

OCW 2020
FUNDAMENTALS OF GEOTECHNICAL ENGINEERING

SELF-EVALUATION
Learning outcomes 1 and 2

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THEORETICAL QUESTIONS

QUESTION 1

Using the definitions of the basic properties of soils, verify the following relationship:

$$\gamma' = \gamma_d - \gamma_w \cdot \frac{1}{1 + e}$$

QUESTION 2

In an intact rock, what is the difference between porosity and effective porosity?

QUESTION 3

According to the USCS (Unified Soil Classification System), explain:

- When a soil is named as Gravel?
- How we can distinguish clayey soils from silty soils?
- What soil is named SP-SM?

QUESTION 4

One interesting property of clay particles is related to their arrangements. Draw the two options that are found in nature and indicate where cohesion could appear.

EXERCISES

EXERCISE 1

At a construction site, a soil sample has been obtained below the water table. Its bulk unit weight is 19 kN/m^3 and the specific gravity of soil solids is 2.7.

Determine the water content of soil.

EXERCISE 2

An undisturbed soil sample has been used to perform a series of tests. The mass of the soil sample was 245.18 g, and after oven drying, its mass was reduced to 210.59 g.

Then, a particle-size distribution analysis by sieving was performed and the results are shown in table 1.

Opening (mm)	100	63	20	5	2	0.4	0.16	0.08	Pan
Retained (g)	0.00	0.00	0.00	0.00	0.36	9.50	15.35	27.53	157.85

Due to the percentage passing through #200 sieve, it was necessary to determine the plastic limit and the liquid limit of this soil. A plastic limit test was performed on a mass of 6.56 g. After oven drying, its mass was reduced to 5.34 g.

Also, using the Casagrande cup device to perform the liquid limit test, the following data were obtained:

No of blows	Wet mass (g)	Dry mass (g)
25	20.66	15.09
18	25.21	17.94

In addition, since there was a slight odour of organic material, the liquid limit without drying was also determined by means of the Casagrande cup device. The following data were recorded:

No of blows	Wet mass (g)	Dry mass (g)
26	18.03	11.56
18	41.03	25.55

From these data, classify the soil according the Unified Soil Classification System (USCS).