March 2011 Dinner Meeting

KEYNOTE SPEAKER: Edward S. O’Malley, P.E.

TOPIC: Rapid Impact Compaction

DATE: Tuesday, March 22, 2011

LOCATION: Radisson Valley Forge
1160 First Avenue, King of Prussia, PA

TIME: Dinner Meeting: 5:30 PM; Social Hour: 6:30 PM
Dinner: 7:15 PM; Presentation

The March 2011 DVGI dinner meeting will feature Edward S. O’Malley, P.E., GeoStructures, Inc., presenting Rapid Impact Compaction. One Professional Development Hour (PDH) will be provided for this dinner meeting. The Rapid Impact Compaction (RIC) process provides controlled impact compaction of the earth using a 7.5-ton weight which is dropped 4 feet onto a 5-foot diameter tamper capable of imparting 40 to 60 blows per minute. The resulting force can densify soils to depths of up to 20 feet. This process can increase bearing capacity of in-situ soils and reduce settlement of footings.

As Vice President of Engineering at GeoStructures, Inc., Mr. O’Malley is responsible for feasibility studies, budget estimates, preliminary and final design review of Geopier Foundation Systems, Rapid Impact Compaction (RIC), helical anchor systems, and various structural elements. Tasks include review of geotechnical reports by consultants and determination of soil properties, verification of structural loading, footing sizing, settlement calculations, cost estimating, and site visits. Final design responsibilities include: review of design calculations performed by project engineers, drawing review and checking, specification and note editing, and interfacing with project management and field personnel. Construction phase responsibilities include: modulus test result interpretation and reporting, RIC startup and testing, changed condition analysis, and general troubleshooting. Other duties include consultation on retaining wall design, review of retaining wall design calculations, drawings and specifications, and consultation during wall construction. Management responsibilities include: workload allocation; review of designs, reports, and letters; training; recruiting; performance reviews; planning; and interfacing with other senior managers.

Mr. O’Malley has his Master of Science and Bachelor of Science degrees in Civil Engineering from the University of Texas, Austin.
March 22, 2011
Afternoon Short Course

TOPIC: Overview of Ground Improvement Technologies
DATE: Tuesday, March 22, 2010
LOCATION: Radisson Valley Forge, 1160 First Avenue, King of Prussia, PA
TIME: Lunch: 12:00 p.m. to 1:00 p.m.; Short Course 1:00 p.m. to 5:00 p.m.

Menard and Nicholson have designed a seminar that will provide an Overview of Ground Improvement Technologies available in your local areas. Included will be several case histories that illustrate the techniques used, along with the limitations and advantages of using the discussed technologies. Four Professional Development Hours (PDHs) will be awarded for course completion.

Menard 1p-3p:
Seth Pearlman, President and CEO,
Menard USA, P.E., P.G.
Frederic Masse, Vice President of Engineering, Menard USA

Ground Improvement - 15 minutes
*Where is it applicable?
Wick Drains & Vacuum Consolidation – 15 minutes
*Brief overview of Wick Drains and Vacuum Consolidation common practices
Dynamic Replacement & Rapid Impact Compaction – 15 minutes
*Brief overview of Dynamic Replacement and Rapid Impact Compaction common practices
Vibrocompaction & Vibro Stone Columns – 15 minutes
*Brief overview of Vibrocompaction and Vibro Stone Columns common practices
Controlled Modulus Columns™ (CMC’s) – 1 hour
*Overview of Controlled Modulus Columns: Basic concepts of what they are, how they are used, & how they improve soils

Nicholson 3p-5p:
Fred Tarquinio, Engineering Manager,
Nicholson, P.E.
Dino Kartofilis, District Manager, Nicholson

Micropile Basics - 45 minutes
*Micropile basic concepts will be presented and identified such as advantages and disadvantages, applications, drilling techniques, design and loading conditions, and materials used.

Soil Nailing Fundamentals - 30 minutes
*The basics of soil nail design methods and construction practices will be presented, along with examples of project dos and don’ts.

Other Support of Excavation – 15 minutes
*Brief overview of Diaphragm Wall Construction, Secant Piling and other earth retention systems will be discussed with respect to cost and soil conditions.

Project case history (TBD) – 15 minutes
The February 2011 DVGI Annual Student Night featured Chad H. Freed, Ph.D. as the keynote speaker. The title of Dr. Freed’s talk was *The Most Challenging Aspect of Education – Instilling Perspective in Students*. The compelling talk discussed the difficulty and potential methods to instill perspective in young civil engineering students during their formal engineering education who have little to no industrial experience. Dr. Freed is an Associate Professor in the Environmental Science Department at Widener University.

He obtained his B.S. in Civil Engineering from Drexel University, his M.S. in Civil Engineering from Drexel University, his M.S. in Engineering Geology from Drexel University, and his PhD. in Earth and Environmental Science from the University of Pennsylvania. Dr. Freed currently teaches undergraduate-level courses in engineering geology and geographic information systems at Widener University, and graduate-level courses in hydrology, hydrogeology, and site characterization at the University of Pennsylvania. Dr. Freed’s recent research projects have included the mathematical modeling of magnetic fields to detect buried steel drums and multiple projects using geographic information systems in science and engineering. Dr. Freed is also a consultant with the Washington Division of URS Corporation, where he assists in geotechnical engineering site characterizations and designs for geotechnical engineering structures.
Stormwater Control Measures (SCMs) have been and are being implemented around the world to control peak flows and stormwater runoff in areas with large amounts of impervious surfaces. Some examples of SCMs include rain gardens, green roofs and constructed wetlands. Although there has been an increase in the use of these structures, little is being done to monitor SCMs after they have been constructed. To gain a clear understanding of the performance of these structures, a methodology has been developed to determine whether an SCM is working at the lowest level of compliance. The methodology largely relies on visual inspection to determine whether the SCM is meeting its basic goals. This monitoring plan provides an easy-to-use, cost effective way to monitor SCMs and to determine potential needs for renovation.

This low level monitoring plan is being applied to a number of sites in the Philadelphia area. The sites consist of different types of SCMs, including green roofs, wetlands, rain gardens, seepage pits and pervious pavements. These systems also vary in age, location, and the type of monitoring that already exists. The sites are closely monitored during storm events to see how well the sites are performing with a steady inflow of water. Additional inspections are being performed to accumulate information on the status of the vegetation as well as the soil properties at the sites. A low level monitoring plan like this can provide a basic understanding of the performance of stormwater control measures. It provides a cost effective approach to help identify problems in the systems that may require repairs or reconstruction.
Regional Hazard Assessment of Earthquake-Triggered Landslides using GIS
Farshid Vahedifard, P.E., MCE, Univ. of Delaware  Advisor: Christopher L. Meehan, Ph.D.

Earthquake-triggered landslides can pose a significant threat to both the population and a wide range of natural and man-made structures in earthquake-prone areas. In many moderate to strong earthquake events, earthquake-triggered landslides account for a significant proportion of the total earthquake damage that is observed, and in some cases damage from earthquake-triggered landslides has exceeded the damage that is directly related to strong shaking and fault rupture. Regional landslide hazard mapping systems can be a useful tool for predicting possible landslides in earthquake-prone areas. As a common practice in quantitative landslide hazard assessment, simplified predictive displacement models are usually incorporated in a GIS-based framework in conjunction with topographical, geological, and seismological data. The overall goal of this project is to develop a GIS-based framework in order to locate areas with higher risk of earthquake-triggered landslides due to probable earthquakes. For demonstration purposes, the behavior of earthquake-triggered landslides in the Oat Mountain quadrangle in California will be simulated for the 1994 Northridge earthquake shaking event. To develop the landslide hazard mapping framework, a 10-m digital elevation model (DEM), a geology map, other geotechnical parameters of interest, and the ShakeMap were collected from readily available sources and the associated data were processed and analyzed to predict earthquake-induced landslide displacements in the study area. The predicted landslide-displacement categories were determined based on the landslide hazard criteria proposed by the California Geological Survey (CGS) for very low (<5 cm), low (5-15 cm), moderate (15-30 cm), and high (>30 cm) hazard levels.

Applications of Sliding Block Models

- Seismic Disp.
- Embankment Dams
- Landslide Hazard Mapping
- Natural Slopes
- Rock Slopes
- Reinforced Slopes
- Gravity Walls

Methodology

- Derive Intermediate GIS raster layers
  - Slope map (α in angle)
  - tan (α)
  - tan (φ’)
- Static Factor of Safety (F.S.)
  \[
  F.S. = \frac{c’}{\gamma \sin \alpha} + \frac{\tan \phi’}{\tan \alpha} \frac{m_y \tan \theta}{\gamma \tan \alpha}
  \]
- Yield acceleration (k_y)
  \[
  k_y = \frac{(F.S.-1)g}{(\tan \phi’ + 1/\sin \alpha)}
  \]
Mechanical Properties and Moisture Susceptibility of a Porous Plastic-Based Cementitious Material
Jabber Al-Bihani and Chibuikem Okoro, Temple University
Advisor: Naji Khoury, Ph.D.

This study evaluated the mechanical properties and moisture susceptibility of a porous plastic-based cementitious (P-PBC) material. P-PBC was produced by simultaneously heating and mixing plastic waste with soils and aggregates at a specified temperature so that a uniform mix was attained. P-PBC specimens with different plastic to soil ratios (PSR, by mass) and plastic to aggregate ratios (PAR, by mass) were prepared, cured and then tested for indirect tensile strength (ITS) and moisture susceptibility. Results showed that ITS decreased with PSR. Specimens prepared with a PSR of 10 had an average ITS value of 114 kPa compared to 745 kPa for specimens with a PSR of 1. It was also found that ITS increased approximately 60% as PAR increased from 0.1 to 0.2. Results from the moisture susceptibility tests showed that all P-PBC mixtures were resistant to moisture induced damage. The findings indicated that P-PBC: 1) provides a structural pavement suitable for pedestrian and vehicular loadings; 2) offers an effective technique for reducing storm water runoff, and improving water quality; 3) diverts a large amount of plastic waste from landfills and incinerators.

**Motivation**
- Impervious Pavements
  - Roads, sidewalks, rooftops, overly compacted soils
  - Do not allow for natural infiltration of stormwater
  - Increase temperature (Heat Island Effect)
  - Degradation of water quality and natural habitats
  - Flooding, erosion and may reduce groundwater levels

**Materials**

- Recycled polyethylene terephthalate (PET), No. 1
  - Density 1370 kg/m³
  - Young modulus (E) 2800–3100 MPa
  - Tensile strength(σ) 55–75 MPa
  - Elongation @ break 50–150%
  - Melting point 260 °C
  - Thermal conductivity 0.24 W/m.K
  - Linear expansion coefficient (α) 7×10⁻⁵/K
  - Specific heat (c) 1.0 kJ/kg.K
  - Water absorption 0.16

![Image of impervious pavements]

![Image of recycled polyethylene terephthalate (PET)]
Widener undergraduate students investigated the load-deformation mechanisms mobilized in their submitted MSE wall design for Geo-competition 2011. The study looked into wall deformation and stress transfer at various stages of the construction. Their efforts resulted in a third place finish nationally, and an invitation to the Retaining Wall construction finals at GeoFrontiers 2011 in Dallas!
Thanks to our Corporate Sponsors and to Villanova University for being a gracious host!

DVGI Scholarships

Congratulations to the 2011 DVGI Scholarship Award Winners:

- Amalie Knabe, University of Delaware $1,000.00
- Casey Hurt, Rowan University $1,000.00
- Jabber Al-Bihani, Temple University $500.00
- Chun Chan, Drexel University $500.00
- Olivia Dalton, University of Delaware $500.00
- Bonnie Zwissler, Widener University $500.00

Checks were presented to each recipient by DVGI Chairman Ara Mouradian.

From left to right: Amalie Knabe; Casey Hurt; Ara Mouradian; Bonnie Zwissler; Jabber Al-Bihani; Olivia Dalton; Missing from photo: Chun Chan.
The following abstract was accepted by Geo-Frontiers 2011. Congratulations to Bashar, Jianchao and Kristen!

**Dynamic Soil-Structure Interaction of High-G Centrifuge Foundation**

Bashar S. Qubain, PhD., P.E., GeoStructures, Inc.
Jianchao Li, Associate, GeoStructures, Inc.
Kristen E. Chang, Project Engineer, Pradaa Geotechnical, Inc.

Centrifuge devices create bi-directional acceleration forces, resulting in rotational radial thrust, overturning moment and torsion which must be safely resisted by the foundation and surrounding earth materials. In addition, the vibration levels should not harm the machine operation, nor adversely affect adjacent sensitive equipment. To achieve these objectives, detailed subsurface characterization together with 3-D dynamic soil-structure interaction using ABAQUS finite element program is implemented. The entire building which houses the centrifuge and surrounding area including the machine pit and foundation are incorporated into the analysis. The subsurface profile is discretized as having a clay overburden overlying shale bedrock. The dynamic soil/rock properties are obtained from field shear wave velocity measurements and laboratory testing. Modal extraction techniques are used to establish the system frequencies of vibration. The lowest two frequencies are then used to calculate the Rayleigh damping coefficients. In order to determine the vibration levels in other parts of the building, history nodes are incorporated into the model at key locations to save computer time and at the same time provide sufficient detail of the overall foundation response.

**Delaware Valley Engineer’s Week**

Philadelphia recently celebrated Delaware Valley Engineer’s Week, and the DVGI proudly supported the cause with a banner hanging downtown along Broad Street!
MEMBER IN THE NEWS:
Rick A. Hoover, Dawood Engineering

Rick presented the following short course at Geo-Frontiers. Thanks to Rick for his contribution to the community!

APPLICATION OF GEOPHYSICS TO GEOTECHNICAL PROBLEMS

Rick A. Hoover, Dawood Engineering

With smaller budgets available for gaining the required insight, engineers are increasingly required to know more about their sites. Proper design and application of geophysical surveys can effectively supplement common site investigation and characterization practices. Participants will find that geophysical surveys can be a cost-effective way to expand site knowledge and understanding, complementing traditional investigation methods. The objective of this course is to expose the participant to the broad variety of geophysical methods available, fundamental geophysical concepts of various methods, and examine practical applications and limitations to engineering and environmental projects.

The participants will have an opportunity to examine a variety of geophysical tools, and work through the value of applying different geophysical methods to a variety of different problems. Instructors will review how different geophysical methods are used, and define how to develop critical parameters for specific geophysical applications. Geophysical methods to be covered in the class include seismic reflection, refraction and surface wave dispersion, resistivity, electromagnetic and magnetic methods, ground penetrating radar, borehole, and a number of other geophysical methods commonly in use today.

The class will present geophysical methods, solutions provided by those methods, and the concepts necessary to specify the geophysical survey parameters required to meet the project objectives successfully. Completing the class, participants will be able to recognize available geophysical planning resources, know which geophysical methods will work and under what settings and be able to identify the concepts necessary to request or specify geophysical services.
Job Posting:

NJ-PA PE Licensed Geotechnical Engineer for small to large scale projects, both buildings and civil structures. Subsurface exploration, soil classification, analysis and foundation recommendations. Prepare proposals and reports, supervise technicians and develop business. Minimum 8 to 10 years experience.

LJCE is an Equal Opportunity Employer.

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Earn PDHs at 2011-2012 DVGI Events

Upcoming Dates for 2011-2012 Dinner Meetings are as follows:
♦ April 13, 2011—Combined Meeting with ASCE at Villanova Conference Center. Archie Filshill of CETCO will present on the Marcellus Shale.
♦ May 17, 2011

One PDH will be awarded for most dinner meetings that you attend. Those interested in the PDHs can obtain supporting documentation at the sign-in desk prior to each event.

Looking for a Geotechnical Career Opportunity?

Have you considered a student internship or a co-op position? It’s a great way to “get your foot in the door” while gaining practical professional experience. Check the new geotechnical co-op and internship links on the G-I Student page at: http://content.geoinstitute.org/student.html.

G-I Chapters and Local Geotechnical Groups

As a 21st Century professional organization, the G-I aims to collaborate with local, national, and international geo-professional organizations. To meet that goal, the G-I has developed a strategic plan for outreach to local geotechnical groups to assist them in becoming a Geo-Institute Chapter. Check out this great link to other G-I Chapters and local Geotech Groups across the country: http://content.geoinstitute.org/groups/index.html.

The University of Delaware has initiated a Student Chapter. Please contact the Chapter President, Lauren Lobo at email address llobo@Udel.edu for more information. Congratulations to the GIUD!

G-I Twitter Brings You Quick News Updates

Twitter is a social networking tool for posting very brief updates, or “tweets.” The G-I launched its Twitter feed in April 2009 to announce updates to its website and other relevant news items. Since then, over 150 updates have been posted and more than 144 persons have become registered G-I followers. Visit our Twitter feed at http://twitter.com/GeoInstitute. You can check for updates or “follow” us using a Twitter account, an RSS reader, or one of the many other web applications that work with Twitter. Spread the word. Also check out the DVGI link at www.linkedin.com. Set up an account and keep up to date with business associates.
Upcoming Conference: Save the Date:

4th International Conference on Grouting and Deep Mixing

New Orleans, Louisiana, USA
Wednesday - Saturday
February 15-18, 2012

Conference sessions will be in both plenary format and in tracks. ICOG and a Technical Advisory Committee of representatives from 20 countries chose the following topics based on 250 abstracts from over 30 countries.

- Analysis and Design: Deep Mixing
- Analysis and Design: Grouting
- Analysis and Design: Jet Grouting
- Anchors and Piles
- Dam Foundation Grouting
- Dams: Grout Curtains and Cutoffs
- Deep Mixing: Methods and Applications
- Deep Mixing: Performance Testing
- Grouting and Deep Mixing for Environmental Containment and Treatment
- Grouting for Seepage Control
- Grouting Performance Testing
- Highways and Transportation: Deep Mixing
- Highways and Transportation: Grouting Innovations in Grouting Methods
- Jet Grouting: New Methods and Applications
- Karst: Grouting Applications and Technology
- Levees and Flood Walls: Deep Mixing
- Low Mobility Grouting
- Materials: Cement Based Grouts
- Materials: Chemical and Other Grouting
- Mining: Grouting Applications and Technology
- Permeation Grouting
- Structural Support: Grouting and Deep Mixing
- Tunneling: Grouting and Deep Mixing Applications

Registration for Exhibition, Sponsorship and Attendance is open at www.grout2012.org
Upcoming Conference: Save the Date:

American Society of Civil Engineers

March 30—April 1, 2011

25TH CENTRAL PENNSYLVANIA GEOTECHNICAL CONFERENCE
Hershey, Pennsylvania

Sponsored by: ASCE, Central PA Section

To register, exhibit and obtain further information, visit our website at:

HAVE DVGI PUBLISH YOUR ARTICLE

Do you have an interesting article on a project or individual in your organization that you would like to have published in the DVGI newsletter? Please submit your articles for consideration in an upcoming edition to Bill Rinker at brinker@kleinfelder.com

Nominations for DVGI At-Large Board Member

The DVGI is seeking nominations to fill one At-large Board member position for the 2011-2012 period, starting this summer. If you are interested, please contact a Board member for more information.

DVGI Merchandise Available for Purchase

1 GB memory sticks ($12); coffee mugs ($8); and lapel pins with the DVGI logo ($5) are available for purchase. See Ara Mouradian if you are interested in purchasing any of these items.

www.DVGI.org

Check out our new website under construction!

Thanks to Genevieve Meehan for managing the site development!

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Read past and present issues of Geo-Strata magazine online at www.geooinstitute.org
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