21 October 2002

53:030 Soil Mechanics Experts
3505 Seamans Center for Engineering
Arts   Sciences
University of Iowa
Iowa City, Iowa 52242-1527

Dear Soil Mechanics Experts:

We are a relatively new and small engineering firm here in the Iowa City area and we have just received a contract to do some preliminary sight assessments and planning for a new steel recycling depot to be located off of Scott Blvd in Iowa City. Your geotechnical-testing firm was highly recommended to us by the Magna Pecuniae Corporation, who mentioned that you have done some excellent work for them this fall. As part of the site development, we are requesting that you take core samples from the site at appropriate locations and that you perform a one-dimensional consolidation test on at least one fine-grained soil sample, and a one-dimensional compression test on at least one sand sample. In terms of results from this test, we are especially interested in the fine-grained soil's:

1. e vs. log[σ_v'] behavior in 1-D consolidation, including estimates of Cs, Cc, and $(\sigma_v')_c$;
2. permeability k as a function of void ratio e, and
3. consolidation index c_v as a function of void ratio e.

For the sandy soil at the site, we are interested in the compressibility behavior.

While we will plan on doing most of our own bearing capacity and foundation settlement analysis once you provide us the relevant soil properties, we would also be quite interested in your calculations of expected settlements under the proposed flexible mat foundation system shown in Figure 1 that will be approximately 4m wide and 20 m long. In particular, the working bearing stress under this foundation is expected to be 230 kPa, and under this loading, we would like you to compute:

a. The short term shear settlements beneath the corner and center of the foundation;
b. The time dependent consolidation settlements beneath the center and corner of the foundation; and
c. The time scale on which we can expect the consolidation settlements to occur (for example, what are t_{50}, t_{75}, and t_{90} ?):

The maximum allowable settlement that we can take under these foundations is 1.0 inch (2.54 cm). Therefore, if your computed settlements are any larger than this, please design a site pre-loading plan for us, so that with the same bearing stresses beneath the foundations, the settlements will be tolerable.

We will pay your firm the going rate of $125 per hour billed up to a maximum of $2500 to complete this request. We look forward to receiving your report by 18 November 2002.

Sincerely,

Diego Rivera, P.E.
Civil Engineer

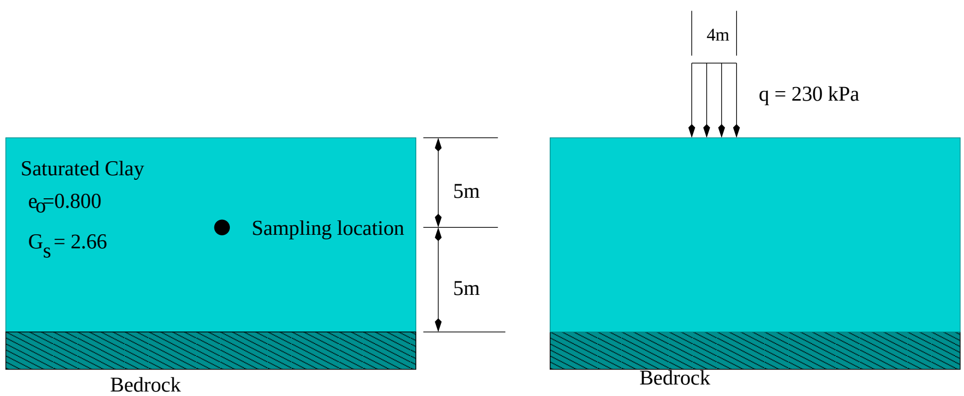

Figure 1. Site as it currently exists, along with approximate location from which the fine-grained soil sample was taken. The second picture is a schematic of the bearing loading that will be applied to the site.

Soil Mechanics 53:030
Labs 8-9 Writeup Guidelines
Fall 2002

A. Client Requests

As you can see from the preceding letter, Stuctural Engineering Artists of Iowa City has requested that you collect an undisturbed soil sample from the proposed site location, and that you perform a one-dimensional consolidation tests on the fine-grained specimens, and simple one-dimensional compression tests on the sand samples. In terms of results from this test, they are interested in:

a. e vs. $\log(\sigma_v')$ for both the sand and fine-grained soils;
b. permeability k as a function of void ratio e for the fine-grained soil; and
c. consolidation index c_v as a function of void ratio e for the fine-grained soil.

For other basic properties of these soils, you can use those of soil FI-6 and FI-10, which you have dealt with in preceding lab sessions.

In addition, you will observe that the client has asked you to compute both the immediate elastic settlements beneath the foundation and the long-term consolidation settlements. To compute immediate settlements, assume that the soil is isotropic and elastic, with Young's modulus and Poisson's ratio values: E=1.0GPa; ν=0.48.

B. Processing the Lab 9 Data

When you obtain the data, it will be in the form of the nine separate files listed below. Each file contains a history of ΔH vs. t for a specific load increment or decrement. To obtain these data files:

a. Log on to an ECSS HP work station.
b. Create a directory where you wish to save the files, and move into that directory.
c. Copy the data files into your directory by typing: cp /usr/ui/class/examples/cee5330/lab9/* For all of the loading tests, use the one-dimensional consolidation model developed in class and in the textbook to complete the data in Table 1 of your Lab 9 handout. For the unloading tests, you need not compute or t_{50}, c_v, k, etc but only the e vs. $\log(\sigma_v')$ behavior of the soil.

50l	load from 25 kPa to 50 kPa;
100l	load from 50 kPa to 100 kPa;
200l	load from 100 kPa to 200 kPa;
400l	load from 200 kPa to 400 kPa;
100ul	unload from 400 kPa to 100 kPa;
25ul	unload from 100 kPa to 25 kPa;

C. The Write-up

By now, you should have a good idea as to how to organize the write-up (professional cover letter, title page, table of contents, main body, appendix, *etc.*) and what information and figures to include. As before, this write-up will be graded based on both technical content (how you analyze the data, find the soil properties, and perform the necessary settlement computations) and presentation style. Good Luck!