GeoVirginia

2012

Lessons Learned in Geotechnical Engineering

Williamsburg, Virginia

April 30 to May 2, 2012

Hosted By
Virginia Geo-Institute
and
ASCE Virginia Section

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

G-I ASCE
GEO-INSTITUTE
Virginia Chapter

CONTENTS

PROGRAM

Monday, April 30, 2012

11:00 AM **Golf Outing – Shotgun Start**

6:00 PM to 8:00 PM **Exhibit Hall Reception**
Virginia Rooms EF

Tuesday, May 1, 2012

7:00 AM to 8:00 AM **Continental Breakfast *(Exhibit Hall – Virginia Rooms EF)***

Morning Session Location: Virginia Rooms ABCD
Exhibit Hall (Virginia Rooms EF) will be open throughout the conference

8:00 AM **Welcome Remarks**
Jose N. Gómez S., PE, MSCE, M ASCE
Conference Chair
Vice President, ECS Mid-Atlantic, LLC

8:10 AM **Katrina In Your Rearview Mirror**
William F. "Bill" Marcuson, III, PE
President, W. F. Marcuson, III & Associates, Inc.

8:50 AM **Lessons on the Behavior of Tunnel Ground**
Edward J. Cording, PhD
Professor Emeritus, University of Illinois

9:30 AM **Break**

10:00 AM **Jefferson Memorial Stabilization - Geotechnical Findings and Their Implications**
Jesus Gómez, PhD, PE, DGE
Principal, Schnabel Engineering

10:40 AM **The Not So Hidden Costs of Deep Foundation Design**
Paul Bullock, PhD, PE
Principal, Fugro Consultants, Inc. - Loadtest

Tuesday, May 1, 2012 (Continued)

11:20 AM **Risk Considerations for Geotechnical Construction**
George K. Burke, PE, DGE
Sr. Vice President – Engineering
Hayward Baker Inc.

Luncheon and Keynote Lecture Location: Colony Room

12:00 Noon **Lessons from Legends: Technical, Professional, and Life Teachings from Some Giants of Geotechnical Engineering**
James K. Mitchell, ScD, PE, GE, Dist. M ASCE
University Distinguished Professor Emeritus, Virginia Tech
Consulting Geotechnical Engineer

Afternoon Session Location: Virginia Rooms ABCD

1:30 PM **RBD for Foundations - The Good, The Bad, and The Ugly**
Fred H. Kulhawy, PE, GE, Dist. M ASCE
Professor Emeritus, School of Civil & Environmental Engineering,
Cornell University & Consulting Geotechnical Engineer

2:10 PM **Geotechnical Engineering Implications from Recent Worldwide Earthquakes**
James (Jimmy) R. Martin, PhD
Professor of Civil Engineering, Virginia Tech

2:50 PM **Break**

3:20 PM **What's Past is Prologue in Geotechnical Engineering**
Deborah J. Goodings, PhD, P Eng, FASCE, DGE
Dewberry Professor and Chairman
Department of Civil, Environmental, and Infrastructure Engineering
George Mason University

4:00 PM **Geosynthetic Reinforced MSE Wall Failures and their Remediation**
Robert M. Koerner, PhD
HL Bowman Professor Emeritus, Drexel University

5:00 PM **Adjourn for the day**

Wednesday, May 2, 2012

7:00 AM to 8:00 AM	**Continental Breakfast *(Exhibit Hall – Virginia Rooms EF)***

Location: Virginia Rooms ABCD

8:00 AM	**Lessons Learned from Landslides in the Panama Canal** **J. Michael Duncan, PhD** Univ. Distinguished Prof. Emeritus, Virginia Tech
8:50 AM	**Lessons Learned Early in Your Career** **Bill Murphy, PE** Principal, Schnabel Engineering
9:30 AM	**Support of Embankments on Very Soft Soils: Lessons Learned** **Jose N. Gómez S., PE, MSCE, M.ASCE** Vice President, ECS Mid-Atlantic, LLC
10:10 AM	**Break**
10:50 AM	**Failures of Helical Piles and Helical Anchors and Associated Lessons Learned** **Howard A. Perko, PhD, PE** Director of Engineering, Magnum Geo-Solutions, LLC
11:30 AM	**Panama Canal: Construction and Expansion** **Frank C. Townsend, PhD, PE** Professor, University of Florida
12:10 PM	**Closing Remarks** **Roger Failmezger** Chair, Virginia Geo-Institute President, In-Situ, Inc.
12:15 PM	**Conference Adjournment**

ORGANIZING COMMITTEE

Jose N. Gómez S., MSCE, PE, M ASCE
Conference Chair
Vice President / Principal Engineer and
Virginia Beach Branch Manager
ECS Mid-Atlantic, LLC
JGomez@ecslimited.com

Roger Failmezger, PE, F ASCE
Conference Co-Chair
President
In-situ Soil Testing, LC
roger@insitusoil.com

Tariq B. Hamid, PhD, PE
Secretary
Associate
GeoConcepts Engineering, Inc.
THamid@GeoConcepts-Eng.com

Greg Simmons MSCE, PE
Exhibits Manager
Business Development Manager
Hayward Baker
gesimmons@HaywardBaker.com

Qamar A. O. Kazmi, PE, M ASCE
Speaker Chair
Principal
Schnabel Engineering
qkazmi@schnabel-eng.com

Rick Finnen, PE
Treasurer
Vice President/Principal Consultant
Professional Service Industries, Inc.
richard.finnen@psiusa.com

Ross Cutts, MSCE, EIT
Webmaster
Transportation Engineer
Maryland State Highway Administration
rcutts@sha.state.md.us

Dana Eddy, MSCE, PE
Golf Outing Chair
Senior Vice President
Professional Service Industries, Inc.
dana.eddy@psiusa.com

Michael J. Galli, MSCE, PE, M ASCE
ASCE Virginia Section Representative
Vice President/
Hampton Roads Regional Manager
ECS Mid-Atlantic, LLC
MGalli@ecslimited.com

ABSTRACTS

Katrina in Your Rearview Mirror

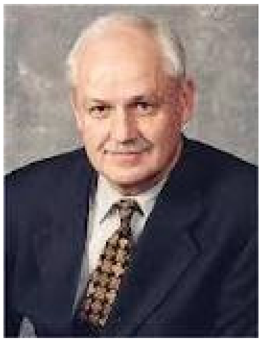
William F. "Bill" Marcuson, III, PE
President, W. F. Marcuson, III & Associates, Inc.

ABSTRACT
In "Katrina in Your Rearview Mirror" W. F. Marcuson will speak about the most damaging hurricane in U.S. history. He will describe the conditions leading up to catastrophe and will use the results of the post-Katrina investigation of the I-wall failures at London Ave. and 17th Street as examples of what went wrong and why. Lastly the subjects of risks, risk management and the lessons that engineers and decision makers should have learned from this disaster will be discussed.

***William F. Marcuson, III** was President of the American Society of Civil Engineers (ASCE) in 2007 and is one of the nation's leading civil engineers. He has received five national awards from ASCE, including the Norman Medal, civil engineering's oldest honor. His career included research and leadership positions at the U. S. Army Engineer Waterways Experiment Station, where he served as Director of the Geotechnical Laboratory for nearly 20 years. He is the only engineer to be named the Corps of Engineer's Engineer of the Year twice (1981 and 1995), and he was honored by the Corps as their Civilian of the Year in 1997.*

Lessons Learned on Behavior of Tunnel Ground

Edward J. Cording, PhD
Professor Emeritus, University of Illinois at Urbana-Champaign



ABSTRACT

Lessons learned on behavior of tunnel ground are described in three categories: the geologic environment, the interaction of the ground with the construction process, and the interaction of the ground with the tunnel structure. Understanding these lessons is critical for a successful tunnel project. In the past 70 years, and even over many centuries, lessons in these areas have been learned and relearned, and, in some cases, forgotten or ignored.

The lesson on the geologic environment and its relation to tunnel ground behavior should not be confined to the first chapter of a geotechnical report but should be an integral part of the decision-making process throughout planning, design and construction.

The lesson on the interaction of the ground with the construction process begins in 1940 on the Chicago Subway with Ralph Peck's squeeze tests, and continues in 1972 on the Washington Metro where, on both projects, monitoring of ground movements correlated with observations in the tunnel resulted in construction changes and dramatic reductions in settlement. The lesson is brought up to date in 2011 on a Sound Transit earth pressure balance (EPB) tunnel where digital readout of machine functions, integrated with an innovative monitoring program revealed how a pressurized envelope around the shield perimeter effectively eliminates settlement.

The lesson on the interaction of the ground with the structure also begins in 1940 on the Chicago Subway, where Karl Terzaghi recommended thin, flexible tunnel linings, which result in uniform soil reactions and low bending moments, in place of the thick concrete linings required by the City to accommodate assumed large differentials between vertical and lateral soil pressures. The lesson continues in 1972 on New York's Second Avenue Subway where newly developed beam-spring analyses allowed, for the first time, determination of elastic stresses in the tunnel haunches that exceeded allowable tensile stresses and would have required much greater concrete thicknesses than had been successfully used on New York tunnels for over half a century.

Lessons have been learned in the last few decades in designing underground structures to accommodate seismic ground displacements, rather than adding seismic loads and increasing the load capacity – and stiffness -- of the structure. Lessons remain to be learned. Structural designs that sum all effects on the structure as factored loads can result in a loss of perspective regarding the loads required to maintain stability and those that are displacement-controlled and depend on the relative lining/rock stiffness.

Lessons need to be interdisciplinary. Even today, there are cases where the interaction between the ground and the structure is not adequately addressed because of a lack of interaction between the geotechnical and the structural engineers designing the tunnel project.

Edward Cording *is Professor Emeritus of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign where he has taught courses in geotechnical engineering and conducted research on the observation and analysis of the behavior of slopes, excavations, and underground structures in soil and rock. He monitored and evaluated the stability and deformations of the first subway tunnels and stations constructed on the Washington D.C. Metro and developed criteria for evaluating ground movements due to excavation and tunneling and measures for protecting surface structures. He was elected a member of the National Academy of Engineering in 1989 and received the 2003 Moles Non-member Award for Outstanding Achievement in Construction. He has served as a geotechnical consultant on projects including transit systems in Washington DC, Baltimore, Philadelphia, Boston, Atlanta, Toronto, Seattle, Portland, San Francisco, New York, San Jose, San Juan PR and Los Angeles.*

Jefferson Memorial Stabilization - Geotechnical findings and their implications

Jesús E. Gómez PhD, PE, DGE
Principal, Schnabel Engineering

ABSTRACT

The Jefferson Memorial in Washington, DC, is a historical and architectural masterpiece. Each spring, hundreds of thousands of visitors admire the cherry blossoms lining the Tidal Basin and complementing the beauty of this stately monument. Settlement and lateral movement of the seawall and North Plaza observed in 2006 prompted the National Park Service (NPS) to close a portion of the memorial to the public due to safety concerns. Since the construction of the Memorial from 1939-1943, the North Plaza and adjacent seawall have been subject to continued settlement. While the Jefferson Memorial itself is founded on a network of deep foundations and grade beams, the surrounding areas were constructed on grade. The Ashlar Seawall, which separates the North Plaza from the Tidal Basin at the north of the Memorial, is supported by vertical and battered timber piles. It is believed that the timber piles did not reach rock and, consequently, the wall was also susceptible to settlement.

An extensive instrumentation program, consisting of piezometers, inclinometers, extensometers, and optical survey began in 2006. The information gathered from the instrumentation led to the design of a movement mitigation scheme that includes demolition of the Ashlar Seawall and reconstruction of a new seawall. The new seawall foundation consists of a system of 48" diameter caissons and inclined pipe piles. The scheme will provide resistance to future vertical and lateral movement of the North Plaza and the new Seawall. Repair to the seawall and plaza began in December 2009, with work completed in Summer 2011.

This presentation describes the investigative work carried out to uncover important details of the construction of the seawall and plaza, and the very interesting results of the geotechnical instrumentation and optical surveys. The geotechnical mechanisms of movement of the seawall and plaza are discussed through results of numerical analysis of the system. Furthermore, some important implications of the geotechnical findings will be discussed.

Dr. Jesús Gómez, PE, DGE *is a Principal and Chief Engineer of the Geostructural Group at Schnabel Engineering, Inc. in West Chester, PA. He has over 25 years of design and construction experience and is a specialist in design of deep foundations and slope stabilization. Dr. Gómez is an Adjunct Professor at University of Delaware. He was recipient of the 2004 Shamsher Prakash Award for Excellence in Geotechnical Practice, and named in the 2011 CE News Power List. Dr. Gómez is a member of the Board of Directors of ADSC.*

The Not So Hidden Costs of Deep Foundation Design

Paul J. Bullock, Ph.D., P.E.
Principal Engineer, Fugro Consultants Inc. - Loadtest

ABSTRACT
Design conservatism, safety factors, and foundation costs necessarily increase as the designer's accumulated knowledge of the project site decreases. A proper site investigation followed by performance testing and quality control will recover it's cost in direct project savings, and typically with a significant bonus. The reduction of risk resulting from improved site information also provides indirect savings to the project schedule. This presentation reviews the practical advantages of various site investigation techniques and performance testing methods available to the foundation designer.

***Paul Bullock**, Principal Engineer with Fugro Consultants Inc. - Loadtest, is proficient with many deep foundation tests (axial, lateral, O-cell, PDA, PIT, CSL) and insitu tests (DMT, CPT, SPT, PMT, GPR). He worked on bridge foundations for 19 years with Schmertmann and Crapps, Inc., helping develop the Dilatometer, the Shaft Inspection Device, the SPT Analyzer, and the O-Cell. He obtained a Ph.D. from and taught as an Assistant Professor at the University of Florida. He has tested both driven and cast-in-place piles worldwide for GRL Engineers, Inc. He is a registered Professional Engineer in ten states. Dr. Bullock is chairman of ASTM D18.11 Deep Foundations, with three ASTM Awards and publications in ASCE, ISSMGE, and DFI.*

Risk Considerations for Geotechnical Construction

George K. Burke, PE, DGE
Vice President of Engineering, Hayward Baker Inc.

ABSTRACT

All geotechnical engineers understand that current investigation techniques and budgets offer only a very small amount of information from which one must interpret to great distances in all three dimensions. This interpretation is usually based on an understanding of local ground experience and geology combined with the investigations which usually improves the result.
This paper will focus on how this interpretation affects geotechnical construction, and offers some points worthy of consideration for all parties concerned. Evaluating risk is a complex issue and differs depending on the construction considered and the potential affects and impacts. Construction risks are multifaceted and include schedule, production, materials, and other time-related costs, but this paper deals primarily with "technical" risks. However, it should be understood that it is generally not possible to separate risks as they are not independent elements.

***George K. Burke, PE, DGE**, is the Senior Vice President of Engineering for Hayward Baker Inc located in the corporate office in Odenton, Maryland. George received his MS and BS in Civil-Geotechnical Engineering from Drexel University, and worked 9 years for a Heavy Civil A&E/Constructor as a designer and builder on power projects. For the last 26 years he has specialized in all types of grouting and ground improvement projects throughout North America. George manages new technology and technical risk for Hayward Baker, with a research and development, management or consulting role in hundreds of projects. He is a member of DFI, ASCE and ADSC and is an active participant on the ACSE Grouting Committee. George also participates as an educator for the Colorado School of Mines annual Grouting course teaching jet grouting technologies. In 2009 he was confirmed as a Diplomate of the Academy of Geo-Professionals, and was presented with the 2010 Wallace Hayward Baker Award from the Geo-Institute of ASCE.*

LESSONS FROM LEGENDS:
Technical, Professional, and Life Teachings from Some Giants of Geotechnical Engineering

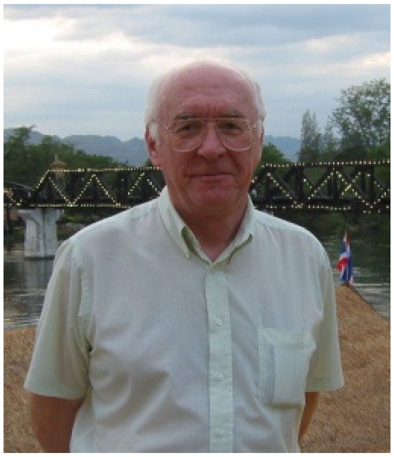
James K. Mitchell, ScD, PE, GE, Dist. M ASCE
University Distinguished Professor Emeritus, Virginia Tech
Consulting Geotechnical Engineer

ABSTRACT
I have had the good fortune over the past 60+ years of studying under, working with, and learning from many of the pioneers and most notable contributors to the modern geotechnical engineering profession. Starting with D.W. Taylor at M.I.T. and Karl Terzaghi and Arthur Casagrande at Harvard, I will describe some of my personal associations with a number of giants of geotechnics, all now deceased, including such well-known engineers as Alec W. Skempton, Laurits Bjerrum, James L. Sherard, Stanley D. Wilson, William W. Moore, Richard J. Woodward, Ralph B. Peck and H. Bolton Seed. Some of their most notable contributions will be described briefly, some highlights of my personal associations with them will be noted, and some unique personal lessons they imparted will be identified.

Jim Mitchell *joined the faculty at Virginia Tech in 1994 and now is University Distinguished Professor Emeritus and Consulting Geotechnical Engineer. From 1958 to 1994 he was on the CEE faculty at the University of California, Berkeley. His teaching, research and consulting activities have focused on soil behavior, soil stabilization, ground improvement, environmental geotechnics, and mitigation of seismic risk. He was the 2006 recipient of the ASCE Outstanding Projects and Leaders Award (OPAL) in Education. He is a member of the United States National Academy of Engineering and the National Academy of Sciences.*

RBD for Foundations - The Good, The Bad, and The Ugly

Fred H. Kulhawy, PE, GE, Dist M ASCE
Professor Emeritus, School of Civil & Environmental Engineering, Cornell University
Consulting Geotechnical Engineer



ABSTRACT
The writer has been involved with the development of reliability-based design (RBD) of foundations since the early 1980s. From this perspective, some basic concepts in the transition from allowable stress design (ASD) to RBD are reviewed. Critical issues related to RBD are noted, including their fundamental strengths and weaknesses - or more specifically "The Good, The Bad, and The Ugly". It is stressed that current simplified RBD methods used in foundation design for all structure types need to be improved and expanded. The structural-based approaches used by some should be replaced by geotechnical-based methodologies that address pertinent ground engineering evaluations in a direct manner. Observations are made for improving factor calibrations, addressing serviceability and economic limit states, and optimizing the foundation design process - linking all to what might be viewed as good, bad, or ugly. Good points include, for example, our intentions and goals, while ugly points include, for example, some of our implementations.

***Dr. Fred H. Kulhawy PE, GE, Dist.M.ASCE** is Professor Emeritus of Civil/Geotechnical Engineering at Cornell University, and a Consulting Geotechnical Engineer, in Ithaca, New York. He received his BSCE and MSCE from the New Jersey Institute of Technology and his PhD from the University of California at Berkeley. He is licensed in several states as a Professional Engineer, Civil Engineer, or Geotechnical Engineer and was certified as a Diplomate, Geotechnical Engineering in the founding group. His teaching and research focuses on foundations, soil-structure interaction, dams, soil and rock behavior, and geotechnical computer and reliability applications, and he is the author of over 370 published technical papers and reports. He has given more than 1420 lectures around the world and has received numerous awards for his work from ASCE, ADSC, IEEE, and others, including election to Distinguished Member of ASCE, the ASCE Karl Terzaghi Award and Norman Medal, and the CGS Meyerhof Award. He also has extensive experience in geotechnical engineering practice with several consulting firms, and he has been a private consultant for major projects on six continents, with over 440 assignments completed to date. Professor Kulahawy's new book (co-authors K.K. Phoon and Y. Wang) titled, "Reliability-Based Design of Foundations - A Modern View, State of the Art & Practice in Geotechnical Engineering," is currently in press*.

Geotechnical Engineering Implications from Recent Worldwide Earthquakes

James R. Martin, PhD
Professor of Civil Engineering, Virginia Tech

ABSTRACT

Ongoing studies of recent earthquakes in New Zealand, Japan, and Virginia provide new insights into seismic ground performance. In New Zealand, the 2010-2011 earthquakes produced strong ground shaking and severe liquefaction over a widespread area. A dense array of regional ground motion recordings, along with well-documented liquefaction damages and extensive site characterization make possible greatly improved correlations between ground shaking and liquefaction damage. Of particular importance, the surprising catastrophic ground failure suffered by several prominent structures founded on improved ground suggests that some approaches for ground treatment may not be as effective as we thought for seismic mitigation.

In Japan during the 2011 M9 Tohuku Earthquake, a highly-developed region with infrastructure and building codes similar to the US was subjected to extreme levels of ground shaking (PGAs > 1.0g with 2-3 minutes of strong shaking) followed by a devastating tsunami. Liquefaction-related ground failures occurred as far away as 400 km from the epicenter, which is unprecedented. Along Tokyo Bay and other waterfront areas closer to the source, there were stark contrasts between the performance of natural sand deposits, which fared well overall, compared to nearby reclaimed sandy sites that commonly suffered severe liquefaction damage. Soil treatment was effective at mitigating damages at most sites where it was used. Although ports and ancillary structures suffered heavy damages, especially from the tsunami, their overall seismic performance was better than expected.

The August 2011 M5.8 Mineral, Virginia Earthquake provided a rare opportunity to study a damaging earthquake in the eastern US and assess the seismic performance of regional infrastructure. Unfortunately, the findings are limited because the event was poorly recorded with instruments. Although no geotechnical ground failures occurred, important observations were made. Damage patterns were strongly related to regional geological and local geotechnical conditions, especially in the Washington, DC area where there was a marked uptick in damages relative to other regions closer to the source. The earthquake underscores the need for region-specific soil amplification factors to improve building code design procedures for the eastern and central US.

This presentation summarizes preliminary findings from these events and discusses implications for geotechnical engineering practice.

Dr. James (Jimmy) R. Martin is Professor of Civil Engineering at Virginia Tech, and Director of the Institute for Disaster Risk Management at Virginia Tech. Dr. Martin's main research interests are geotechnical earthquake and foundation engineering, soil and site improvement, seismic hazard analysis, numerical modeling, and thermo-active foundations. He is a frequent field investigator of major worldwide earthquakes, and has been closely involved in the advancement of building code provisions in the US and abroad. In addition to his research, he often serves as a professional engineering consultant on major national and international civil infrastructure projects, such as nuclear power facilities, dams, bridges, and large building developments. Dr. Martin has received numerous national, state, and university awards for teaching, research, and professional work, including the American Society of Civil Engineer's Norman Medal.

What's Past is Prologue in Geotechnical Engineering

Deborah Goodings, PhD, P Eng, F ASCE, DGE
Dewberry Professor of Civil Engineering & Department Chairman
George Mason University

ABSTRACT
Geotechnical case studies are valuable when they build technical judgment for application to new design challenges. The differences between projects, however, extend beyond differences in project location and project function. Both the new tools we have at our disposal, and newly imposed demands on design – especially the increasing insistence on integration of sustainability in geotechnical design -- are changing design. Embracing change is the only viable option for the geotechnical engineer of the 21st century, but leading that change is even better. This presentation addresses questions and opportunities on our geotechnical doorsteps now, set in the context of our geotechnical past.

Deborah J. Goodings PhD, P Eng, F ASCE, DGE*, joined George Mason University in 2009 as the Dewberry Professor and department chairman in the Department of Civil, Environmental, and Infrastructure Engineering. In her previous position at the University of Maryland, she was Professor of Civil Engineering; co-Director of the Engineering and Public Policy program; and she led the university's award-winning chapter of Engineers Without Borders. Her career accomplishments have been recognized with the Fred Burggraf Award from the National Research Council's Transportation Research Board; the Department of the Army Outstanding Civilian Service Medal; the Distinguished Service Award of the U.S. Universities Council on Geotechnical Engineering Research; the Engineering Medal of Engineering Excellence from Professional Engineers Ontario; she is a Fellow of the American Society of Civil Engineers; and a Diplomate, Geotechnical Engineering. Dr. Goodings has served on the Visiting Committees of the Department of Civil and Environmental Engineering at the Massachusetts Institute of Technology, and at the University of Delaware; on the external review committee of the Department of Civil Engineering at the University of British Columbia; on the US Army's Research Office environmental program review committee; on the Canadian Natural Sciences and Engineering Research Council civil engineering extended review panel; and on the University of Massachusetts-Amherst Evaluation Review Team for the New England Association of Schools and Colleges Commission on Institutions of Higher Learning. She was elected a By-Fellow of Churchill College, Cambridge University. She received her bachelors of Civil Engineering degree from the University of Toronto, Canada, and her PhD in Geotechnical Engineering from Cambridge University, UK. She is a registered professional engineer.*

Geosynthetic Reinforced MSE Wall Failures and their Remediation

Robert M. Koerner, PhD, PE, NAE
Emeritus Professor – Drexel University
Emeritus Director – Geosynthetic Institute

ABSTRACT
The success of mechanically stabilized earth (MSE) walls and slopes with geosynthetic reinforcement is outstanding as evidenced by approximately 40,000 of them being designed and constructed over the past 15-years. However, there have been failures, and this presentation will present a database consisting of 34 cases of excessive deformation and 107 cases of partial collapse. Within this total were the following:

37 cases (26%) of internal instability
23 cases (16%) of external instability
51 cases (36%) of internal water
30 cases (22%) of external water

Design and construction issues dominated the above situations and the salient features within these four categories will be described. Furthermore, 14 of the 34 excessively deforming walls were remediated using ground modification techniques and several cases will be described. Lastly, the cost of remediation and recommendations to avoid such failures going forward will be presented.

__Dr. Robert M. Koerner__ is a Professor Emeritus of Civil Engineering at Drexel University and Director Emeritus of the Geosynthetic Institute. His interest in geosynthetics spans almost 35 years of teaching, research, writing and consulting. He holds his PhD in Geotechnical Engineering from Duke University. He is a registered Professional Engineer, a Distinguished Member of ASCE, a Geotechnical Engineering Diplomate, an Honorary Member of the International Geosynthetics Society and a member of the US National Academy of Engineering. Bob has authored and co-authored approximately 650 papers on geosynthetics and geotechnical topics in journals and at national and international conferences. His most widely used publication is the book titled "Designing With Geosynthetics".

Lessons Learned from Landslides in the Panama Canal

Michael J. Duncan, PhD
Professor Emeritus of Civil Engineering, Virginia Tech

ABSTRACT

The 8-mile-long Gaillard Cut, at the southern end of the Panama Canal, is excavated through the highest terrain along the axis of the canal. The slopes in this area rise as high as 500 feet above the canal invert, and have been plagued with landslides throughout the 120-year history of canal construction and operation. Managing the hundreds of landslides that have occurred in Gaillard Cut has been difficult because of the complex geological conditions in the Cut. Extremely hard rocks (basalt and agglomerate), and very soft rocks (Cucaracha shale and Culebra shale) are juxtaposed in the canal slopes, and the rocks are dissected and offset by many faults. The weak rocks, mainly shales, are prone to softening over time, resulting in a continual process of landsliding. Effective programs have been developed for monitoring landslide movements, for stabilizing landslides before they impact canal operation, and for designing and constructing canal improvements. These proactive programs, based on many years of successful experience, ensure continued viability of the canal as a valuable shipping route.

Mike Duncan *is a Professor Emeritus of Civil Engineering at Virginia Tech. He has been a consultant on geotechnical engineering projects since 1965, and has supervised 45 PhD students at UC Berkeley and Virginia Tech. He has authored more than 300 geotechnical engineering publications, including the textbook "Soil Strength and Slope Stability", co-authored with Stephen G. Wright. He is a member of the National Academy of Engineering and a Distinguished Member of ASCE. He has been a member of the Panama Canal Geotechnical Advisory Board since 1986.*

Lessons Learned Early in Your Career

Bill Murphy, PE, MS, LM ASCE
Principal, Schnabel Engineering

ABSTRACT
Each of us throughout our careers will be learning lessons, sometimes through our own experience and sometimes through the experience of others during their long careers. Many of the lessons we are learning from practitioners and educators at this meeting will make us better engineers. I am going to talk about a few non-technical lessons I learned early in my career, some of which kept me alive to talk to you today.

Bill Murphy *is a Principal of Schnabel Engineering, Inc., an ENR Top 10 geotechnical engineering firm. Bill will be retiring shortly after a career of 15 years with Schnabel and 30 years with Dames & Moore, now part of URS, where he was a partner. Bill received a Bachelor of Civil Engineering degree from Manhattan College and an MS degree in Geotechnical Engineering from Purdue University. He is a Life Member of ASCE and a Past President of the ASCE West Coast (Florida) Chapter. Bill also is Past President of the Atlanta Chapter of the GSPE and is a Fellow of the ACEC/Metropolitan Washington section. He lives in Alexandria with his wife Patricia and long-coat Chihuahua, Tina. They have a son, Tom who is a criminal defense attorney in Orlando and a daughter, Christine, who works in combating SPAM, and four grandchildren.*

Support of Embankments on Very Soft Soils – Lessons Learned

Jose N. Gómez S., PE, MSCE, M ASCE
Vice President, ECS Mid-Atlantic, LLC

ABSTRACT
The perimeter road along the S-SE shoreline of La Virgen Sound of Cartagena de Indias, Colombia, is 3.4 km (2.1 miles) long and was built on very difficult geotechnical conditions, where soft to very soft compressible marshy soils about 2 meters thick (6.6 ft) support the road. This special high compressible soil condition required the installation of a woven geotextile as a separation-strength device in order to continue placing and compacting an embankment made of low plasticity calcareous fill. The fill had an average height of 3.5 m (11.5 ft), which displaced about 2 to 2.5 m (6.6-8.2 ft) of soil within one or two days, upon reaching a stronger soil foundation. The final height of the fill above the shoreline surface was about 1.5 m (4.9 ft) at the proposed location of the pavement. The embankment continued to settle while the foundation soil continued consolidating.

The subject special geotechnical circumstances required the design of an instrumentation system including settlement plates and electric piezometers, in order to understand the behavior of the embankment with respect to the rate of foundation settlements. As such, it was necessary to postpone the construction of the pavement structure until the settlement rate slowed to less that 1 mm/day (0.04 in/day).

Additionally, big load in situ plate tests of 2.86 m (9.4 ft) in diameter and 1.12 tn/m2 total load, were carried out to evaluate the elastoplastic parameters of the embankment materials and foundation marshy soils, in order to understand the consolidation behavior of these materials. Many geotechnical experiences presented in the article were learned with this project in terms of consolidation soil parameters and settlement predictions.

Jose Gomez *is a Vice President and the Branch Manager of the Virginia Beach office of ECS Mid-Atlantic LLC. He has more than 30 years of varied experience in a wide range of geotechnical and civil engineering consulting for studies, designs, project layouts and construction supervisions for more than 190 projects since 1980. He has provided geotechnical recommendations for site preparation, earthwork, excavations, retaining structures, embankments, dams and levees, slope stability and foundation design for several industrial, commercial and infrastructure projects.*

Mr. Gomez has been adjunct professor for several undergraduate and graduate geotechnical courses and speaker during the last 20 years of his professional career. His main topics have been geotechnical and project case histories. Currently he is an Adjunct Professor at Old Dominion University, teaching courses in Soils and Foundations. He is a registered Professional Engineer in the Commonwealth of Virginia. Mr. Gomez has published more than 40 technical papers in a variety of seminars and technical session and proceedings related to geotechnical and civil engineering projects. He is the author of a book on sailing.

Failures of Helical Piles and Helical Anchors and Associated Lessons Learned

Howard A. Perko, PhD, PE
Director of Engineering, Magnum Geo-Solutions

ABSTRACT
A variety of helical pile/anchor projects that experienced problems will be presented, including one that resulted in a temporary moratorium on helical piles in New York City. These include: a failed helical soil nail wall at a stadium, a marine bulkhead with poor anchor load test results, excessive settlement of helical piles supporting a 6-story condominium project, collapse of a helical piles supported scaffold, and a residential underpinning project where a worker was unfortunately killed. Two failures can be explained by the lack of lateral bracing at the tops of helical piles. The tie-back failure may be explained by loss of bearing at the foot of the wall and incorrect earth pressure distribution. The poor load tests for the sea wall may be explained by lack of proper torque calibration, while the settlement of the condominium building may be attributed of faulty load tests. Through a study of these case histories, important lessons learned in properly designing and specifying helical piles will be presented.

__Dr. Howard Perko__ is the Director of Engineering at Magnum Geo-Solutions, in Fort Collins, Colorado. He is an internationally recognized expert in helical pile foundations and author of a textbook on helical pile design and installation. He obtained his BS in Civil Engineering from Michigan Technological University, Houghton, MI, and his masters and PhD degrees from Colorado State University, Fort Collins, Colorado.

Panama Canal: Construction and Expansion

Frank C. Townsend , PhD, PE
Professor of Civil Engineering, University of Florida

ABSTRACT

This paper presents aspects of the construction and current expansion of the Panama Canal. The Canal was constructed during 1904 to 1914, and has been designated one of ASCE's "Seven Wonders of the Modern World". The triumph over engineering obstacles, disease, landslides, floods, and politics represents a hallmark of perseverance and civil engineering skills. The construction involved 262 million cubic yards of soil excavation, and 2.05 million cubic yards of concrete for the locks at an under-budget cost of $639 million.

The Panama Canal Authority (PCA) is currently undergoing a $5.25 billion expansion project to increase capacity and future shipping demands. The expansion involves the construction of two new sets of locks and 39.2m yd3 of dry excavation. Completion is scheduled for 2015.

***Frank C. Townsend** was born and raised in the Panama Canal Zone. He received his baccalaureate degree in civil engineering in 1962 from Michigan Tech and PhD from Oklahoma State University in 1970. He worked as a Research Civil Engineer at the Corps of Engineers Waterways Experiment Station. He was Professor of Civil Engineering at the University of Florida, with 26 years of teaching and research experience until his retirement in 2005. He has served on several ASCE and ASTM committees. Prof. Townsend was an instructor for ASCE's and NHI's short course on "Design and Construction of Driven Piles", and has conducted deep foundations research for over 15 years. As a Professor in Civil Engineering he has been involved in over 100 MS and PhD committees and has taught over 25 short courses throughout the USA and Latin America.*

LIST OF SPEAKERS

Paul J. Bullock, PhD, PE
Principal Engineer, Fugro Consultants Inc. - Loadtest

George K. Burke, PE, DGE
Vice President of Engineering, Hayward Baker Inc.

Edward J. Cording, PhD
Professor Emeritus, University of Illinois at Urbana-Champaign

Michael J. Duncan, PhD
Professor Emeritus of Civil Engineering, Virginia Tech

Jesús E. Gómez, PhD, PE, DGE
Principal, Schnabel Engineering

Jose N. Gómez S., PE, MSCE, M ASCE
Vice President, ECS Mid-Atlantic, LLC

Deborah Goodings, PhD, P Eng, F ASCE, DGE
Dewberry Professor of Civil Engineering & Department Chairman
George Mason University

Robert M. Koerner, PhD, PE, NAE
Emeritus Professor – Drexel University
Emeritus Director – Geosynthetic Institute

Fred H. Kulhawy, PE, GE, Dist M ASCE
Professor Emeritus, School of Civil & Environmental Engineering, Cornell University
Consulting Geotechnical Engineer

James R. Martin, PhD
Professor of Civil Engineering, Virginia Tech

William F. "Bill" Marcuson, III, PE
President, W. F. Marcuson, III & Associates, Inc.

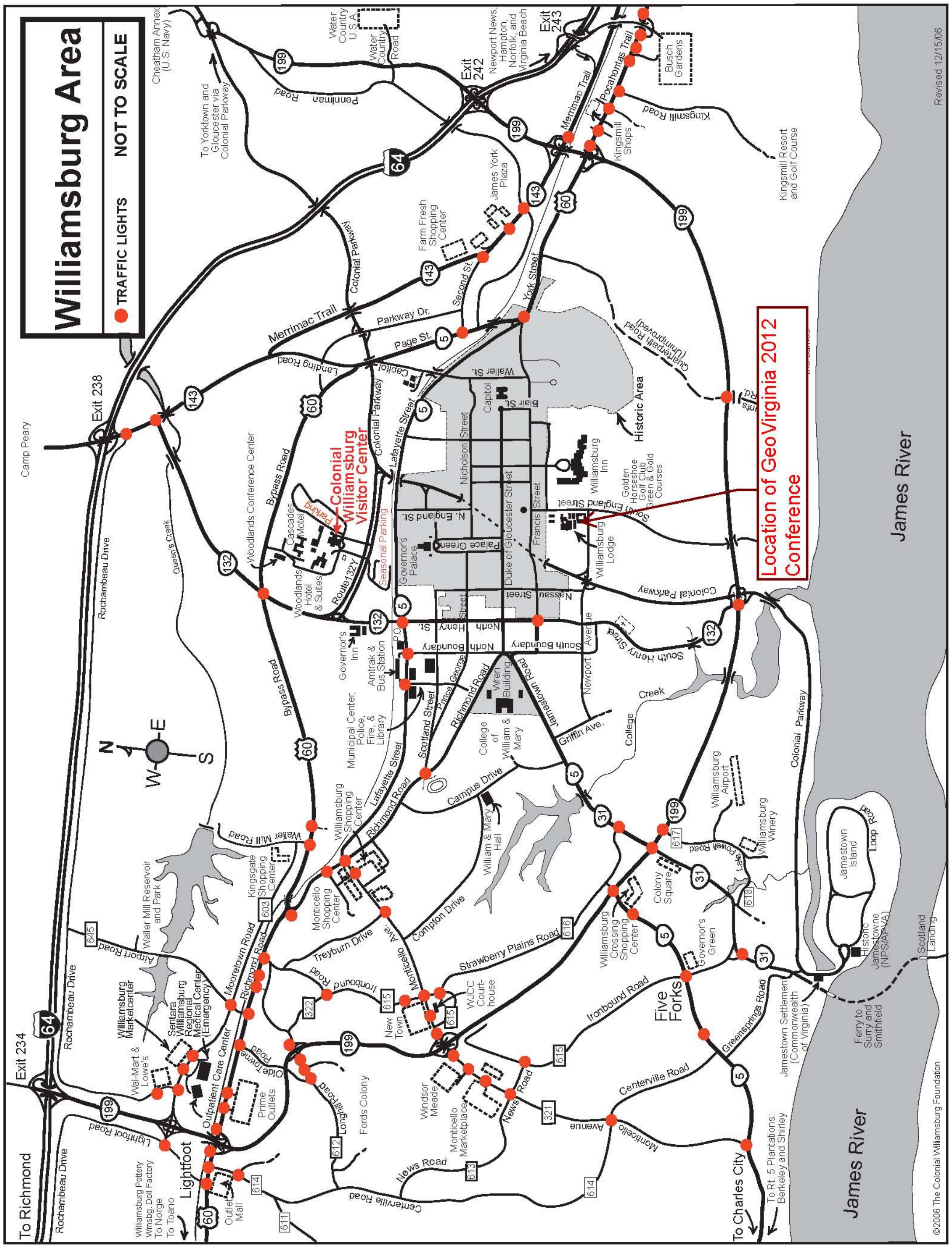
James K. Mitchell, ScD, PE, GE, Dist. M ASCE – *Keynote Speaker*
University Distinguished Professor Emeritus, Virginia Tech
Consulting Geotechnical Engineer

Bill Murphy, PE, MS, LM ASCE
Principal, Schnabel Engineering

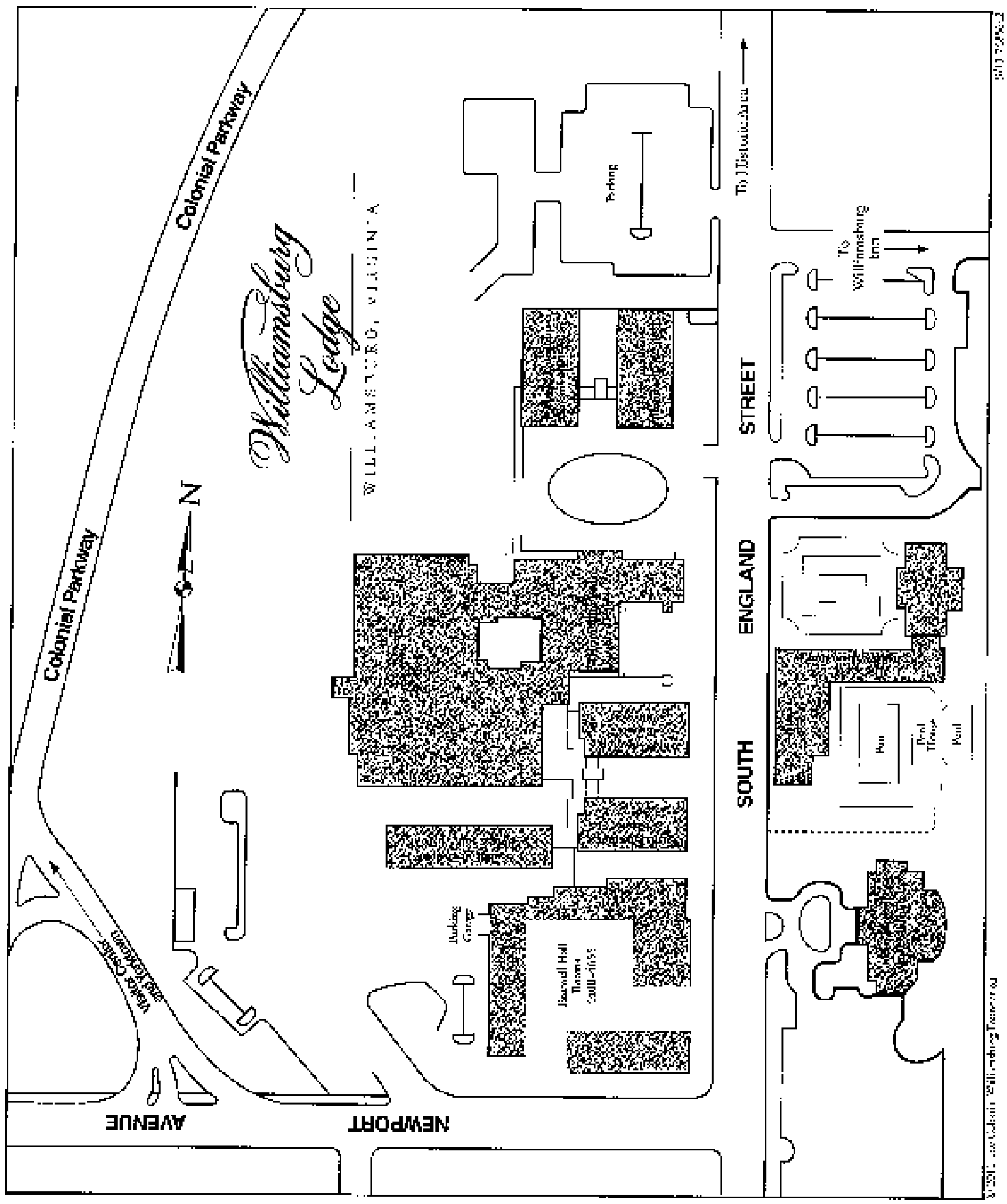
Howard A. Perko, PhD, PE
Director of Engineering, Magnum Geo-Solutions

Frank C. Townsend , PhD, PE
Professor of Civil Engineering, University of Florida

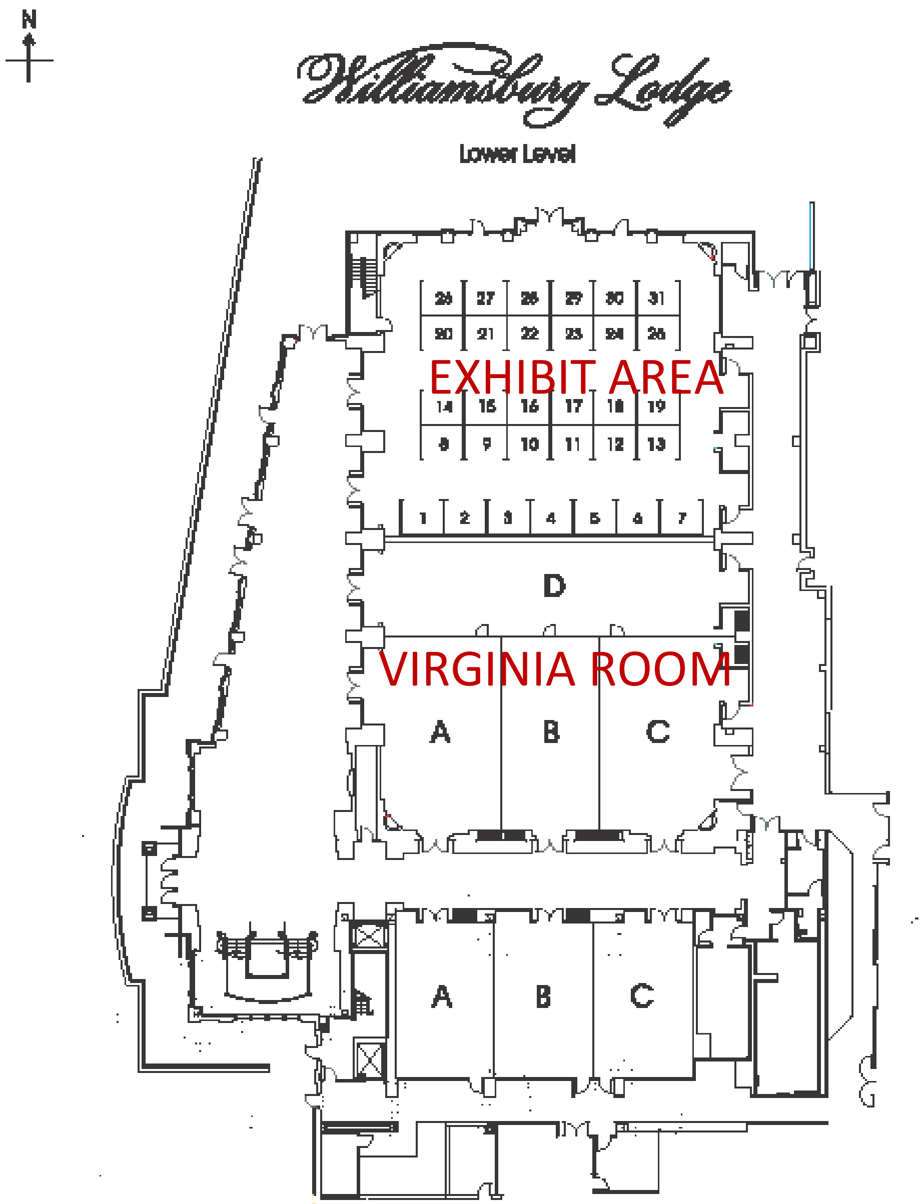
WILLIAMSBURG MAP



MAP OF WILLIAMSBURG LODGE



CONFERENCE AREA LAYOUT



GeoVirginia 2012

April 30 to May 2, 2012

CONFERENCE SPONSORS

PLATINUM LEVEL SPONSORS

ECS™

HAYWARD BAKER
Geotechnical Construction

KELLER

In-Situ Soil Testing, L.C

GOLD LEVEL SPONSORS

Berkel & Company Contractors, Inc. 1959

GeoStructures, Inc.

Schnabel
ENGINEERING

SPONSORED BREAKS

GET Solutions, Inc.
Geotechnical • Environmental • Testing

psi Information To Build On
Engineering • Consulting • Testing

TECHNICAL
FOUNDATIONS
INCORPORATED