

# NONDESTRUCTIVE EVALUATION (NDE) USERS SEMINAR COURSE OUTLINE



November 1–3, 2022, 8:30 am – 5:00 pm  
 Hosted at Braun Intertec Office – Texas Room  
 10900 Hampshire Ave South, Bloomington, Minnesota USA  
 (Minneapolis/St. Paul Airport – MSP)

- › **Structures: November 1 (Tues)**
- › **Foundations/Pavements: November 2 (Wed)**
- › **Geophysics: November 3 (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 - \$400/day**

**Register by:** emailing [Seminars@OlsonInstruments.com](mailto:Seminars@OlsonInstruments.com), or online at [www.OlsonInstruments.com/Support/Training](http://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 so please, register early!***

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

## Day 1, November 1 (Tuesday)

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

Larry Olson, PE, Chief Engineer

- » 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

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

- » Ultrasonic Pulse Echo - Shear Wave Tomography for Concrete Integrity with 1-Sided Access
  - Test Procedures and Equipment
  - Case Histories for Concrete Void, Honeycomb, Cracking
  
- » 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
  
- » Ground Penetrating Radar on Concrete and Asphalt Overlaid Bridge Decks
  - Test Procedures and Equipment
  - Structural Embedment Location
  - 2D and 3D Data Analyses
  - Bridge Deck Surveys for Delaminations - Ground and Air Coupled
  
- » 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 with Sonic Surface Scanner
  - Test Procedures and Equipment
  - IE Scanning of Concrete Bridge Decks and Slabs
  - SASW Scanning of Asphalt Overlaid Concrete Bridge Decks
  - Data Analysis and Presentation

Nondestructive Investigation Considerations and Case Histories for Ground Penetrating Radar, Impact Echo and Ultrasonic Pulse Velocity by Alf Gardiner, PE, Principal Concrete Engineer, Braun Intertec.

Nondestructive testing demonstrations will be held on concrete specimens for the above methods during the day.

**Quality Assurance & Forensic NDE Methods for Pavements & Foundations**

*Larry Olson, PE, Chief Engineer*

- » 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
  
- » Slab Impulse Response for Structural Evaluation
  - Test Procedures and Equipment
  - Physics and ACI 228.2R and ASTM C1740
  - Structural Condition Assessment Case History
  
- » Asphalt/Concrete Pavement Evaluation with Ground Penetrating Radar and Impact Echo/Spectral Analysis of Surface Waves Scanning
  - Test Procedures and Equipment
  - Asphalt Pavement Thickness and Subgrade Moisture Assessment with GPR
  - Detection of Delamination and Ravelling
  - Surface Waves for Elastic Moduli Determination
  
- » 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

**Quality Assurance & Forensic NDE Methods for Pavements & Foundations**

- » 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 and ASTM D8381
  - 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
  
- » 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

Nondestructive testing demonstrations will be held on concrete specimens for the above methods during the day

**Day 3, November 3 (Thursday)****Applied, Engineering and Environmental Near-Surface Geophysics**

*Ryan North, Ph.D., RPG, PG, Principal Geophysicist and Larry Olson, PE, Chief Engineer*

- » Introduction
  - Geophysics versus NDE
  - Applications
  - Instrumentation
  - Resolution
  - ASTM Standards D6429 and Guidelines
  - Matrix of Methods & Applications
- » Seismic Methods
  - Refraction Method
  - Reflection Method
  - Multichannel Analysis of Surface Waves (MASW) both active and passive
  - Borehole Methods: In-hole, Downhole and Crosshole
- » Ground Penetrating Radar (GPR)
  - Surface vs borehole
  - Man-made vs naturally occurring mediums
- » Electrical Resistivity
  - Electrical resistivity tomography (ERT)
  - Vertical electrical soundings (VES)
- » Electromagnetic Methods
  - Metal Detectors
  - Electrical Conductivity Profiling
  - Deep Conductivity Methods
  - Nuclear Magnetic Resonance
- » Potential Fields
  - Magnetic Method
  - Gravity
  - SP
- » Wrap-up Geophysical Survey Methods
  - Case study discussions: earthen vs concrete dams
  - Case study discussion: void detection

For each geophysical survey method we will cover the theory, instrumentation, maximum depth of penetration, resolution, data collection methods, data processing methods, analysis, interpretation, and reporting. We will also cover some case studies for each method.

We will have hands on demonstrations both inside and outside for seismic refraction tomography (SRT), multichannel analysis of surface waves (MASW), electrical resistivity, spontaneous potential (SP), and total field magnetics.

**Seminar Location:**

Offered by Olson Instruments, Inc.  
Hosted at Braun Intertec Office  
10900 Hampshire Ave South  
Bloomington, Minnesota USA

Minneapolis/St. Paul Airport (MSP)

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

[www.OlsonInstruments.com/Support/Training](http://www.OlsonInstruments.com/Support/Training), and select "NDE Users Seminar"  
Contact us at 303.423.1212 or email: [Seminars@OlsonInstruments.com](mailto:Seminars@OlsonInstruments.com)