quick and simple means of determining moisture content of soil. It is particularly useful for field determinations of moisture content in conjunction with field compaction testing.

The basic premise of the calcium carbide gas moisture tester is that the free moisture in the soil reacts with calcium carbide reagent to form a gas called acetylene gas. $\text{CaC}_2 + \text{H}_2\text{O} \rightarrow \text{CaO} + \text{C}_2\text{H}_2$ The acetylene gas pressure developed within the tester is displayed on the pressure dial gauge, which is calibrated to read directly moisture content (in %) by wet mass of soil. Since moisture content by definition is expressed as a percentage of dry mass of soil, the readings obtained by speedy moisture meter are corrected using the following expression: $w = \frac{w_{sp} \cdot 100}{100 - w_{sp}}$ Where w = moisture content in %, w_{sp} = moisture content as obtained by speedy moisture meter expressed as decimal fraction

Procedure

1. Weigh a 26 gram soil sample on the tarred scale and place it in the cap of the tester.
2. Place three scoops (approximately 24 gm) of calcium carbide and two 1.25 in (3.175cm) steel balls in the larger chamber of the moisture tester.
3. With the pressure vessel in an approximately horizontal position, insert cap in the pressure vessel and seal it by tightening the clamp. Take care that no carbide comes in contact with the soil until a complete seal is achieved.
4. Raise the moisture tester to a vertical position so that the soil in the cap will fall into the pressure vessel.
5. . Shake the instrument vigorously so that all soil lumps are broken to permit the calcium carbide to react with all available free moisture. The instrument should be shaken with a rotating motion so that the

steel balls will not damage the instrument or cause soil particles to become embedded in the orifice leading to pressure diaphragm.

6. When the needle stops moving, read the dial while holding the instrument in a horizontal position at eye level.
7. Record the dial reading.
8. With the cap of the instrument pointed away from the operator, slowly release the gas pressure. Empty the pressure vessel and examine the material for lumps. If the sample is not completely pulverized, the test should be repeated using a new sample.
9. The dial reading is the percent of moisture by wet mass and must be converted to dry mass.

Note: If the moisture content of the sample exceeds the limit of the pressure gauge (20 percent moisture), use half of the soil mass and double the dial reading. Other methods of determining moisture content quickly: Other methods of measuring moisture content quickly include measurements by stove method and by micro wave oven methods. ASTM D4959-07 is used for measuring by stove method and ASTM D4643-08 is used to measure moisture by micro wave method.

Results and Comments

Zero Error of Dial Gauge = 0.8
Dial Gauge Reading = 17.6
Corrected Dial Gauge Reading = 16.8
 $W_{sp} = 0.68$
 W (Moisture Content) = 20.19 %

- Speedy Moisture meter give better and faster result than the ordinary oven drying.

- In this method the water present in soil reacts with calcium carbide and results in acetylene gas which in turn gives the value of moisture content.
- Speedy moisture meter method is an efficient method as it doesn't involve too much time for its performance. It is used when tests are performed in the field.
- Moisture content effects the soil resistivity, soil compaction and soil shear strength.