

Exam Soil Mechanics

Bachelor 2nd year, CiT/CTW

Module/course code: 202000065-1A: Safety and Risk in Delta's – Soil Mechanics

Date: 10 November 2022

Time: 13.45-15.45 (+25% for students who may use extra time)

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Instructors: Vanessa Magnanimo and Floriana Anselmucci

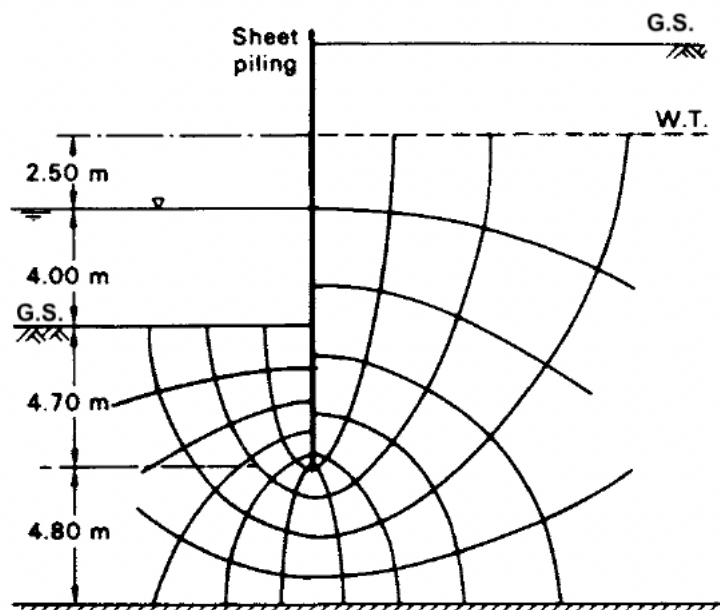
Type of test: Exercises, Open questions.

Allowed aids: Scientific calculator, formula sheet, English-Dutch dictionary.

Attachments: Formula sheet.

Exercise 1

The section through a sheet pile wall along a tidal estuary is given in the figure. At low tide the depth of water in front of the wall is 4 m. The water table behind the wall lags 2,5 m behind tidal level.

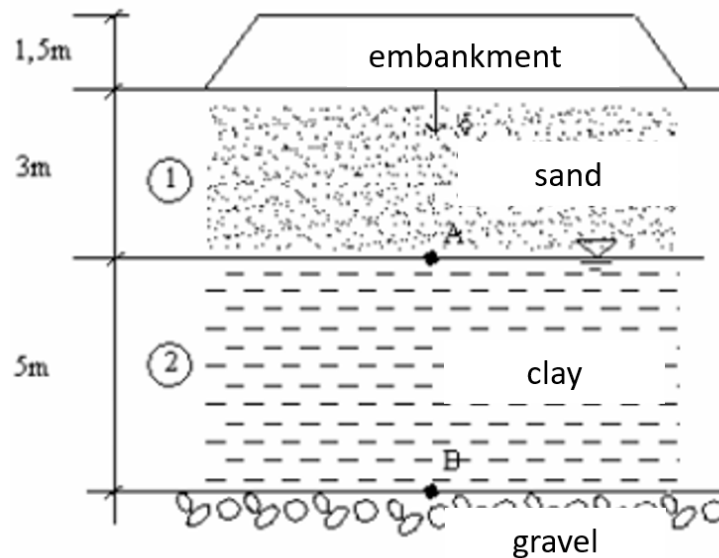


- Indicate the equipotential and flow lines (draw them with different colors/styles on the test paper or on your paper).
- Calculate and plot the net distribution of water pressure on the piling.
N.B.1 The net distribution is the difference between the two sides of the piling.
N.B.2 You can deduce the elevation of the piling points from the drawing.
- What do you expect to be the effect of rising tide on the net pressure?

Exercise 2

A normal consolidated soil section is presented in the figure. An embankment of 1,5 m has to be built. The table shows the soil characteristics of the embankment, the first layer of sand, and the second made of clay, respectively. Determine:

- The profile of the effective vertical stress – before and after the embankment installation.
- The profile of the effective horizontal stress – before and after the embankment installation.
- Calculate the total displacement of the soil section.
- Consider now a case with $OCR_{clay} = 2$. Calculate the total displacement of the soil section.
- Plot the $\log_{10}(\sigma')$ -e curve for both cases. Comment on the differences.



	$\gamma_{dry} [KN/m^3]$	$\gamma_{sat} [KN/m^3]$	$\phi' [^\circ]$	H[m]	e_0	Cc	Ce
Embankment	18	22	32	1,5	-	-	-
Layer 1	15	18	30	3	0,5	0,03	-
Layer 2	17	20	25	5	0,8	0,091	0,006

Exercise 3

The results of a triaxial tests show that the chamber confining pressure is 100 kN/m², the deviatoric stress is 89,4 kN/m², and the recorded pore pressure is 58,1 kN/m².

- Quantify the undrained and drained friction angle of a normal consolidated clay.
- Plot the failure planes of the two conditions.
- Find the angle θ that the failure plan makes with the major principal plane in the drained case