AUGUST 21, 2002 - Shallow Slope Failures and Suction from Vegetation

Speakers: Professors Dr. Chuck Aubeny and Dr. Bob Lytton

PRESENTATION SUMMARY

Professors Dr. Chuck Aubeny and Dr. Bob Lytton gave a PowerPoint presentation entitled, "Shallow Slope Failures and Suction from Vegetation" to a room of about 25. The presentation is the result of a TxDOT study for using suction to predict shallow slope failures along highways.

The mechanism described for shallow slope failures is:
1. Shallow cracks (6 to 10 ft maximum depth) occur from normal vegetation desiccation.
2. Rainwater moving down slope enters and fills the cracks.
3. Excess moisture weakens the deeper soil because water tends to remain in the bottom of the cracks.

The speakers described the relationship between suction and soil shear strength. The decreased shear strength of the soil is related to a decrease in matric suction so that suction can be used to predict failure.

In the study they investigated numerous failures in two high plasticity clays, Paris clay and Beaumont clay, with PI's of about 50 to 60%. Failure depths ranged from 2 to 10 ft. They found that the suction at the failure surface was about 2.0 to 2.4 pF.

One outcome of the study was development of a much faster and less expensive method of determining suction in the lab. They had tested between 12 and 18 different methods to determine suction. They one they preferred is a method using psychrometers. They radially inserted six wire screen (using ceramic was not as good) psychrometers spaced along the length of an 8 to 12 inch long Shelby tube clay sample. They exposed one end to the atmosphere and measured the change in relative humidity along the sample as it dried. The test takes one day rather than two weeks needed for the commonly used filter paper method. The total equipment cost is under $1000.

Their conclusions in the study were:
1. A decrease in suction is related to slope failure
2. Moisture diffusion controls the rate of strength loss.
3. Critical parameters for predicting slope failure using suction are:
- Depth of root zone
- Crack depths in the soil
- Diffusion coefficient (alpha)
- Osmotic suction (pi)
- Effective soil friction angle (phi prime)

The first two parameters are determined by field reconnaissance, and the remaining three are determined by lab work and simple calculations.

To download a copy of the slide presentation in Adobe Acrobat format, <u>click here.</u>

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