

**The University of Iowa**  
**Department of Civil & Environmental Engineering**  
**Foundations of Structures, 53:139**  
**Spring Semester 2002**  
**Preview of Second Midterm Examination**  
**Prof. C.C. Swan**

The second midterm exam is scheduled to be given on Tuesday, May 14 at 9:45am in 3321 SC. The exam period is two hours long, and will be used to examine you on the material covered since the first midterm – namely the material on retaining walls, sheetpile walls and deep foundations. The exam format will be basically explanative, where an issue pertaining to any of the above subjects will be raised, and you will be requested to discuss it with words and diagrams. The exam will be closed book, closed notes. To prepare for it, you should familiarize yourself with the following subjects:

**Retaining Wall Structures**

- Different types of retaining walls: cantilever, gravity, anchored, non-anchored, mechanically stabilized earth, etc.
- Appropriate earth pressure assumptions to apply to structures: earth pressure at rest; Rankines active and passive pressures; Coulomb's active and passive pressures, etc.
- Understand the limit state ideas that are involved in choosing active and passive soil design forces for the retaining walls.
- Analysis of both cantilever and gravity retaining walls with respect to sliding, overturning, and bearing capacity. Know which forces need to be applied to the wall, and where they are applied. (You may be requested to draw diagrams to this effect.)
- Miscellaneous practical issues pertaining to the analysis/design of retaining walls: placement and sizing of anchors; providing drainage, etc.

**Sheetpile Walls**

- Have an understanding of how sheetpile walls “work.”
- Understand the fact that we consider equilibrium of the sheetpile when the soil along the length of the pile is in a state of shear failure. Thus the analysis of the pile under these conditions is called “limit state” analysis.
- Know how to use appropriate formulas to compute the necessary depth of embedment of sheetpile walls;
- Know how to size, place, and design various anchors for sheetpile wall systems including anchor beams, tiebacks, deadman anchors, etc.

**Deep Foundation Systems**

- Know the basic advantages provided by deep foundations, and the variety of situations where they might thus be employed;
- Know the load transfer mechanisms and what pure “friction piles” and pure “end-bearing” deep foundations are;
- Know the different materials that can be used as piles, and what their relative advantages / disadvantages are;
- Understand the difference between high- and low-displacement piles, and how this effects the ultimate capacity of the piles;

- Understand why piles are generally used with pile caps and/or grade beams;
- Be able to discuss the changes induced in soil as a result of the pile driving process, both for clay and sand type soils;
- Have some recognition of the major methods used to compute the end-bearing and frictional capacity of piles, and be able to use these methods if sufficient information is given to you (i.e. Meyerhoff's method, Vesic's method, Coyle-Costello method, the  $\alpha$ ,  $\beta$ , and  $\lambda$  methods).
- Understand when full-scale field load tests are used to estimate the capacity of piles. Also, understand the subtleties and complexities involved in interpreting the test results;
- Know the basic concepts behind pile driving formulas to estimate the capacity of driven piles. Also know the arguments for and against using these formulas in practice;
- Know how to compute the settlement of piles if you were given the necessary formulas, charts, etc.
- Understand what negative skin friction is and how it can adversely effect deep foundations;

### Foundations on "Difficult" Soils

- Know the different types of notoriously weak and compressible soils;
- Know and understand some of the workable strategies for building on such weak and compressible soil deposits:
- Understand what collapsible soils are, and that loess is a collapsible soil that is quite common here in Iowa. Specifically, know about different tests that are used to measure the hydro-collapse potential of soils.
- Understand the potential dangers of building structures on expansive soils which tend to be clayey in content. If this cannot be avoided, know some of the standard strategies for avoiding damage to structures from expansive soils.

**Disclaimer:** This review sheet is provided to assist you in studying for the exam. While it is expected that the exam questions will be drawn primarily from the material outlined above, it is possible that additional background knowledge and information may be needed to answer the actual exam questions.