

Specific Gravity of Soil

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Objectives

Find a specific gravity of soil using ASTM standards.

Introduction

Specific gravity of soil (G_s) is the ratio between the soil and water at $4^\circ C$. This property of soil can be used in classifying the type of soil, and other applications including compaction and consolidation. This experiment is aimed to find G_s of clay using the water pycnometer method.

Methodology

The method can be found in the manual ASTM. Note that procedures are followed closely as written in the manual.

Results and Discussion

The specific gravity of soil, G_s can be calculated from the following equation,

$$G_s = \frac{M_s G_T}{M_s + M_2 - M_1}$$

Where:

M_s = Mass of Dry Soil (g)

G_T = Specific gravity of Water

M_1 = Mass of Flask + Water (g)

M_2 = Mass of Flask + Water + Soil (g)

Using the value from Table 1, G_s can be estimated as

$$G_s = \frac{(29.52)(0.9922)}{29.52 + 340.15 - 654.05} = 2.622$$

All values are obtained from Table 1. The average value of G_s is calculated using the value of G_s from other groups. Note that the value of M_1 is estimated using a plot in Figure 1 when the temperature is $41^\circ C$. From Figure 2, G_s is estimated as 2.609, which is within a correct range of soil clay.

The experiment procedure can introduce some errors at many stages. The estimation of M_1 from the graph can introduce significant error as the plot is not accurate due to limited number of data points. This error can be rectified by including more data points to obtain a better plot.

Conclusion

- The specific gravity of soil is 2.609, which is in the correct range for clay.
- The most significant error from the experiment is due to the mass of water obtained from the plot.

Specific Gravity Determination		Flask Calibration				
Trial No.	1	2	1	2	3	4
1. Temperature, °C	41	34	54	38	32	26
2. Mass of Flask + Water, g	654.05	655.29	651	654.4	655.8	656.3
3. Mass of Flask + Water + Soil, g	672.4	673.5				
4. Container No.	1	1				
5. Mass of Dry Soil + Container, g	340.15	340.15				
6. Mass Of Container, g	310.63	310.63				
7. Mass of Dry Soil, g	29.52	29.52				
8. Sp.Gr. Of Water	0.9922	0.9944				
9. Sp.Gr. Of soil	2.622	2.595				
Average Sp. Gr. Of Soil	2.609					

Table 1: Showing a raw data obtained from the experiment

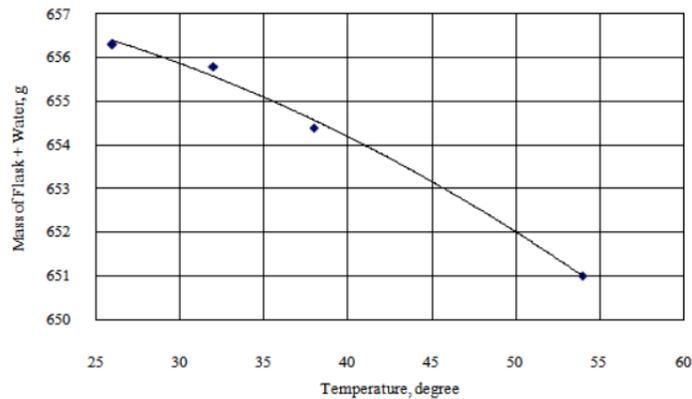


Figure 1: A plot between temperature and the mass of water

Soil	Specific gravity
Sand	2.63 – 2.67
Silt	2.65 – 2.7
Clay & silty clay	2.67 – 2.9
Organic soils	<2.0

Figure 2: Show specific gravity of different soil types