

OCW 2020
FUNDAMENTALS OF GEOTECHNICAL ENGINEERING

SELF-EVALUATION
Learning outcomes 1 and 5

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EXERCISE

A building is to be constructed at a construction site. The foundation of this building will be rectangular footings 2.5 m by 3 m (B x L), which will lie on the ground whose profile is shown in the figure of the next page. These footings will carry a uniform vertical load. There are two options to carry out the foundation: a) at a depth of 1 m, b) at a depth of 4 m. The water table has been found at a depth of 3 m, while the intact rock is at 10-m depth. The main characteristics of the different strata are the following:

Upper stratum. SP, poorly graded sand.

a) Test to determine the density and unit weight of a soil.

Test result: unit weight of soil (above the water table): 17.0 kN/m³

Test result: unit weight of soil (below the water table): 18.5 kN/m³

b) Standard Penetration Test (SPT) at a depth of 2 m.

Test result: number of blows = 10.

In order to determine the shear strength parameters of this sand, the chart provided by the Technical Building Code. Foundations (see next page) has been used, because no more tests have been conducted on this soil.

Lower stratum. CL, lean clay (normally consolidated)

a) Test to determine the density and unit weight of a soil.

Test result: bulk unit weight of soil: 21.8 kN/m³

b) Unconfined compression test.

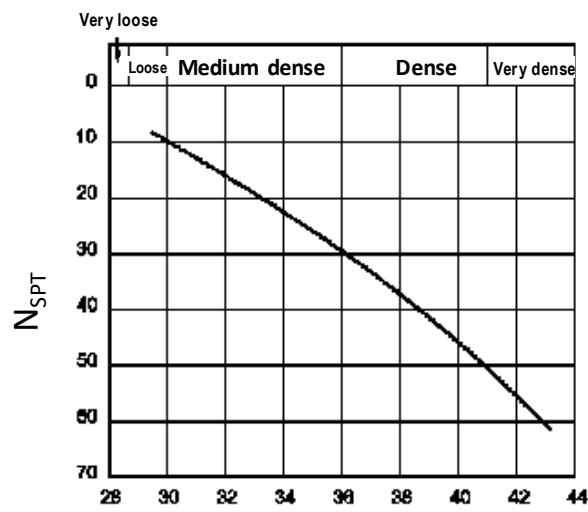
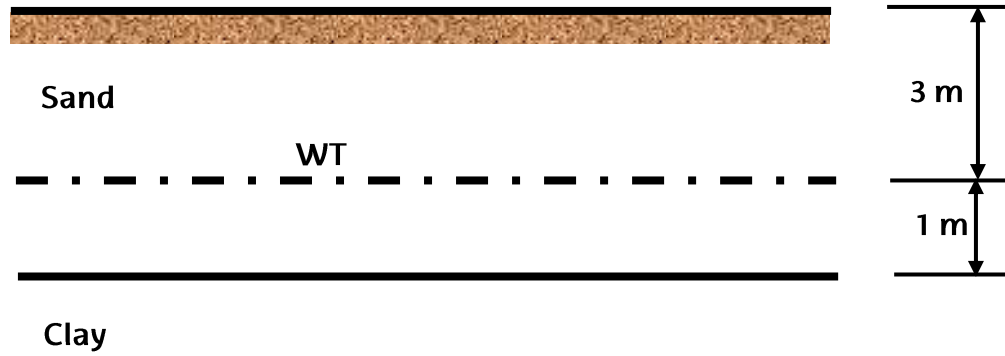
Test result: unconfined compressive strength = 145 kPa.

No more tests have been performed, so that the friction angle of the clay has been taken 25° from the bibliography.

At this project, the allowable settlement has been set as 25 mm.

Taking into account, solely, the bearing capacity of the soil, determine the most adequate option, (a) or (b), to carry out the foundation, explain the reasons of that choice and calculate the allowable bearing capacity.

For the two options, all bearing failures (short-term, long-term) must be studied using all the different expressions provided by the TBC.



ϕ , friction angle

Chart provided by the Technical Building Code. Foundations.