

NONDESTRUCTIVE EVALUATION (NDE) AND GEOPHYSICS USERS SEMINAR COURSE OUTLINE

October 2 - October 4, 2018, 8:30 am - 5:00 pm
Wheat Ridge, CO USA Office



Olson Instruments, Inc.

- › **Structures: October 2 (Tues)**
- › **Foundations/Pavements: October 3 (Wed)**
- › **Geophysics: October 4 (Thurs)**

In addition to NDE and geophysical method presentations, questions/discussion sessions and hands-on demonstrations will be conducted for most test methods with an instructor's guidance. A total of 7.5 PDH certificate hours will be awarded each day for use in Professional Engineering registration continuing education requirements. Classes start at 8:30 am and end at 5:00 pm with lunch provided by Olson. Coffee, drinks, and snacks provided daily.

Seminar Costs - \$300/day

Register by: emailing info@OlsonInstruments.com, or online at www.OlsonInstruments.com/Support/Training, and select the "NDE Users Seminar" link on the page. PayPal payments only if registering online.

Class size is limited to 30 participants, register early!

Contact our office if you would like assistance. Ex: letter of invitation for a US visa, lodging, etc.

Day 1, October 2 (Tuesday)

Structural NDE Methods for Concrete, Masonry & Wood Concrete Condition Assessment & Quality Assurance

- » Basic NDE Physics Overview
 - Wave Types
 - Wave Propagation
 - Wave Speeds
 - Reflection and Transmission
- » Ultrasonic/Sonic Pulse Velocity and Velocity Tomography for Quality and Integrity on Concrete with 2-Sided Access
 - Test Procedures and Equipment
 - Pulse Velocity Physics and ASTM C597
 - Materials and Case Histories
 - Strength Correlations
 - Velocity Tomography
- » Impact Echo for Thickness and Integrity on Concrete with 1-Sided Access
 - Test Procedures and Equipment
 - Impact Echo Physics and ASTM C1383
 - Thickness Q/A of Pavements
 - Materials and Case Histories for Void, Honeycomb, Cracking
 - Impact Echo Scanning

Day 1, October 2 (Tuesday)...*continued*

**Structural NDE Methods for Concrete, Masonry & Wood
Concrete Condition Assessment & Quality Assurance**



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- » Spectral Analysis of Surface Waves for Concrete with 1-Sided Access
 - Test Procedures and Equipment
 - SASW Physics
 - SASW for Concrete Quality/Strength Correlation
 - Damage Evaluation of Cracking, Fire, Frost, Alkali-Silica Reaction

- » Galvanostatic Pulse, Concrete Resistance and Half-Cell Potential for Rebar Corrosion
 - Test Procedures and Equipment
 - Corrosion Measurement Physics
 - Case Histories

- » Ground Penetrating Radar on Concrete and Pavements
 - Test Procedures and Equipment
 - Structural Embedment Location
 - 2D and 3D Data Analyses
 - Bridge Deck Surveys for Delaminations
 - Void/Wet Subgrade Detection for Pavements and Slabs
 - Roadway/Pavement Thickness Evaluation

- » Slab Impulse Response for Structural Evaluation and Void Detection below Rigid Pavements
 - Test Procedures and Equipment
 - Physics and ACI 228.2R and ASTM C1740
 - Structural Condition Assessment
 - Subgrade Void vs. Questionable vs. Sound Support
 - Correlations with Ground Penetrating Radar for Void Detection
 - Structural Case History

- » Resonance Testing of Cylinders, Beams and Cores for Freeze-Thaw Durability and Elastic Moduli
 - Test Procedures and Equipment per ASTM C215-08 for Elastic Moduli
 - Calculation of Young's and Shear Moduli, and Poisson's Ratio
 - ASTM C666/666M-03 (2008) applications for Freeze-Thaw Durability

- » Bridge Monitoring and Load Tests
 - Test Procedures and Equipment
 - Traditional Monitoring and Testing Methods
 - Interferometric Phase Radar for Bridge Displacements and Vibration

- » Bridge Deck Scanning
 - Test Procedures and Equipment
 - IE Scanning of Bridge Decks and Slabs
 - SASW Scanning of Bridge Decks and Slabs
 - Data Analysis and Presentation

Day 2, October 3 (Wednesday)

Quality Assurance & Forensic NDE Methods for Pavements & Foundations



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- » Lightweight Deflectometer for Subgrade and Base Compaction Control
 - Test Procedures and Equipment
 - Data Analysis
 - Materials and Case Histories
 - Proctor Test for Field Implementation
 - Discussion of University of Maryland Pooled Fund Study for LWD Testing Protocol

- » Crosshole Sonic Logging for QA of Drilled Shaft Foundations, Auger Cast Piles and Diaphragm Walls
 - Test Procedures and Equipment
 - Review of ASTM D6760-08 and European Standard
 - CSL Ultrasonic Signal Analysis and Anomaly/Debonding Considerations
 - Log Generation and Report Considerations
 - Velocity vs. Strength
 - Angled and Singlehole Sonic Logs
 - Research and Case History Results
 - When does an anomaly become a defect?
 - Destructive Coring/Drilling Considerations
 - General Repair Approaches

- » Crosshole Tomography for 2-D and 3-D Imaging of CSL Anomalies
 - Review of Tomography Algorithms
 - Data Collection Procedures in CSL tests for Velocity Tomography
 - Data Analysis of Angled CSL data
 - Velocity Tomography Analyses
 - 2-D vs. 3-D Velocity Tomograms in Research and Case Histories

- » Sonic Echo/Impulse Response for Shaft/Pile Integrity and Length in QA and Forensic Studies
 - Test Procedures and Equipment
 - Review of ASTM D5882-07 and ACI 228.2R-98
 - Sonic Echo Physics
 - Impulse Response Physics
 - Research and Case History Results for Concrete, Wood and Steel Piles
 - Testing through Pilecaps and on Pile Sides

- » Parallel Seismic for Shallow and Deep Foundation Unknown Depth Determinations and Buried Piles below Pilecaps
 - Test Procedures and Equipment
 - Review of ACI 228.2R-98
 - Parallel Seismic Physics
 - Research and Case History Results for Concrete, Wood, and Steel Piles and Masonry Piers/Abutments and Steel H-Pile and Sheet Pile Considerations
 - Unknown Foundation Depth Determinations for Bridge Scour Safety Studies

- » Ground Penetrating Radar for Unknown Foundation Depths/Pile Locations
 - Test Procedures and Equipment
 - Review of ACI 228.2R-98
 - Research and Case History Results

Day 2, October 3 (Wednesday) ...continued

Quality Assurance & Forensic NDE Methods for Pavements & Foundations



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- » Impact Echo for 1-Sided Concrete Thickness and Integrity of Piers, Abutments, and Pilecaps
 - Test Procedures and Equipment
 - Impact Echo Physics and ASTM C1383
 - Unknown Thickness Determinations

- » Dam Condition Evaluation
 - Test Procedures and Equipment
 - Cross-Dam Tomography
 - SASW and IE Applied to Dams
 - Interferometric Phase Radar (IBIS-L) for Dams and Slopes

- » Asphalt/Concrete Pavement Evaluation with Impact Echo/Spectral Analysis of Surface Waves Scanning
 - Test Procedures and Equipment
 - Detection of Delamination and Ravelling
 - Surface Waves for Elastic Modulii Determination

Day 3, October 4 (Thursday)

Engineering and Environmental Geophysics



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- » Introduction: Geophysics versus NDE
 - Instrumentation
 - Resolution
 - ASTM Standard D6429 and Guidelines
 - Matrix of Methods & Applications

- » Seismic: Refraction Method
 - Background Theory on Seismic Wave Propagation
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Seismic: Reflection Method
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Seismic: Borehole Methods - In-Hole, Downhole and Crosshole
 - Test Procedures and Equipment
 - Data Analysis, Applications, and Elastic Property Calculations
 - Case Histories

- » Seismic: Surface Wave Method - Active MASW (Multichannel Analysis of Surface Waves)
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Seismic: Surface Wave Method - Passive MASW
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Ground Penetrating Radar (GPR) for Geologic Investigations and Utilities/UST's
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Electrical Resistivity Method
 - Test Procedures and Equipment
 - Data Analysis for Engineering Applications
 - Case Histories

- » Electromagnetic Methods: Time-Domain and Frequency-Domain Methods
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

Day 3, October 4 (Thursday)...continued

Engineering and Environmental Geophysics



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- » Magnetic Method
 - Test Procedures and Equipment
 - Data Analysis and Applications
 - Case Histories

- » Wrap-up Geophysical Survey Methods

Seminar Location:

Olson Corporate Office
12401 W. 49th Avenue
Wheat Ridge, CO 80033-1927
Hours: 8:30 am — 5:00 pm
p: 303.423.1212
f: 303.423.6071

Registration is available either by phone, email, or online at:

www.OlsonInstruments.com/Support/Training, and select "NDE Users Seminar"
Contact Janet Shriner at 303.423.1212 or email: info@OlsonInstruments.com