Colorado State University

Knowledge to Go Places

Presented by the Department of Civil Engineering

Foundation Design for Expansive Soil

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Introduction

Litigation against builders, developers, and engineers arising out of damage to structures and infrastructure due to expansive soils is a billion dollar issue. Actual damages in the United States will exceed $10 billion this year alone. Where these problems were thought to occur mainly in the arid Western United States, many cases have been developing in the Midwest and the East. Many of the problems result from inadequate design and construction as a result of the failure to identify expansive soils on the site, failure to accurately predict heave associated with the expansive soil, specification of inappropriate foundation systems, and/or improper construction practices. Foundation engineering for expansive soil sites is dramatically different than for "ordinary" sites. This course will present the basic fundamentals of design of foundations for expansive soil sites. It will discuss the general nature of expansive soil, the need for different site investigation techniques, and different foundation systems to be used on these soils. It will present methodologies to predict slab and pier heave and apply these methodologies to the design of foundation systems. A new topic introduced this year will include stabilization with lime and cautions when soluble sulfates are present.

Objectives

The course is intended to provide structural, geotechnical, and construction engineers, engineering geologists, and architects with the tools necessary to design and construct foundations on expansive soils sites for a variety of soil types. It will present an overview of various problems encountered when building on expansive soils. It will include the following topics.

- Identification and characterization of expansive soils
- Field investigation and soil sampling
- Laboratory testing for expansive soils
- Fundamentals of soil suction and its role in heave prediction

Day Two

8:30 - 9:30	Heave Prediction – Suction Method • General concepts • Suction Compression Index • Free field heave
9:30 - 10:00	Foundation Systems • Types of foundations
10:00 - 11:15	Drilled Pier Design • Rigid pier design • Elastic pier design • Reinforcing steel • Helical piers
11:15 - 12:00	Lateral Earth Pressures • Effect of swell pressure
12:00 - 1:00	Lunch Break – *On Your Own*
1:00 - 2:00	Post-Tensioned Slabs-on-Ground • Field investigation • Laboratory investigation • Expansive soil support parameters
2:00 - 3:00	Lime Stabilization of Soils • Nature of lime stabilization • Lime reactivity • Sulfate reactions and the Ettringite problem
2:30 - 4:00	Design Workshop • Piers and grade beam • Over-excavation and replacement • Post-tensioned slab
4:00 - 4:30	Questions and Discussion

Colorado State University, Division of Continuing Education will grant Continuing Education Units (CEUs) after successful completion for a fee of $50.00.

Fees

The fee for early registration is $810.00. Space is limited so participants are encouraged to make registrations in advance by using the attached registration form. The registration fee includes the seminar, refreshments, and short course materials. **The text book referenced, *EXPANSIVE SOILS: Problems and Practices in Foundation and Pavement Engineering*, is not included in registration fees, but will be available for purchase on site.** If there is room available, registration may be taken during the Registration time at the site. Late registration (postmarked less than 10 days from the date of the seminar) and on-site registration is $860.00. Checks should be made payable to Colorado State University. Refunds, less a handling fee of $25.00, five days prior to the date of the seminar. Substitution of participants is permitted. There is a $17.00 return check charge. Registration questions may be directed to the Office of Conference Services, telephone (970) 491-7501, FAX (970) 491-7747, or E-mail: ocsreg@colostate.edu.

Locations and Dates

Chicago, Illinois

Date: June 26-27, 2006
Place: Holiday Inn Chicago O'Hare/Kennedy
8201 West Higgins Road
Chicago, IL 60631
(773) 693-2323

San Antonio, Texas

Date: August 21-22, 2006
Place: Holiday Inn Select Hotel
77 N.E. Loop 410
San Antonio, Texas 78216
(210) 349-9900

Dallas, Texas

Date: August 24-25, 2006
Place: Marriott Suites Dallas Market Center
2493 North Stemmons Freeway
Dallas, Texas 75207
(214) 905-0050

Regina, Saskatchewan - Canada

Date: September 18-19, 2006
Place: Delta Regina
1919 Saskatchewan Drive
Regina, Saskatchewan
CANADA S4P 4H2
(306) 525-5255

Edmonton, Alberta - Canada

Date: September 21-22, 2006
Place: Delta Edmonton South Hotel and Conference Center
4404 Gateway Blvd.
Edmonton, Alberta
CANADA T6H 5C2
(780) 434-6415

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- Field investigation and soil sampling
- Laboratory testing for expansive soils
- Fundamentals of soil suction and its role in heave prediction
- Prediction of heave of slabs and pier foundations
- Design of appropriate foundation systems for expansive soil sites
- Lime stabilization of soils under slabs and pavements

Who Should Attend

This course is intended for engineers and geologists with a basic understanding of soil engineering. The material will be of important and practical value to:

- Geotechnical Engineers
- Foundation Engineers
- Structural Engineers
- Engineering Geologists
- Architects
- Construction Engineers
- Builders/Contractors
- Building Inspectors

Course Schedule

(Times are approximate and flexible)

Day One

8:00 - 8:30	Registration
8:30 - 9:00	Introduction • Nature of expansive soil • General concepts of soil behavior
9:00 - 9:30	Damage from Expansive Soil • Nature of damage • Types of damage
9:30 - 10:30	Site Investigation • Soil sampling • Frequency of sampling
10:45 - 12:00	Mechanics of Unsaturated Soils • Stresses in unsaturated soils • Stress-strain relationships
12:00 - 1:00	Lunch Break – *On Your Own*
1:00 - 2:00	Soil Suction • General concepts • Measurement of soil suction • Use of soil suction
2:00 - 3:00	Oedometer Testing of Expansive Soil • Consolidation – Swell testing • Constant Volume testing
3:00 - 4:00	Heave Prediction • Free field heave • Effect of footing pressure • Pier heave
4:00 - 4:30	Questions