

2024 Annual Kansas City Specialty Seminar

Geotechnical and Structural Engineering – A Collaborative Seminar

September 13, 2024
Burns & McDonnell Engineering
Kansas City, Missouri



Thank you for attending the Kansas City Geo-Institute Chapter 2024 Specialty Seminar. We are excited that this year's joint seminar with the Structural Engineering Institute (SEI) brings together technical experts from industry to collaborate and discuss challenges that affect both disciplines. We hope that you take advantage of this opportunity to expand your knowledge on these subjects, as well as network with fellow geo-structural professionals.

The net proceeds generated from today's conference are used to fund Scholarship Endowment Programs at the University of Missouri Kansas City and the University of Kansas.

Thank you to our corporate sponsors and exhibitors for their generous contributions, to Burns & McDonnell for hosting this event, to our event planners who work diligently all year coordinating this event, and to the KCGI Board for their support.

Sincerely,



Mike Noguera, P.E.

ASCE Geo-Institute, Kansas City Chapter, 2024 - 2025 Chair




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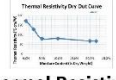
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7:00 – 8:00 AM

Registration
Breakfast/Coffee
Visit with Exhibitors

8:00 – 8:10 AM

Welcome and Introductory Remarks

8:10 – 9:00 AM

Geotechnical and Structural Lessons Learned from 500 Third-Party Geotechnical Peer Reviews

Steve Wendland, PE, PG, BCGE
Bedrock GeoConsult, LLC - President,

9:00 – 9:50 AM

How Specialty Geotechnical Contractors Use Geotechnical and Structural Recommendations to Manage Risk

Lyle Simonton, PE
Subsurface Constructors, Inc.
Director of Business Development

9:50 – 10:20

BREAK / VISIT WITH EXHIBITORS

10:20 – 11:10

Drilled Shaft Rock Socket Shear Spike: Experimental Behavior and Practical Approaches

Paul Axtell, PE
Dan Brown & Associates
COO/Senior Principal Engineer

11:10 – 12:00

Lateral Performance of Helical Piles with Bolted Couplers

Dylan Madden, PE
Burns & McDonnell
Engineering – Department Manager

Vainqueur Ndangi
Burns & McDonnell, EIT
Engineering – Assistant Structural Engineer

12:00 – 12:40

LUNCH / VISIT WITH EXHIBITORS

12:40 – 1:30

ETHICS PRESENTATION Ethical Strategies for an Irrational World

Aaron Mann
Terracon
Chief Legal Officer, Senior Principle

1:30 – 2:20

Methods for Evaluating the Structural Integrity of Drilled Shaft Foundations

Elvis Ishimwe
GRL Engineers, Inc.
Geotechnical Engineer

2:20 – 2:50

BREAK / VISIT WITH EXHIBITORS

2:50 – 3:40

Practical Design-Build Applications of Drilled, Reinforced Concrete Tangent Piles for Excavation Support and Protection Systems

William F. Powers III, PE
PTM Engineered Foundation
Construction, LLC
Founding Partner and Managing Member

3:40 – 4:30

Panel Discussion

4:30 – 4:35

Wrap Up

SCHOLARSHIP ENDOWMENT PROGRAMS

The ASCE/AEG/UMKC Peck-Williams-Garstang Scholarship Endowment Program was initiated in 2001 after a successful year of income resulting from both a specialty seminar and our annual conference keynoted by Dr. Ralph Peck, and Mimi Garstang and James Williams of the Missouri Geological Survey. The endowment has grown each year with the Kansas City ASCE Section acting as the host sponsor and accounting administrator.

Last year the contribution towards the ASCE/AEG/UMKC Scholarship Endowment was \$8,790.30. The total endowment balance has now grown to over \$265,000. These earnings are equally shared within the UMKC School of Science and Engineering between the Department of Civil Engineering and the Department of Earth and Environmental Science.

The Kansas City Geotechnical Group in 2013 entered into a Memorandum of Understanding with the Department of Civil, Environmental, and Architectural Engineering at the University of Kansas (KU CEAE) to establish an Endowment-Sponsorship program for the KU CEAE Department. The Endowment-Sponsorship is intended for use by the geotechnical program at KU and is administered mutually between the KU CEAE Department and the Geo-Institute Kansas City Chapter. The amount given to KU this past year was \$20,510.70; total endowment balance is now over \$102,000.

The University of Kansas students receiving this year's scholarship are:

- Md Wasif Zaman
- Yuqiu Ye

ASCE and AEG wish to recognize the professors and staff of both UMKC and KU who have dedicated their time and support to these scholarship and sponsorship programs. These annual contributions to academic universities provide a means of giving back to our engineering/geology community locally.

- Kansas City Geo-Institute Chapter Board

SESSION 1

Geotechnical and Structural Lessons Learned from 500 Third-Party Geotechnical Peer Reviews

Steve Wendland, PE, PG, BCGE
Bedrock GeoConsult, LLC - President

Bio:

Mr. Wendland has 37 years of experience in geotechnical and geological engineering for a wide variety of projects, sites, and subsurface conditions. He started Bedrock GeoConsult in 2022 to provide expert geotechnical engineering and engineering geology consulting services in the central USA. He helps contractors, owners, legal counsel, and design teams overcome the concerns caused by the commoditization of geotechnical engineering services by providing third-party peer reviews, independent guidance, construction engineering support services, and expert evaluations. Mr. Wendland has also conducted geotechnical forensic analyses of structures that have been impacted by expansive clay soils, compressible foundation bearing materials, groundwater, and poor construction. These forensic analyses have included a variety of failed retaining walls, cut slopes, embankments, foundations, and floor slabs.

*Summary:*

Since 2016 I have completed over 500 third-party geotechnical peer reviews of geotechnical reports, drawings, and specifications. These reviews have provided a great opportunity to see a variety of reports and how they've been used to develop structural designs and construction plans. I have seen great examples of collaboration between geotechnical, civil, and structural engineers and contractors. I have also seen examples of poor geotechnical efforts creating problems. I will share geotechnical and structural lessons learned on these topics:

- Communication of maximum foundation and floor loads
 - Establishing tolerable total and differential settlement
 - Long-term settlement of thick fill sections
 - Existing undocumented fill
 - Expansive clays below floor slabs
 - Lean clay as select LVC fill
 - LVC fill below pavements
 - Collaborating with civil engineers on pavements
 - Accurate exploration of groundwater conditions
 - Accurate exploration of "topsoil" and B-horizon soils
 - Differential bearing: stiff clay vs. structural fill vs. shale vs. limestone.
 - Varying bearing resistance for strip vs. square footings
 - How is end bearing of drilled shafts to be evaluated during construction?
 - Earthwork specifications
 - How can a structural engineer push back when they are not satisfied?
 - Be concise!
 - Benefits of geotechnical peer reviews
 - How will the forthcoming ASCE Foundation Design Standard impact our work?
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SESSION 2

How Specialty Geotechnical Contractors Use Geotechnical and Structural Recommendations to Manage Risk

Lyle Simonton, PE
Subsurface Constructors, Inc.
Director of Business Development

Bio:

Lyle Simonton is the Director of Business Development for Subsurface Constructors of St. Louis, MO. Lyle graduated from the University of Missouri-Rolla (MS&T) with a bachelor's degree in Geological Engineering in 1997 and received a master's degree in Civil (Geotechnical) Engineering from the University of Illinois – Champaign Urbana in 1999. He is a registered professional engineer in Missouri.

Lyle is a member of ASCE and DFI, and is currently on the Soil and Ground Improvement Committees for the ASCE Geo-Institute and the Deep Foundations Institute, respectively.



Lyle is a Past - President for the ASCE St. Louis Section, and has been an active member of the St. Louis Geo-Institute Chapter throughout his career. He is also currently serving as the Membership Chairperson for the ASCE St. Louis Section and is an ASCE Mentor.

Lyle is on the Board of Directors and Education and Legislative Committees for the Southern Illinois Builders Association (SIBA). He also sits on the Professional Advisory Board for the Civil, Environmental and Infrastructure Engineering Department at Southern Illinois University – Carbondale.

Summary:

Specialty geotechnical contractors are often required to design and install ground improvement, deep foundation or earth retention solutions based on the recommendations of the geotechnical report and structural design parameters. Ground improvement could come in the form of aggregate piers or rigid inclusions, and contractor-designed deep foundations are usually small diameter elements such as micropiles or helical piles. When foundation designs call for one of these systems, the specialty contractor is typically given design loads or maximum bearing pressure and maximum settlement criteria. Often times, one of these systems is specified but may not be the best solution for the project.

Other times, it is clear that there hasn't been much communication between the geotechnical engineer and the structural engineer during project development. The specialty geotechnical contractor is often trying to adhere to structural design requirements and specifications without recent input from the geotechnical engineer, other than the geotechnical report. The geotech investigation was likely completed months or years prior when structural information was limited.

The purpose of this presentation will be to discuss the role of the specialty geotechnical contractor and how good communication between all parties during project development can lead to a much more successful project in terms of lower cost, better schedule control, and definitely fewer headaches. Several examples will be discussed showing how a little bit of teamwork on a project would have led to better results.

SESSION 3

Drilled Shaft Rock Socket Shear Spike: Experimental Behavior and Practical Approaches

Paul J. Axtell, PE
Dan Brown & Associates
COO/Senior Principal Engineer

Bio:

Paul J. Axtell is a senior principal engineer for Dan Brown and Associates in Overland Park, Kansas, where he works on major bridge projects nationwide. He holds a B.S. degree in civil engineering from the University of Missouri and a M.S. degree in geotechnical engineering from the University of Texas. Axtell has 24 years of experience in geotechnical and foundation engineering and has authored more than 35 technical papers. Paul served as Chairman for the DFI Drilled Shaft Committee from 2013 through 2023, is a member of the DFI Board of Trustees, and was admitted to the Academy of Distinguished Alumni at the University of Missouri in 2021.

*Summary:*

The versatility of drilled deep foundations consisting of reinforced concrete piles provides an incredible variety for structural applications in various soil stratigraphies. This presentation will focus on valuable lessons learned pertinent to the design of drilled deep foundations derived from recent full-scale experimental studies to investigate the mysterious shear spike that occurs in zones of significant stiffness contrast. The analysis and design of rock-socketed reinforced concrete pile foundations under combined axial and lateral loading is revisited. Is the amplified shear in rock sockets predicted by the p-y method a real design concern? A full-scale experimental program in which piles designed to fail in shear on the basis of p-y calculations provides insight to this longstanding problem by showing that the pile response is dominated by bending, not shear, and no damage occurred within the rock socket during the experiments. Otherwise, serious constructability problems arise with respect to reinforcement congestion in the rock socket. Viable design alternatives to address the issue will be discussed.

SESSION 4

Lateral Performance of Helical Piles with Bolted Couplers

Dylan Madden, PE
Burns & McDonnell
Engineering – Department Manager

Bio:

Dylan Madden is the Civil-Structural Department Manager for the Burns & McDonnell South Central Region inside the Transmission & Distribution global practice. Dylan manages and supports a team of sixteen (16) engineers and designers supporting civil site grading and structural engineering for Substation and Industrial Electrical Systems. Dylan has ten (10) total years of experience in structural engineering; first working as a design structural engineer designing subsea infrastructure for the offshore oil & gas industry and later leading substation civil-structural engineering projects at Burns & McDonnell.



Dylan is husband to his wife Shelley and proud father of two young children. Dylan enjoys playing tennis, chess, and time with the family.

Vainqueur Ndangi, EIT
Burns & McDonnell
Engineering – Assistant Structural Engineer

Bio:

Vainqueur Ndangi, E.I.T, is a Structural Engineer at Burns & McDonnell, with over two and a half years in the substation industry. With a B.S. in Civil Engineering from the University of Houston, he specializes in foundation and steel design for high-voltage substations. Outside of work, Vainqueur enjoys working out, playing English Football, music, and volunteering at his local church. Recently, his family grew with the addition of twin girls.

*Summary:*

Helical piles are increasingly utilized in the transmission and distribution industry to support various structures, such as transmission towers, poles, and substation structures. Their rapid installation, minimal site disturbance, and ability to bear significant loads make them an attractive alternative to traditional foundation methods. Helical pile foundations have traditionally

been used in groups to support equipment, however, helical pile foundations in substations tend to support substation steel structures directly through steel-steel connections. Due to the nature of the loading on substation steel structures, deep foundations supporting these structures are often controlled by their lateral performance rather than axial capacity. Lateral performance concerns can emerge where typical detailing and installation practices are carried into substations from other industries.

Helical piles are often extended using multiple sections bolted together, either by design or necessity during installation. Helical piles using these typically oversized bolted extensions could have lateral performance concerns due to the lack of rotational rigidity through the bolted coupler from lead section to extension sections. This presentation will show the results of a geometric evaluation of a case-study bolted coupler and RISA 3D structural analysis of test cases where pile diameter and coupler depth below ground surface were varied to develop relationships to performance.

SESSION 5

Ethical Strategies for an Irrational World

Aaron Mann
Terracon
Chief Legal Officer, Senior Principle

Bio:

Aaron is a Senior Principal with Terracon Consultants and serves as their Chief Legal Officer. He has been practicing law for more than two decades with a focus on managing risk and resolving business disputes. Aaron regularly manages outside counsel acting on behalf of the company and works internally to troubleshoot project issues and avoid disputes before they escalate. He also handles internal investigations and helps implement Terracon's ethics program. He is a frequent presenter at past events hosted by ACEC, ACI, ASCE, GBA, NSPE, and others.



Prior to joining Terracon in early 2016, Aaron was a partner at Husch Blackwell, an AmLaw 100 law firm, where his practice focused on commercial and cross-border litigation. During his time with Husch Blackwell, Aaron spent four years working in the firm's office in London, England. Aaron began his career serving as a judicial clerk for a U.S. District Judge in Kansas City, Missouri. Aaron earned his J.D. from Creighton University School of Law in 2001.

Summary:

We've all heard of tricks of the eye before, but what about tricks of the mind? As much as we would like to believe that we are rational thinkers and we base our decisions on evidence alone, the reality is far more complicated.

This presentation will explore tricks of the mind, specifically the unseen biases that affect all of us and threaten to lead us astray on a daily basis. Whether it is being overly optimistic about a project's success, dismissing the risk to the public, or making poor choices to avoid a small loss, our most important decisions are often shaped by completely unrelated factors (including how long it has been since we have last eaten). And while the effects may be minor in many circumstances, they can also lead to serious ethical lapses. At worst, they can potentially lead to catastrophic results such as the pedestrian bridge collapse at the Florida International University or the Space Shuttle Challenger explosion, both of which will be explored.

Together, we will explore some of the mental shortcuts and illusions that are most commonly encountered by engineers. And more importantly, we'll explore how to combat their impact in the workplace. My hope is you will never again think the same way about how you think.

SESSION 6

Methods for Evaluating the Structural Integrity of Drilled Shaft Foundations

Elvis Ishimwe, PhD
GRL Engineers, Inc.
Geotechnical Engineer

Bio:

Dr. Ishimwe is a geotechnical engineer at GRL Engineers, Inc. With over five years of professional experience, he has contributed to more than 200 construction projects across the Midwest and internationally. His expertise lies in testing various deep foundation elements and unsaturated soil properties. As a researcher, he has studied the impact of liquefaction-induced dragload and downdrag on drilled shafts and driven piles in the New Madrid Seismic Zone. Dr. Ishimwe is an active member of the Deep Foundation Institute (DFI) and the Geo-Institute (G-I), and has published numerous articles and journals on various geotechnical topics.

*Summary:*

Drilled shafts can experience defects such as cracks, bulges, voids, reduction in concrete cover and soil intrusion. These irregularities can significantly affect both structural and geotechnical integrity of drilled shafts, subsequently impacting their overall performance. Several methods are currently available for evaluating the integrity of drilled shafts. In the case of large diameter shafts, Cross-hole Sonic Logging (CSL) and Thermal Integrity Profiling (TIP) are commonly used as non-destructive methods to assess the integrity of the placed concrete. It is acknowledged that each method has its own advantages and limitations, and the selection of the test may depend on the region, designers, specifications, and site conditions. The author has compiled a dataset in which both methods were performed on identical shafts (i.e. same shaft diameter, lengths, concrete mix, etc.), allowing direct comparisons between two methods. As reported in the literature, these large diameter shafts have characteristics of mass concrete in which the placed concrete can generate excessive temperatures within a shaft. These excessive generated temperatures can substantially impact the quality of the concrete by inducing cracking. The author will discuss case studies where the installation of large shafts was investigated, utilizing TIP thermal wires with the goal of preventing thermal cracking. Finally, the advantages and limitations of each method will be examined and discussed.

SESSION 7

Practical Design-Build Applications of Drilled, Reinforced Concrete Tangent Piles for Excavation Support and Protection Systems

William F. Powers III, PE
PTM Engineered Foundation Construction, LLC
Principal/Managing Member

Bio:

Bill Powers is a Founding Partner and Managing Member of PTM Engineered Foundation Construction, LLC, a specialty geotechnical subcontractor working in the Midwestern United States, headquartered in Olathe, Kansas, with satellite operations in Oklahoma City, Oklahoma. Bill's role in the firm includes business development, design (as applicable by project), project management and day-to-day administrative and financial operations. Prior to founding PTM in 2013, Bill has worked in the specialty geotechnical construction field since 1997 and for four years in geotechnical engineering exploration, analyses and design. Bill is a licensed professional engineer in five states and has co-authored several refereed publications on design and performance of earth retaining structures and the behavior of permanent ground anchors. When not working, Bill enjoys being outside, hunting, golf, working out, playing ice hockey and YouTube music videos.



MS, Civil Engineering, Texas A&M University
BS, Civil Engineering, University of New Hampshire

Summary:

Drilled, reinforced concrete tangent piles are cost-effective for temporary and permanent excavation support and protection systems, particularly in mixed face geologic conditions where rock and groundwater are present. In some instances where right-of-way restrictions and/or the presence of existing utilities limit the use of tiebacks for lateral support, cantilevered or internally braced tangent piles can provide a viable solution to complete deep excavations. Depending upon the application, tangent piles can be designed to accommodate permanent earth pressures and reduce basement wall sizes and dimensions, and in some cases, facilitate basement wall construction where there is not enough working room for a traditional double sided forming system. Close coordination with the project design team to review key structural and architectural requirements is essential for a successful result in the field.
