SUMMARY OF RESULTS OF THE SOIL SAMPLE

LABORATORY No. 2 : DETERMINATION OF WATER CONTENT, UNIT WEIGHT, VOID RATIO, POROSITY AND DEGREE OF SATURATION	
AVERAGE WATER CONTENT, ω	**37.98 %**
SPECIFIC GRAVITY OF SOIL SOLIDS, G_S	**2.44**
VOID RATIO, e	**0.68**
POROSITY, n	**40.48 %**
DEGREE OF SATURATION, S_r	**76.28 %**
LABORATORY No. 3 : MECHANICAL ANALYSIS OF SOIL	
Coefficient of Uniformity, C_U	**1.79 – Gap Graded**
Coefficient of gradation, Cc	**0.83**
% Fine particle	**2.91 %**
% Coarse particle	**97.09%**
Grade	**Poorly Graded**
LABORATORY No. 4 : DETERMINATION OF LIQUID AND PLASTIC LIMITS OF SOIL	
LIQUID LIMIT	**51.13 %**
PLASTIC LIMIT	**36.90 %**
LIQUIDITY INDEX/FLOW INDEX	**0.11 (OVERCONSOLIDATED)**
PLASTICITY INDEX	**14.23 %**
*SOIL CLASSIFICATION ACCDG TO: -AASHTO CLASSIFICATION SYSTEM -UNIFIED SOIL CLASSIFICATION	- **A-2-7 (0)** - **SP, Poorly Graded Sandy Soil with Gravel**
LABORATORY NO. 5 : DETERMINATION OF SHRINKAGE LIMIT OF SOIL	
SHRINKAGE LIMIT,SL	**24.49 %**
SHRINKAGE RATIO,SR	**1.16**
VOLUMETRIC CHANGE	**21.91%**
LABORATORY No. 6 : FIELD DENSITY TEST OF SOIL	
UNIT WEIGHT OF SOIL IN THE FIELD, γ_{FIELD}	**15.45 KN/m^3** **98.19 pcf**
LABORATORY No. 7 : SPECIFIC GRAVITY TEST OF SOIL	
SPECIFIC GRAVITY OF SOIL SOLIDS, G_S	**2.44**
LABORATORY No. 9 : STANDARD PROCTOR TEST	
DRY UNIT WEIGHT, $\gamma_{Dmaxlab}$	**15.95 Kn/m^3**
OPTIMUM WATER CONTENT, $\omega_{OPTIMUM}$	**39%**
RELATIVE COMPACTION, R	**96.56%**
LABORATORY No. 10 : DIRECT SHEAR TEST	
ANGLE OF INTERNAL FRICTION, $\varnothing$	**22.93°**
COHESION, C	**102.4 kPa**

the openings of the #200 sieve shall be determined as coarse, and the smaller grain size soil will be termed as fine. The classifications of soil size distribution are accomplished by setting up a stack of sieves in which sieve is a set above a second one whose opening is commonly half the size of opening of the first. Frequently, seven or eight sieves are used. The range of size varies perhaps by ¾ size openings. However, the selection of sieve usually depends on how the observer sizes up this range in the soil most accurately. With a known weight of sieves, the nest is shaken vigorously for 10 to 15 minutes. And then, the weight of the soil retained din each sieve is measured. The soil in any sieve is the size resisting upon it. A pan catches the grain passing through the sieve.

In the case of the finer particles, they are separated by the method of wet analysis, which is principally based on the speed of sedimentation. The method of wet analysis generally used is the “hydrometer method”. Other methods are the pipette and elutriation method, which will not be discussed here.

REMARKS AND CONCLUSION:

In this particular laboratory work, we were able to determine the particle size distribution of our soil sample. Our total soil sample is 641.2 grams and from the experiment, it is found out that about 9.89% is in the particle size of 1.18mm to 4.75 mm and about 86.31% is in the particle size of 0.1mm to 0.425mm. And only 2.91% of the sample penetrated the Sieve# 200 or is smaller than 0.075mm. Therefore, only little amount of the sample is considered as fine, only about 2.91% (34.9g) and the rest of the sample, 97.09% (1162.55g) is to be considered as coarse. And from the value of the uniformity coefficient which is 1.79, the soil sample is considered to be poorly graded or uniformly graded.

Weights	Trial 1	Trial 2	Trial 3
Wt. dish	21.49 g	21.94 g	21.27 g
Wt. dish + wet soil	91.91 g	88.90 g	89.77 g
Wt. dish + dry soil	70.50 g	68.62 g	69.17 g
Wt. of wet soil (W)	70.42 g	66.96 g	68.50 g
Wt. dry soil (Wd)	49.01 g	46.68 g	47.90 g
Water content (w)	43.68 %	43.44 %	43.01 %
Initial water level	750 mL	750 mL	750 mL
Final water level	790 mL	792 mL	791 mL
Water rise	40 mL	42 mL	41 mL
Vol. dry soil (Vd)	40 cub. cm	42 cub. cm	41 cub. cm
Vol. wet soil (V)	51 cub. cm	51 cub. cm	51 cub. cm

Table 1. Sample Data

W = (Wt. dish+ wet soil) - Wt. dish
W_d = (Wt. dish + dry soil) - Wt. dish

COMPUTATIONS:

Moisture Content Determination (*w*):

$$w = \frac{(W \ - Wd)}{Wd}\ x\ 100\%$$

Trial 1:

$$w = \frac{(W \ - Wd)}{Wd}\ x\ 100\%$$

$$w = \frac{(70.42\ - 49.01)}{49.01}\ x\ 100$$

w = 43.68 %

Trial 2:

$$w = \frac{(W \ - Wd)}{Wd}\ x\ 100\%$$

$$w = \frac{(66.96 - 46{,}68)}{46.68}\ x\ 100$$

w = 43.44 %

Trial 3:

$$w = \frac{(W \ - Wd)}{Wd}\ x\ 100\%$$

$$w = \frac{(68.50 - 47.50)}{47.50}\ x\ 100$$

w = 43.01 %

Ave. $w = \frac{\Sigma w}{no.of\ trials}$

Ave. $w = \frac{43.68\ + 43.44 + 43.01}{3}$

Ave. w = 43.38 %

GENERAL DISCUSSION:

The specific gravity of soil, Gs without any qualifications are taken to be the average value for the soil grains. If numerical values are given in the discussion where it may not be clear to what specific gravity is preferred, the magnitude of the values may indicate the correct usage since the specific gravity of the soil grains may always be larger than the bulk specific gravity based on inclusion of the sol voids in the computation (either full of air or full of water or party full of water).

A value of specific gravity is necessary to compute the void ratio of the soil. If it is used in the hydrometer analysis, and it is used to predict the unit weight of the soil mineral classification, i.e., iron mineral have a larger value of specific gravity than silica.

The specific gravity of a substance divided by the weight of distilled water. Thus, f one is considering only the soil grains, one obtains specific gravity Gs as:

$$Gs = \frac{\text{Unit weight of soil solids}}{\text{Unit weight of water}}$$

The specific gravity of the material can also be computed using any ratio of weight of substance to weight of water as long as equal volumes are involved. Thus:

$$Gs = \frac{Ws \ / \ W}{Ww \ / \ V}$$

The problem consist of obtaining the volume of a known weight of soil grains and dividing this by the weight of the same volume of water, i.e., applying the above equation, since the form is easier to visualize as well as obtain values in the laboratory. The volume weight of soil grains can be obtained by using a containers of known volume and applying the Archimedes Principle (that a boy submerged in a volume of water will displace a volume of water equal to the volume of a submerged body). The container of a known volume is a flask, which holds a standard volume of distilled water at 20 °C. At temperatures above this value, it will be slightly more, if below 20 °C, it will be slightly less.

REMARKS AND CONCLUSION

For this method in determining the specific gravity of soil it needs a lot patience in calibrating the pycnometer to have a result that is more reliable and accurate. The specific gravity of the soil sample is 2.44. The value of specific gravity is necessary to compute the void ratio of the soil, saturation ,etc.

The cohesion is a term used in describing the shear strength soils. Its definition is mainly derived from the Mohr-Coulomb failure criterion and it is used to describe the non-frictional part of the shear resistance which is independent of the normal stress. In the stress plane of Shear stress-effective normal stress, the soil cohesion is the intercept on the shear axis of the Mohr-Coulomb shear resistance line.

X. CONCLUSION

We were able to determine the strength parameters of our soil sample, its cohesion and internal friction by the direct shear test for soil. The cohesion is found out to be **102.4 KPa** and the angle of internal friction is **22.93**°. The angle of internal friction describes friction shear resistance of soils together with the normal effective stress. The cohesion and the angle of internal friction will be used to determine the shear strength of soil by the formula of Mohr- Coulomb Failure Criteria.

Cohesion and angle of internal friction are important parameters for design of structures on soil such as footings. It can be utilized to determine amount of load that can be supported by the soil. It can affect the dimensions, size and type of structures that is built on an area.