

Geotechnical Aspects of Earthquake Engineering

San Jose, CA

February 20-22, 2007

Schedule

Day 1

- 1. Introductions and Objective** **8:00 - 8:30 (Ted)**
- Registration
 - Personnel Introduction: Ted S. Vinson (Ted); Gustavo Ordonez (Gus)
 - Course Participant Introductions
 - Philosophy – Objectives – Limitations
 - Overview of Site Specific Seismic Hazard Analysis
- 2. Earthquakes** **8:30 - 10:00 (Ted)**
- Causes, Distribution and Stress Waves Generated by Earthquakes
 - Definitions (fault types, distance, magnitude, PGA)
 - Earthquake Magnitude and Intensity
 - Characterization of the Seismic Environment
 - Maximum Credible Earthquake, Design Earthquake, Maximum Considered Earthquake
 - Sources – Zones
 - Estimating Rock Motions for Design Purposes
 - Amount of Energy Release
 - Attenuation Relations: Development, PGA
- Break** **10:00 - 10:15**
- 3. Ground Motions During Earthquakes** **10:15 - 12:00 (Ted)**
- Ground Motions and Response Spectra
 - Influence of Soil Conditions on Ground Motion and Response Spectra
 - Methods for Predicting the Influence of Soil Conditions on Level Ground Response
 - Building Codes (IBC, NEHRP)
 - Attenuation Relations
 - PGA, Spectral Acceleration
 - Free Field, Base Rock, Outcrop
 - Development
- Lunch** **12:00 - 1:00**
- 4. Ground Response Analysis – Overview** **1:00 - 2:00 (Ted)**
- Seismic Hazard Analysis
 - Deterministic SHA

- Identification and Characterization of Sources
 - Selection of Source-Distance Parameter
 - Selection of Controlling Earthquake
 - Definition of Hazard Using Controlling Earthquake
 - Development of Ground Motion Histories
 - Site Response Analysis
- 5. Software - SHAKE2000 Hands-on Training** **2:00 - 3:00 (Gus)**
- SHAKE & SHAKE2000 Features
 - SHAKE Options
 - Validation Studies, Recommendations.
 - Program Installation & Registration
- Break** **3:00 - 3:15**
- 6. Site Specific Response - SHAKE2000 Hands-on Training** **3:15 - 4:45 (Gus)**
- Site Specific Response Analysis with SHAKE
 - Problem Definition
 - Selection of Input Ground Motions
 - Dynamic Soil Properties
 - Soil Column
 - Assignment of Input Motion
- Questions/Answers** **4:45 - 5:00**
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Day 2

- 7. Site Characterization** **8:00 - 8:30 (Ted)**
- Soil Profile
 - Soil Parameters for Analyses
- 8. Determination of Soil Properties for Ground Response Analysis** **8:30 - 10:00 (Ted)**
- Introduction to Soil Properties and Test Procedures
 - Field Wave Velocity Measurements
 - Laboratory Tests
 - Forced Vibration Tests
 - Free Vibration Tests
 - Repeated Cyclic Loading Tests
 - Dynamic Soil Properties for analyses
- Break** **10:00 - 10:15**
- 9. Influence of Base Rock Characteristics on Ground Response** **10:15 - 11:00 (Ted)**
- Homogeneous Rock Formations with Different Stiffness Characteristics
 - Influence of Intermediate Rock Layers
 - Influence of Sloping Rock Boundaries

10. Liquefaction	11:00 - 12:00 (Ted)
<ul style="list-style-type: none"> • Phenomenological Explanation • Laboratory Investigation of Soil Liquefaction <ul style="list-style-type: none"> ○ Representation of Stress Conditions During an Earthquake in the Laboratory to Evaluate Liquefaction ○ Typical Test Results for Loose and Dense Sands ○ Major Factors Influencing Liquefaction ○ Minor Factors Influencing Liquefaction 	
Lunch	12:00 - 1:00
11. Site Specific Response - SHAKE2000 Hands-on Training (cont.)	1:00 - 3:00 (Gus)
<ul style="list-style-type: none"> • Site Specific Response Analysis with SHAKE <ul style="list-style-type: none"> ○ Acceleration & Shear Stress Time Histories ○ Response Spectrum 	
Break	3:00 - 3:15
<ul style="list-style-type: none"> • Processing of Output Data from SHAKE • Sequential SHAKE Analyses 	3: 15 - 4:45 (Gus)
Questions/Answers	4:45 - 5:00

Day 3

12. Evaluation of Liquefaction Potential	8:00 - 9:00 (Ted)
<ul style="list-style-type: none"> • Analysis of Soil Liquefaction <ul style="list-style-type: none"> ○ Historical Development ○ General Procedure ○ Simplified Procedure for Evaluating Soil Liquefaction Potential • Liquefaction Hazard Assessment <ul style="list-style-type: none"> ○ Use of Field Data to Evaluate Soil Liquefaction ○ Mitigation of Liquefaction Hazard 	
Break	10:00 - 10: 15
13. Seismic Slope Stability	10: 15 - 12:00 (Ted)
<ul style="list-style-type: none"> • Analysis Procedures <ul style="list-style-type: none"> ○ Pseudostatic ○ Deformation • Peak Acceleration, Yield Acceleration • Shear Strength for Pseudostatic Analysis • Post-earthquake Slope Stability Analysis 	
Lunch	12:00 - 1:00

- 14. Liquefaction and Settlement - SHAKE2000 Hands-on Training** **1:00 - 3:00 (Gus)**
- Liquefaction Evaluation Potential - SPT
 - Liquefaction Evaluation Potential - CPT
 - Settlement Analysis
 - Liquefaction-Induced Lateral Displacement
- Break** **3:00 - 3:15**
- 15. Displacement Analysis - SHAKE2000 Hands-on Training** **3:15 - 4:45 (Gus)**
- Newmark Method of Displacement Analysis
 - Makdisi-Seed Simplified Method of Displacement Analysis
- 16. Closure** **4:45 - 5:00**
- Questions/Answers
 - PHDs

Nonlinear Effective-Stress Site Response Analysis
San Jose, CA
February 23, 2007
Schedule

- 1. Introductions and Objective** **8:00 - 8:30 (Ted)**
- Registration
 - Personnel Introduction: Neven Matasovic (Neven); Gustavo Ordonez (Gus)
 - Course Participant Introductions
 - Philosophy – Objectives – Limitations
- 2. Role of Advanced Analyses in Geotechnical Earthquake Engineering** **8:30 - 10:00 (Neven)**
- Why and When is Nonlinear Analysis Needed?
 - Why and When is Effective Stress Analysis Needed?
 - When to use the Nonlinear and Effective Stress Analyses, When are 2-D and 3-D Analyses Required, and When Soil-Structure Interaction Effects Should Not be Ignored
- Break** **10:00 - 10:15**
- 3. Nonlinear and Effective Stress Analyses** **10:15 - 12:00 (Neven)**
- Theoretical Background
 - Modeling
 - Layer Thickness, Transmitting versus Rigid Boundary
 - Evaluation of Rayleigh (Viscous Damping) Parameters
 - Porewater Pressure and Cyclic Degradation of Clay Models
 - Use of Generic Input Parameters
 - Generation of Input Parameters from Published Data and Laboratory Testing
 - Interpretation of Results
 - Calculation of Soil Liquefaction
 - Calculation of Seismically-Induced Settlement
 - Quasi 2-D Effects and Slip Elements
 - Validation of D-MOD2000
 - Response to Sinusoidal Loading and Handling of Reversals
 - Case Histories
 - Comparison with Other Programs
- Lunch** **12:00 - 1:00**
- 4. Nonlinear Analysis - D-MOD2000 Hands-on Training** **1:00 - 3:00 (Gus)**
- Program Download and Installation
 - Site Specific Response Analysis with D-MOD2000
 - Problem Definition
 - Selection of Input Ground Motions
 - Dynamic Soil Properties
 - Soil Column

- Assignment of Input Motion

Break

3:00 - 3:15

5. Nonlinear Analysis - D-MOD2000 Hands-on Training (cont.)

3:15 - 4:45 (Gus)

- Site Specific Response Analysis with D-MOD2000
 - Acceleration & Shear Stress Time Histories
 - Porewater Pressure and Degradation Index Time Histories
 - Response Spectrum
- Processing of Output Data from D-MOD2000

6. Closure

4:45 - 5:00

- Questions/Answers
- PHDs