Particle size analysis using hydrometer essay sample

Abstract

This experiment is designed to determine the range of grain sizes and its amount in percentage present within the soil sample. This percent distribution is used to define the structure of the soil. Knowing the structure of any soil sample has been very vital for the study of Civil Engineering. This characteristic determines whether the soil is suitable for foundations of building, road constructions and the like. Using the Hydrometer analysis to determine the soil particles present within the soil sample, we have come up with a conclusion that the soil sample we have obtained was well-graded.

Objectives

* To be able to determine the particle size distribution of a given soil sample using hydrometer analysis

Materials

* Set of Sieves
* Balance
* Hydrometer (152H)
* Graduated Cylinder
* Stirring rod
* Thermometer
* Distilled water
* Timer
* Oven
* Pan
* Hexametaphosphate (dispersing agent)

Hydrometer reading correction Rh:

Rh = actual hydrometer reading – composite correction

Diameter D of soil particles:

D (mm)

K = constant depending on the temperature of suspension and specific gravity of soil. In this experiment, a value of 2. 45 had been used as the specific gravity and a temperature of 28°C. Table 3 of ASTM D44 had been used to determine K with a value of 0. 01327. L = effective hydrometer depth as provided by Table 2 of ASTM D422 T = time elapsed from the beginning of sedimentation up to reading Percent finer in suspension, P:

W = mass of oven dry soil, after hygroscopic correction

Gs = specific gravity of soil

G1 = specific gravity of water (equal to 1)

Rh = corrected hydrometer reading

Hydrometer reading correction Rh:

Rh = actual hydrometer reading – composite correction

For the particle Size distribution of the soil sample, we may use clay = <0. 002 mm

silt = 0. 002–0. 02 mm

fine sand = 0. 02–0. 20 mm

Discussion and Analysis

This experiment was based on the assumption that particles with larger diameter settled faster. The results that were obtained in the hydrometer analysis have been represented by a chart. It was seen that at the trials 1 and 2 the plot of time intervals 4, 15 and 30 seconds were not as consistent at the time intervals 60, 90 and 120 seconds.

This is due to the fact that the hydrometer reading was obtained right after the graduated cylinder was agitated for 60 seconds and not having enough time to be stable and the particles were not settled. As you can see on the chart for trial 3, the plot were consistent for the time intervals 5, 15, 30 and 60 minutes but not on the 1440 minutes. This is obviously because of the large gap between 60 minutes and 1440 minutes. There were different factors that may have changed the consistency of the hydrometer and thermometer reading.

The initial weight of the air dry soil sample plus the weight of the container is 21. 7g while the weight of the soil sample after oven drying plus the weight of the container was found to be just 21. 34. We got the hygroscopic correction factor of 0. 9834.

We can see that most of the soil sample is composed of fine sand with diameters ranging from 0. 02-0. 20mm while just a portion of the soil sample are silt and clay with diameters ranging from 0. 002 – 0. 02mm and less than 0. 002mm, respectively.

Conclusion and Recommendation

The errors obtained in the experiment were mostly from the shaking of the graduated cylinder. Water was spilled during the process. It is recommended to cover the graduated with plastic and then cover it with your palm. This would greatly reduce the amount of water spilled in the process. It was found out that the soil sample was composed mostly of fine sand.

References

ASTM D422 Particle Size Analysis of Soils

September 2004, Files, Procedures for Particle Size Analysis, http://uwlab. soils. wisc. edu