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Volume 31 • Number 1 • March 2013

GEOTECHNICAL news

- Use of dyed cement grouts in foundation grouting

innovation

in MEMS Digital Inclinometer Systems

DIGITAL MEMS INCLINOMETER SYSTEM

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OTHER INCLINOMETERS VS. RST

Other Inclinometers → | RST Inclinometer

Interference

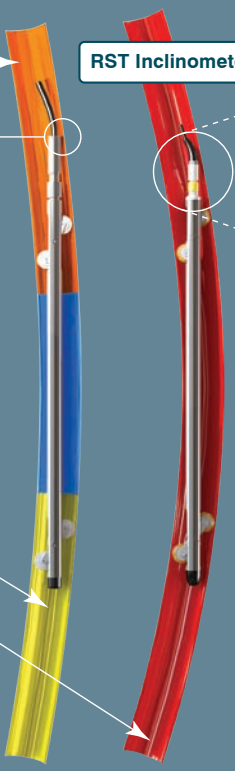
Interference at connector is visibly inherent in other inclinometers (left) while RST's Digital MEMS Inclinometer (right) can clearly traverse a smaller radius bend (1.93 m) than all other inclinometers.

Minimum Negotiable Casing Radius

Other Inclinometers:
3.12 m

RST Inclinometer:
1.93 m

0.5 m wheelbase probes shown in 70 mm OD inclinometer casing.



RST's newly developed connector is by far the industry leader for the least amount of connector interference.

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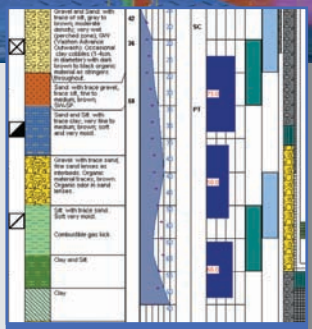

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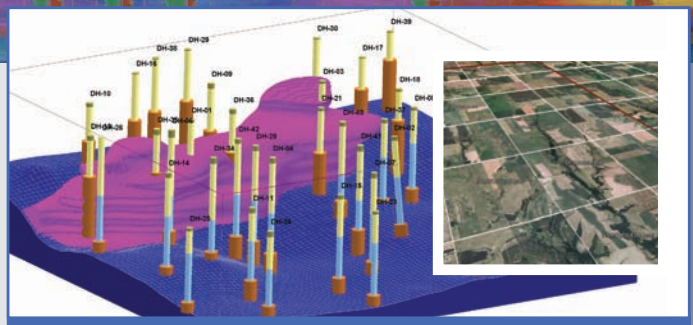

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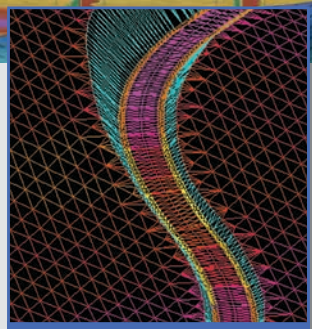

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CONTENTS

COVER *Wolf Creek Dam on the Cumberland River, Kentucky. (Photo credit: US Army Corps of Engineers, Nashville District). See artice on page 28.*

Message from the President

Richard J. Bathurst, President of Canadian Geotechnical Society

I am delighted to have this opportunity to share with the members of the Canadian Geotechnical Society (CGS) my first President's Message as I begin my two-year term (2013-14). I would like to start by congratulating the previous Executive Committee led by the Immediate Past-President, **Mr. Bryan Watts**, for their exemplary leadership and many accomplishments over the last two years. Notable examples are the Articles of Continuance and revised CGS By-Laws that were submitted to Corporations Canada for continuance of the CGS as a Technical Society under the new Canada Not-for-Profit Corporations Act (NFP Act) and the adroit management of the finances of the Society which has allowed us to deliver value to our membership while maintaining fees constant for regular members and even lowering fees for our students. Bryan and his team have delivered the Society and its affairs to the new Executive Committee in good order, which is much appreciated by the new team and our membership. At the last General Meeting in Winnipeg in October, I was able to introduce the following incoming Executive Committee members:

- **Dr. Angela G. Küpper** as Vice President, Technical. Angela is a Principal with AMEC Environment & Infrastructure in Edmonton. She has more than 30 years experience on large geotechnical and mining projects in North and South America and is a Past-President of the Geotechnical Society of Edmonton (GSE). Angela replaces Dr. John Sobkowicz.
- **Dr. Dharma Wijewickreme** as Vice President, Finance. Dharma is Professor of Civil Engineering at the University of British Columbia and practiced as a geotechnical consulting engineer for 11 years prior to joining UBC. Dharma takes over from Mr. Peter Gaffran.
- **Dr. Catherine N. Mulligan** as Vice President, Communications. Catherine is Professor, Department of Building, Civil and Environmental Engineering and Associate Dean, Research and Graduate Studies, at Concordia University in Montreal. Catherine has 25 years of research experience in government, industry and academia. Catherine replaces Dr. Jean-Marie Konrad.

I am very grateful that these very talented and busy members of our Society have agreed to serve in the capacities noted. The Executive Committee also includes a Representative of the Technical Divisions and a Representative of the Local Sections who serve one-year terms. I am pleased to report that **Dr. Jim**

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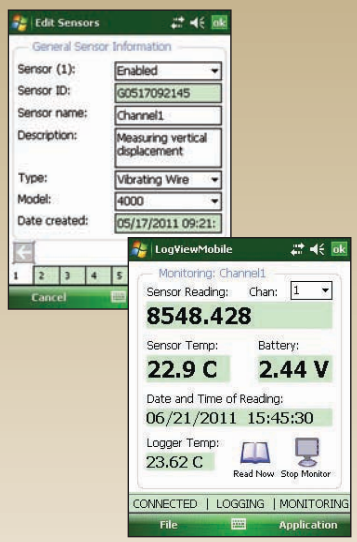
www.geokon.com/digital-inclinometer-system

Wireless Inclinometer Field PC

2 IN-ONE

All-Weather Data Retriever



For more information about LogView Mobile Software please visit our website

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The versatile Geokon model GK-604-6 Archer® Field PC uses LogView Mobile Software for all-weather retrieval of data stored in LC-2 Series Geokon dataloggers.

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Hazzard has agreed to serve as the Representative for the Technical Divisions. Jim is a Senior Engineer with Itasca Consulting Group in Toronto. He takes over from Dr. Lukas Arenson. **Dr. Paul Dittrich** is the incoming Local Sections Representative and takes over from Mr. Baolin Wang. Paul is Senior Geotechnical Engineer and Principal with Golder Associates in Mississauga. Finally, I am pleased to announce that **Dr. Jean Côté** at the Université Laval has agreed to serve as interim chair of the CGS Geotechnical Research Board for a one-year period.

The Society continues to be well served by our Secretary-General, **Dr. Victor Sowa** and in day-to-day administrative duties by **Mr. Wayne Gibson** and **Ms. Lisa McJunkin** of the Gibson Group. Victor has advised me that he intends to retire at the end of 2014 and thus one important task of the new executive will be to find a suitable successor and arrange for a transition period in the last half of 2014.

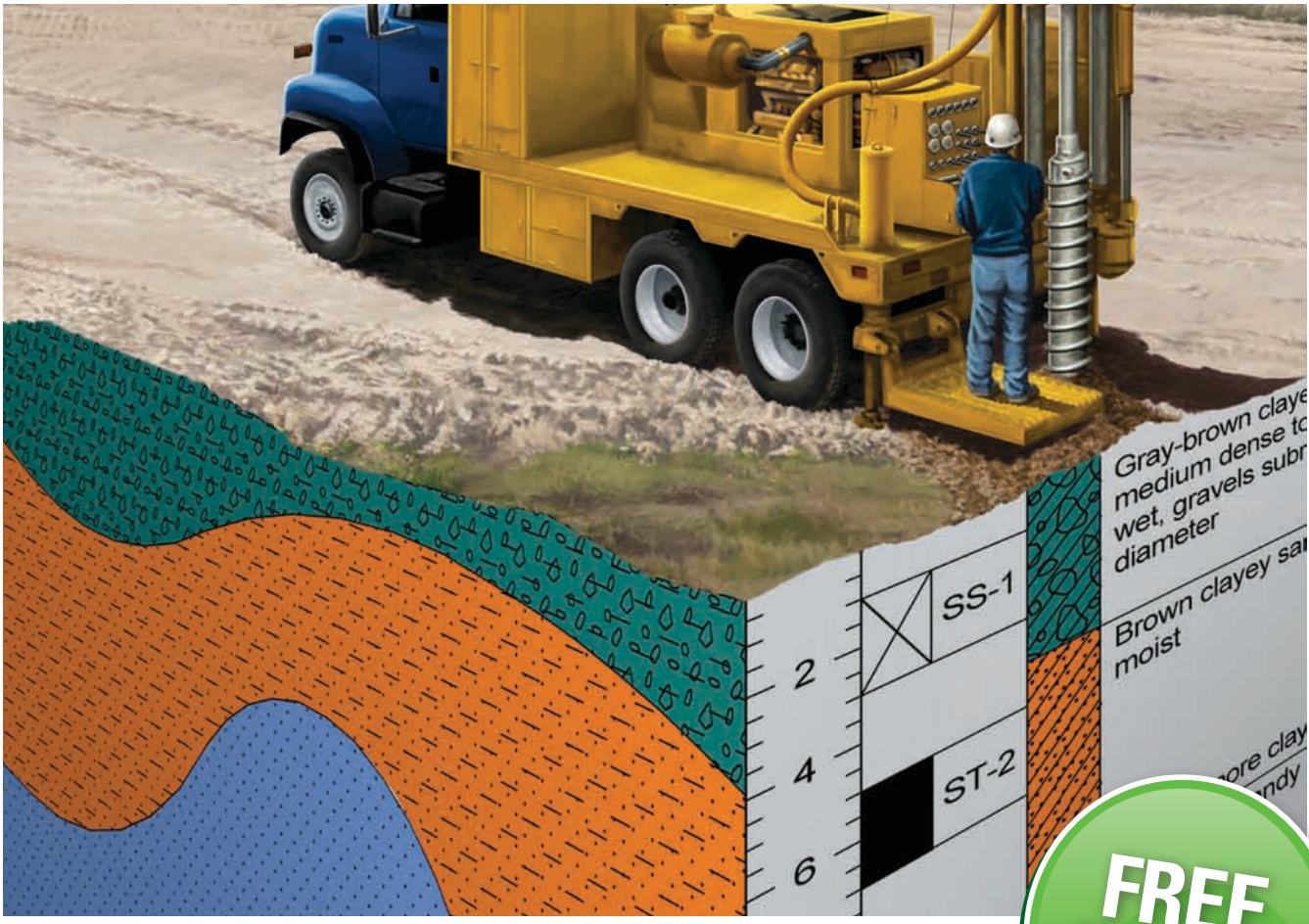
One of the first tasks of the Executive Committee was indeed a pleasurable one. The Executive Committee voted to accept the additional funding offered by **The Canadian Foundation for Geotechnique** Trustees to increase the annual financial award component of the Canadian Geotechnical Society (CGS) Student Awards for Graduate and Undergraduate Students from a total of $3,750 for all awards to $6,000.

I am delighted to report that the French translation of the **4th Edition of the Canadian Foundation Engineering Manual (CFEM)** is now complete. We look forward to having this document available in print in 2013. It follows that the CGS executive will have on its next agenda a discussion regarding how to proceed with updating the technical content of the CFEM and equally important, what format will be adopted.

I should like to remind you that the **66th Canadian Geotechnical Society (CGS) Annual Conference** will be held in Montreal, on September 29-October 3, 2013, in collaboration with the International Association of Hydrogeologists (IAH-CNC) and the North American Geosynthetics Society (NAGS). This conference promises to be the largest CGS conference to date, thanks to the many efforts of the organizing committee under the leadership of **Mr. Mario Ruel** and **Mr. Sylvain Roy**.

Message du président

Je suis ravi d'avoir l'occasion de transmettre à nos membres mon premier message à titre de président de la Société canadienne de géotechnique



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(SCG), en ce début de mon mandat de deux ans (2013-2014). J'aimerais commencer par féliciter le Comité exécutif précédent, dont notre président sortant **M. Bryan Watts** avait assuré la direction, pour son leadership exemplaire et ses nombreuses réalisations au cours des deux dernières années. Il convient de mentionner tout particulièrement les statuts de prorogation et les règlements administratifs révisés qui ont été soumis à Industrie Canada pour que la SCG soit prorogée à titre de société technique, en vertu de la *Loi canadienne sur les organisations à but non lucratif* (ou Loi BNL), ainsi que l'habile gestion des finances de la Société, qui nous a permis de rehausser la valeur de notre offre aux membres en maintenant les frais d'adhésion des membres ordinaires et en parvenant aussi à réduire les frais d'adhésion des étudiants. Bryan et son équipe ont laissé au nouveau Comité exécutif une Société dont les affaires sont en bon ordre, ce qui est fort apprécié de la nouvelle équipe et des membres. Lors de la dernière assemblée générale, qui avait lieu à Winnipeg en octobre, j'ai présenté les membres suivants du nouveau Comité exécutif :

- **Angela G. Küpper**, **Ph. D.**, est la vice-présidente du programme technique. Directrice de la division Environnement et infrastructure d'AMEC à Edmonton, elle compte plus de 30 années d'expérience consacrée à d'importants projets géotechniques et miniers en Amérique du Nord et en Amérique du Sud. Elle est également présidente sortante de la Geotechnical Society of Edmonton (GSE). Elle remplace John Sobkowicz, Ph. D.
- **Dharma Wijewickreme, Ph. D.**, est le vice-président des finances. Actuellement professeur de génie civil à l'Université de la Colombie-Britannique (UBC), il a été ingénieur-conseil en géotechnique pendant 11 ans avant d'occuper ce poste. Il succède à M. Peter Gaffran.
- **Catherine N. Mulligan, Ph. D.**, est la vice-présidente des communications. Professeure au Département du génie du bâtiment, du génie civil et du génie environnemental de l'Université Concordia de Montréal, elle y est également vice-doyenne à la recherche et aux études supérieures. Elle possède 25 années d'expérience en recherche dans les secteurs gouvernemental, industriel et universitaire. Elle remplace Jean-Marie Konrad, Ph. D.

Je suis très reconnaissant que ces membres très talentueux et très occupés de notre Société aient accepté d'exercer ces fonctions. Le Comité exécutif comprend également un représentant des divisions techniques et un représentant des sections locales,

dont le mandat est d'une durée d'un an. J'ai le plaisir d'annoncer que **Jim Hazzard, Ph. D**., a accepté de représenter les divisions techniques. Il occupe un poste d'ingénieur principal chez Itasca Consulting Group, à Toronto. Il succède à Lukas Arenson, Ph. **D. Paul Dittrich, Ph. D**., est le nouveau représentant des sections locales. Il remplace M. Baolin Wang. Il est ingénieur géotechnique principal et directeur chez Golder Associates, à Mississauga. Enfin, je suis heureux d'annoncer que **Jean Côté, Ph. D**., de l'Université Laval, a accepté d'être président par intérim du Conseil de recherche géotechnique de la SCG pour une période d'un an.

La Société continue de bénéficier des bons et loyaux services de notre secrétaire général, **Victor Sowa, Ph. D**., et peut compter sur **M. Wayne Gibson** et **Mme Lisa McJunkin**, de l'entreprise Gibson Group, pour ce qui relève de l'administration. Victor m'a annoncé avoir l'intention de prendre sa retraite à la fin de 2014. Par conséquent, l'une des tâches importantes du nouvel exécutif sera de lui trouver un remplaçant compétent et de prendre des dispositions pour assurer la transition durant les six derniers mois de 2014.

L'une des premières tâches du Comité exécutif a été des plus agréables. Elle consistait à voter l'approbation de fonds supplémentaires offerts par les curateurs de la **Fondation canadienne de géotechnique** pour augmenter les prix en argent décernés par la Société canadienne de géotechnique aux étudiants diplômés et non diplômés. La cagnotte de l'ensemble des prix est passée d'un total de 3 750 $ à celui de 6 000 $.

Je suis ravi d'annoncer que la traduction française de la 4e édition du Manuel canadien d'ingénierie des fondations (Canadian Foundation Engineering Manual) est terminée. Nous anticipons qu'il sera disponible en formation imprimé en 2013. Il s'ensuite que l'exécutif de la SCG aura une discussion, à son prochain ordre du jour, sur la façon de procéder avec la mise à jour de ce manuel et, ce qui est tout aussi important, sur le format qui sera adopté.

J'aimerais vous rappeler que la **66e conférence annuelle de la Société canadienne de géotechnique (SCG)** aura lieu à Montréal, du 29 septembre au 3 octobre 2013, en collaboration avec l'Association internationale des hydrogéologues (AIH-SNC) et la North American Geosynthetics Society (NAGS). Cette conférence promet d'être l'un des plus ambitieux événements de la SCG à ce jour, grâce aux nombreux efforts du comité organisateur, sous la direction de **MM. Mario Ruel** et **Sylvain Roy**.

Finalement, j'ai hâte de relever les défis qui surviendront inévitablement au cours des deux prochaines années et de poursuivre la longue tradition de services rendus par notre Société à nos membres et à notre discipline.

From the Society

Call for nominations CGS President-Elect

The next President-Elect for the Society will be appointed effective January 1, 2014. The person appointed to this position will become President of the Society for the years 2015 and 2016.

In accordance with the By-Laws of the Society, a Nominating Committee will propose a suitable candidate for the President-Elect, 2014. In addition to the candidate proposed by the Nominating Committee, other candidates are also welcomed. Any general member of the Society may nominate a candidate for election to the position of President-Elect. Nominations must be received by the Society Secretariat in writing by June 15, 2013. Through the By-Laws of the Society, any such nomination shall have the written support of at least 18 general members as evidenced by their respective signatures, and a statement from the

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candidate agreeing to serve as President if elected. For further information, see the Society's Administration Manual in the Members Section of the CGS website. To find the Administration Manual, CGS members can log-in at http://cgs.ca/login.php, then proceed to Online Member Resources, find the CGS Manuals, and the Administration Manual.

If there are no additional candidates, the candidate proposed by the Nominating Committee will be elected by acclamation at the Meeting of the CGS Board of Directors preceding the 2013 Annual CGS Conference in Montreal. If additional candidates are nominated, an election by mail-in or electronic ballot will be held, open to all members of the Society, with submission of ballots no later than mid-night on July 15, 2013.

(Provided by Victor Sowa, Secretary General).

Call for nominations for CGS Awards

Nominations for CGS Awards may be submitted to:

The Canadian Geotechnical Society Secretariat, (8828 Pigott Road, Richmond, BC, V7A 2C4, Canada; Fax: (604) 277-7529, *e-mail: cgs@cgs.ca* by not later than June 1, except where noted.

The nomination letter must include:

- reasons why the individual merits the award relative to the nomination criteria
- any other pertinent information on the nominee
- C.V. of the nominee

Letters from other Canadian Geotechnical Society members supporting the nomination add strength to the nomination.

Nominators are recommended to review the full award details before preparing nominations for the Awards listed below. The Awards details can be obtained from the Society's Awards and Honours Manual, (Sections B-1 to B-12 inclusive), which is available to CGS members in the CGS Members Section of the CGS Website. CGS members can log-in at http://cgs.ca/login.php, then proceed to Online Member Resources, find CGS Manuals and proceed to the Awards and Honours Manual. Information can also be obtained from Division Chairs, Section Directors, and the Secretariat.

Funding for the Society's awards is provided by generous support from the independent charitable body, The Canadian Foundation for Geotechnique.

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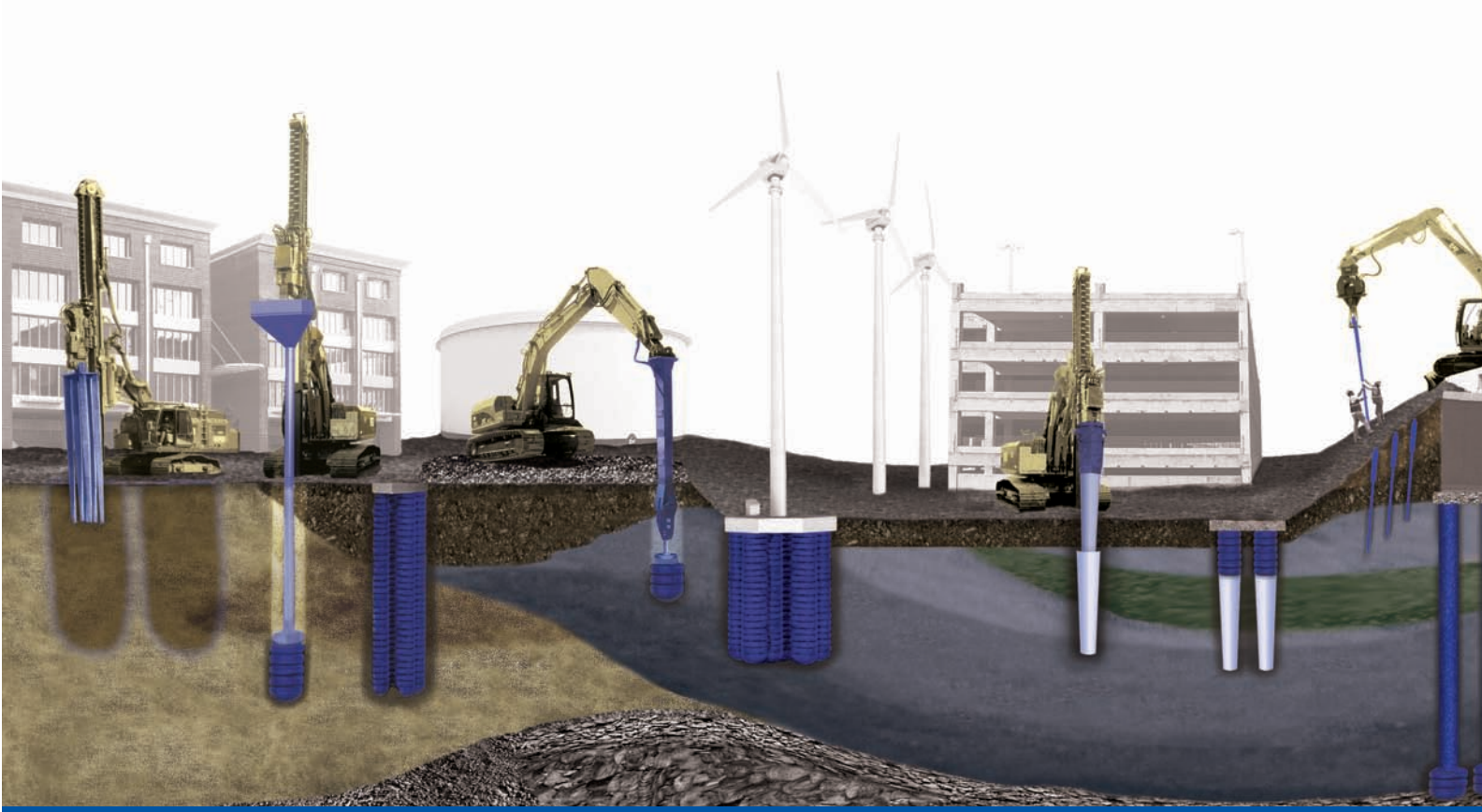

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Members are invited and encouraged to submit nominations for the following CGS Awards:

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Awarded to an individual for outstanding life-long contributions to geotechnique.

R.M. Quigley Award

Awarded to an individual or individuals for the best paper published in the Canadian Geotechnical Journal within the preceding year in which the prize is awarded. Nominations are made by the Associate Editors of the Canadian Geotechnical Journal.

G. Geoffrey Meyerhof Award

Awarded to an individual for outstanding and exceptional contributions to the art and science of foundation engineering.

Thomas Roy Award

This award is presented to honour an outstanding contribution to the field of Engineering Geology in Canada.

Roger J.E. Brown Award

The award is presented to an individual (preferably Canadian) for publishing the best paper on permafrost science or engineering in:

Canadian Geotechnical Journal, or

- Canadian Journal of Earth Sciences, or
- Proceedings of National or International Permafrost Conferences, or
- to honour an individual for their excellence in the field of permafrost.

Awarded every second year, it **will not** be awarded in 2013.

John A. Franklin Award

This award recognizes an individual or individuals, who have made an outstanding technical contribution in the fields of rock mechanics or rock engineering in Canada and or internationally. Awarded every second year, it **will** be awarded in 2013

Geosynthetics Award

This award was presented for the first time in the 2000 to recognize an individual or individuals who have made an outstanding technical contribution to the use of geosynthetics in Canada and/or internationally. Awarded every second year, it **will not** be awarded in 2013.

Geoenvironmental Award

This award was presented for the first time in 2000 to recognize an individual or individuals who have made an outstanding technical contribution to the practice of multidisciplinary geoenvironmental engineering in Canada and/or internationally. Awarded every second year, it **will not** be awarded in 2013.

Robert N. Farvolden Award

Following some years as the Hydrogeology Division Award, the Robert N. Farvolden Award was presented for the first time in 2002. The Hydrology Division selects the winner of the award, which recognizes outstanding contributions to groundwater science and engineering in Canada. The Awards Committee of the Hydrogeology Division commonly asks for input from the International Association of Hydrogeologists, Canadian National Committee, (IAH-CNC).

A.G. Stermac Awards for Service to the Canadian Geotechnical Society

Before 1999, these awards were known as the CGS Service Plaques. A.G. Stermac Awards are presented to members of the Society who have contributed specific or special, worthy and significant service(s) to the Society. All submissions must reach the Society's Secretariat not later than June 1.

CGS Graduate Student Award

For the best paper authored or co-authored and presented by a geotechnical graduate student at an accredited Canadian University. The winning paper each year is presented by the student at the annual Canadian Geotechnical Conference. All submissions and accompanying documentation must be received by the Chair of the Student Awards Sub-Committee on or before May 21 of the competition year. The contact information for the Chair is: Sumi Siddiqua, School of Engineering, University of British Columbia, Okanagan Campus, 1137

Alumni Avenue, Kelowna, BC, VIV 1V7, Tel: 250-807-9863, email: **sumi.siddiqua@ubc.ca**

CGS Undergraduate Student Awards

There are two undergraduate student awards that endeavour to increase student awareness of the Society and their involvement in it.

a. **The Undergraduate Student Report, Individual Submission Award** was established In 1987 with the main purpose of recognizing and rewarding excellence in the preparation of a geotechnical report by an individual full time undergraduate student in an accredited engineering program or a geoscience program in a Canadian University.

b. **The Undergraduate Student Report, Group Submission Award** was added in 1990 to recognize and reward excellence of a report prepared by one or more undergraduate students in an accredited engineering program or a geoscience program in a Canadian University.

All submissions and accompanying documentation must be received by the Chair of the Student Awards Sub-Committee **on or before May 21** of the competition year. The contact information for the Chair is: Sumi Siddiqua, School of Engineering, University of British Columbia, Okanagan Campus, 1137 Alumni Avenue, Kelowna, BC, VIV 1V7, Tel: 250-807-9863, email: **sumi.siddiqua@ubc.ca**

Late Breaking Award News

The honorariums for the Graduate and Undergraduate Group Awards have just been increased, but are not yet shown in the Honours and Awards Manual.

The **Graduate Paper Awards** are increasing from $750 to $1,000 for the winner and from $500 to $750 for the runner-up. The prize for the **Undergraduate Individual Report Award** remains unchanged for both the winner and runner-up. **The Undergraduate Group Report Award** was previously $750, to be shared by the entire group. It has now been increased to $500 for each person in the group, but capped to a group total of $2,000. For the runner-up group, the previous prize of $500 was to be shared by the entire group, but has now been increased to $250 per each person in the group, but capped to a group total of $1,000.

Provided by Victor Sowa, Secretary General

Upcoming Conferences

GeoMontreal 2013 September 29 - October 3, Montreal, Quebec

The Canadian Geotechnical Society (CGS) in collaboration with the International Association of Hydrogeologists (IAH/CNC) and the North American Geosynthetics Society (NAGS), invite you to **GéoMontréal 2013**, the 66th Canadian Geotechnical Conference and the 11th Joint CGS/IAH-CNC Groundwater Conference. The conference will be held at the Hilton Montreal Bonaventure Hotel, Montreal, Quebec, Canada from Sunday, September 29 to Thursday October 3, 2013.

The theme for GéoMontréal 2013 is "Geoscience for Sustainability" and will examine how our three associations invest in the progress necessary to create an innovative and prosperous economy that is ecologically and socially responsible. The organizers intend to weave the conference theme throughout the technical program and social activities and to remind delegates of this important goal in our professional work. The official languages for the conference will be French and English.

Contacts

Questions regarding sessions, topics and the technical program should be directed to the Local Organizing Committee

Geotechnical Sessions:
Catherine Mulligan, CGS Technical Chair
mulligan@civil.concordia.ca

Hydrogeological Sessions:
Marie Larocque, Quebec Representative for the IAH-Canadian National Chapter
larocque.marie@gmail.com

Geosynthetics Sessions:
Eric Blond, Quebec Representative for NAGS
eblond@gcttg.com

For General Inquiries:
Mario Ruel, Co-chair
mario.ruel@cn.ca

Sylvain Roy, Co-chair
Sylvain.Roy@lvm.ca

Canadian Young Geotechnical Engineers and Geoscientists (cYGEGC) October 3 to 6, 2013 Mont Tremblant, Quebec

Join us in Mont Tremblant for the 4th Canadian Young Geotechnical Engineers and Geoscientists Conference (cYGEGC) from October 3 to 6, 2013, a gathering of young engineers and geoscientists sharing technical knowledge and career experiences.

Conference Highlights include:

- exciting technical presentations from the delegates
- 5 keynote speakers with diverse career paths
- a field trip highlighting applications of geoengineering

More information is available at www.cygegc2013.ca

Geotechnical Society of Edmonton Short Courses April 11 and April 12, 2013 Edmonton, Alberta

The Geotechnical Society of Edmonton is pleased to present two 1-day short courses delivered by **Dr. Fred H. Kulhawy,** P.E., F.E., of Cornell University. Each course will be independent, so participants can attend either one day or both days. The course on day 1 is **Estimation of Soil Properties for Foundation Design**. Course concepts include soil property evaluation strategy, geologic inference in property assessment, comparative evaluation of in-situ tests, relative density assessment, in-situ stress evaluation, soil strength evaluation, and deformability estimation. Day 2 is **Geotechnical Uncertainty and Reliability-Based Foundation Design (RBD).** Course concepts include an overview of the development of geotechnical RBD for foundations in North America, followed by a discussion of basic issues of uncertainty, risk, judgment, and RBD formulation.

For further details on the courses and lecturer, and to register, please refer to the GSE website at **www.geotechnical.ca** or email **events@geotechnical.ca**

3rd Climate Change Technology Conference (CCTC 2013) May 27 - 29, 2013 Montreal, Quebec

The 3rd Climate Change Technology Conference (CCTC 2013) is a Canadian and international forum for the exchange of ideas for dealing with climate change. It is also an opportunity to keep abreast of emerging techniques and technologies for the mitigation of, and adaptation to, the impacts of climate change. The Engineering Institute of Canada (EIC) and ten of its member societies are organizing CCTC 2013, which will be held on the campus of Concordia University in Montreal. For more information, go to the conference website at www.CCTC2013.ca

Canadian Foundation for Geotechnique

Meet the 2013 Trustees for the Canadian Foundation for Geotechnique

The Canadian Foundation for Geotechnique is a registered charitable organization that works at arm's length from the Canadian Geotechnical Society (CGS), to recognize and foster excellence in the geotechnical field in Canada. It funds the annual CGS' student awards and prizes, the annual Canadian Geotechnical Colloquium, the travel costs associated with the two Cross Canada Lecture Tours each year, and offers its own annual $5000 National Graduate Scholarship.

The Foundation is managed and overseen by a number of volunteer Trustees who represent the breadth of the geotechnical field in Canada. The Trustees for 2013 are, in alphabetical order:

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–

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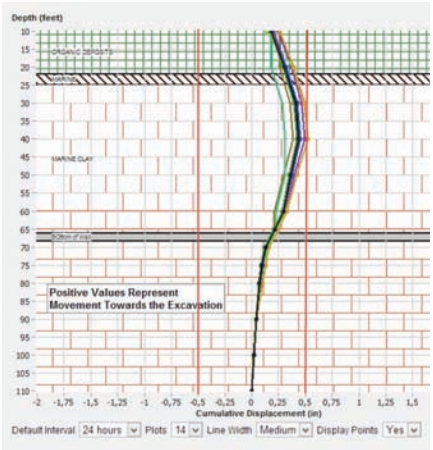

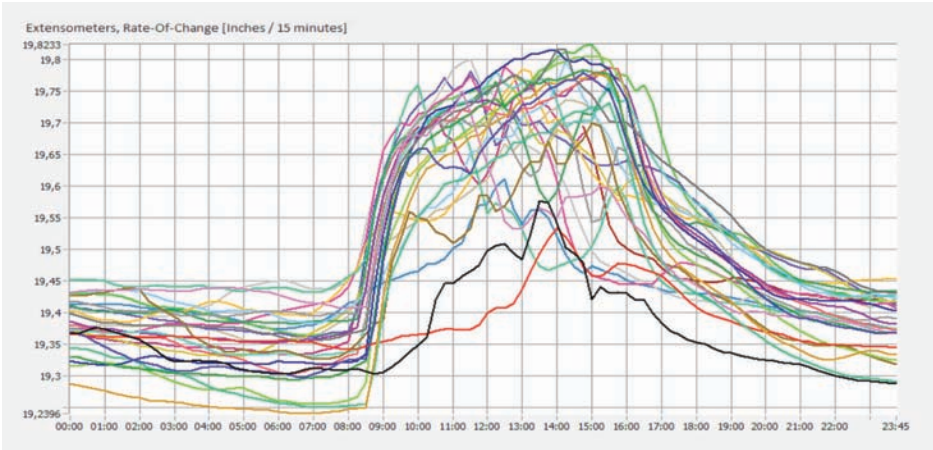

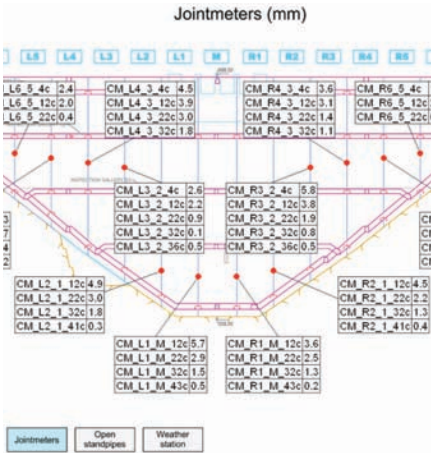

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Astute readers of this column will note a new name among the Trustees. Harry Oussoren has joined the Foundation both as a Trustee and as Treasurer. In 1992, Harry Oussoren, PEng (ON and BC) founded Insitu Contractors Inc, based in Guelph, ON. Insitu Contractors specializes in construction dewatering and environmental groundwater control projects. A graduate from University of Toronto (BASc, Geological Engineering; MEng, Civil Engineering), Harry previously worked with Terraprobe, Golder Associates, JW Stang and Griffin Dewatering. Harry served as CGS Vice President of Finance in 2005 and 2006. He more recently served as Chair of Finances for the very successful Pan-Am CGS Geotechnical Conference held in Toronto in 2011. His membership in the Royal Canadian College of Organists provides a hint of how Harry spends some of his leisure time.

As we welcome Harry as a Trustee and Treasurer, we would also like to thank David Harding who is stepping down as Treasurer after eight years of excellent service. Beside overseeing the finances of the Foundation, David initiated and helped develop the Foundation's website.

In order to fulfill its mission, the Foundation relies on donations from individuals, corporations. It also receives donations and interest-free loans from the local sections and technical divisions of the CGS. To learn more about the Foundation, its activities, and to learn how you can help, visit the Foundation's website, at **www.cfg-fcg.ca.**

Provided by Doug VanDine, President

Editor

Don Lewycky, P.Eng.

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(Additional information for the various positions shown below is located on the CGS website at **www.cgs.ca**)

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GEO MONTRÉAL 2013

66TH CANADIAN GEOTECHNICAL CONFERENCE / 66E CONFÉRENCE GÉOTECHNIQUE CANADIENNE

September 29 – October 3 2013 / 29 septembre – 3 octobre, Montréal, Québec

The Canadian Geotechnical Society (CGS) in collaboration with the International Association of Hydrogeologists-Canadian National Chapter (IAH-CNC) and the North American Geosynthetics Society (NAGS) invite you to GéoMontréal 2013, the 66th Canadian Geotechnical Conference and the 11th Joint CGS/IAH-CNC Groundwater Conference.

The theme for GéoMontréal 2013 is **"GEOSCIENCE FOR SUSTAINABILITY"** and will examine how our three associations invest in the progress necessary to create an innovative and prosperous economy that is ecologically and socially responsible.

GÉOMONTRÉAL 2013 CONFERENCE PROGRAM HIGHLIGHTS WILL INCLUDE:

- R M Hardy Address presented by Dr. Michel Aubertin (École polytechnique)
- Comprehensive Industry Trade Show with over 50 exhibitors
- Over 600 delegates and more than 300 technical and special presentations over three days!
- 6th annual CGS Gala Awards Banquet and Local Colour Night at Montreal's Centre des sciences in the old port

TENTATIVE TECHNICAL THEMES

Fundamentals
- Engineering Geology
- Foundation Engineering
- Geoenvironmental
- Landslides / Slope Stability / Slope Engineering
- Reliability-based and Limit State Design
- Risk Assessment
- Soil and Rock Mechanics
- Seepage
- Soil Stabilization

Geotechnical
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- Geohazards
- Retaining Walls
- Mechanically Stabilized Earth Walls
- Brownfields and Redevelopment
- Mine Site Remediation
- Design of Earth Dams
- Design of Clay Liners
- Marine Geotechnics
- Non-textbook Soils / Waste Soils
- Harbour and Shoreline Geotechnics
- Mining Geotechnics
- Cold Regions Geotechnology

Geosynthetics
- Wall Reinforcement
- Confinement in Solid Waste Landfills and Mining Operations
- Drainage and Soil Filtration
- Geosynthetics in Mining Processes
- Water Conservation
- Dams and Levees
- Environmental Engineering
- Case Histories or Failures
- Conveyance and Storage
- Transportation
- Temporary Roads

Multi-Disciplinary
- Geoenvironmental Sustainability
- Instrumentation

Hydrogeological
- Groundwater-Surface Water Interactions and Ecohydrology
- Contaminated Sites and Remediation Technology
- Regional Aquifer Characterization
- Groundwater Management
- Groundwater Quality
- Groundwater Issues Associated with Mineral and Gas Mining
- Impacts of Climate Change on Groundwater Resources
- Isotopic Tracing and Age-dating in Groundwater
- Groundwater and Geotechnics
- General Hydrogeology

The conference will be held at the Hilton Bonaventure in downtown Montréal, Québec.

Please see the conference web site at **www.geomontreal2013.ca** for detailed conference information and to register online. Be sure to register before July 31, 2013 to take advantage of early pricing discounts!

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Introduction by John Dunnicliff, Editor

This is the seventy-third episode of GIN. Just one article this time. As you'll see below, I'm struggling to find contributors.

Field monitoring challenges

I've agreed with colleagues at Monir Precision Monitoring Inc., Mississauga, Ontario, a specialized monitoring contractor, to include in GIN a series of articles titled *Field Monitoring Challenges.* Here's the first one. Our purpose is to tell about challenges that occurred in the field, their resolutions and the lessons learned. Straightforward practical stuff!

Lessons learned. I need you

A significant number of articles in recent GINs have described new and emerging technologies. It's been exciting for me to learn about these, but I'd now like to take a step towards nuts-and-boltsy things, and lessons learned, primarily lessons learned from unexpected events in the field. All of us in this business have such stories to tell, and if we share them we can learn from each other. So – please – ask yourself whether you could contribute some of these stories for GIN. They don't need to be complex things, and you can refer to "Project X". I well understand that you may have difficulty with employer or client approval, in which case I'm happy to refer to you as "Anonymous", and promise not to disclose your name to anyone.

In the past, I've had very little response to pleas for contributions, and have usually had to rely on arm-twisting. **Please let me hear from you.**

Smile for the day

When I was checking out of a hotel recently, the receptionist had just put her phone down and was laughing. I asked her to share the joke. She said that the call was from a man in one of the rooms, asking how he could get out of his room. "I told him that there were two doors, one to the bathroom and one to go in and out of the room". He said, "But that one has a sign on the handle saying, *"Please Do Not Disturb"*.

The next continuing education course in Florida

This will be on April 7-9, 2013 at Cocoa Beach. If it's cold where you are, come and join us, and keep warm! Details are on www.conferences.dce.ufl.edu/geotech. Also see the announcement on page 27.

Closure

Please send contributions to this column, or an abstract of an article for GIN, to me as an e-mail attachment in MSWord, to *john@dunnicliff.eclipse.co.uk, or by mail: Little Leat, Whisselwell, Bovey Tracey, Devon TQ13 9LA, England. Tel. +44-1626-832919.*

Kippis (Finland)

Field monitoring challenges. Episode 1 Unforeseen piling details and damage to inclinometer casing

Marcelo Chuaqui and Wing Lam

Introduction

We have agreed with the editor of GIN to contribute a series of articles, titled *Field Monitoring Challenges*. In these articles we will describe situations where the recommended monitoring practices could not be performed, followed by the solutions to and consequences of these challenges. We present these from the perspective of a specialized monitoring contractor, believing that there is value in sharing our experiences and the lessons learned.

In an ideal world we all could execute perfect monitoring programs. We would be able to utilize a systematic approach to the planning and execution of each project. The process of systematically planning and executing a monitoring program is well understood and defined in texts such as Geotechnical Instrumentation for Monitoring Field Performance by John Dunnicliff.

However, real-world constraints force implementation of less than ideal mon-

itoring programs. Practical constraints include short schedules, limited budgets, no easy access to areas, damage to equipment or instrumentation, lack of understanding of roles and responsibilities, unexpected changes, and conflicting priorities/goals/experience amongst project stakeholders.

In such cases we need to evaluate the situation and adapt the monitoring program in order to achieve its objective of providing vital information. We have to remember that the monitoring data is of importance for monitoring the performance of a design or structure, to verify assumptions and mitigate risk, as well as the safety of all those involved in the construction.

Challenge 1 – Unforeseen piling details

At a high-rise condominium project in downtown Toronto, the monitoring plan included inclinometer casings attached to piles, and targets on the piles for monitoring movement of the shoring wall. These reflective targets are typically placed at the top of each pile for monitoring of horizontal and vertical movement of the shoring and are surveyed with an accuracy of ± 2mm. A typical site can have 100 to 300 piles. While there is expected movement of the wall, neighbouring buildings and structures are not expected to experience movement. The plan also included precision targets using prisms or reflective targets that are placed on the structures, usually along the perimeter of the walls and in far fewer numbers than the targets on the piles, and are surveyed with an accuracy of ± 1mm. In addition, five extensometers were installed in sensitive areas to measure horizontal wall movements and an array of electrolevels was placed along joints in the adjacent underground subway transit to monitor horizontal and vertical differential movements between tunnel segments.

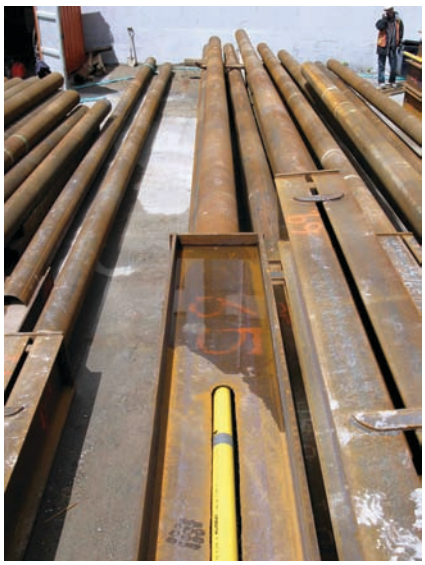

Figure 1. Lower section of pile with inclinometer casing transition to pipe pile.

Our typical installation detail for monitoring of shoring excavations involves attaching the inclinometer casings to the piles. The inclinometers were to be installed in eight locations and ranged from approximately 76 to 110 feet in length. However, due to their extreme depths, the piles for the shoring wall were not the typical wide flange I-beams used in local construction. Instead, two of the wide flange beams were welded together along their length and a pipe pile was welded to the bottom to extend the overall lengths. Due to space, budget and schedule constraints switching to drilled inclinometers was not practicable, and we needed to work with the shoring contractor to achieve an atypical method of attaching the inclinometer casings.

An installation method was devised to run the casing along the outside of the double pile at the upper end. A long notch was cut out of the middle of the pile nearing the transition to the pipe pile at the bottom. The inclinometer would be slightly curved to run down into the notch and into the centre of the pipe pile below, shown in Figure 1.

To avoid excessive movement in the pipe pile section that would affect readings, centralizers were positioned along the length of the casing as seen in Figure 2. Figure 3 shows a custom-made base, consisting of a metal tube (which would contain the bottom of the inclinometer casing) welded to a flat plate, which was in turn welded to the edge of the bottom of the pipe pile to prevent any downward movement of the inclinometer casing.

With the successful installation of the inclinometer casing, readings proceeded as the shoring wall was installed and excavation progressed.

Challenge 2 – Damage to inclinometer casing

A problem arose when during the installation of a tieback, the drill rig hit an installed inclinometer casing. Fortunately, the site personnel contacted our staff to notify us of the situation. If the tieback installation had continued, the inclinometer casing would have been filled with grout.

To salvage the inclinometer and the vital information it provided, staff developed a plan to thread a smaller diameter casing into the damaged casing. The annulus between the larger and smaller casing was grouted to prevent movement and anomalous readings. This remedy was successful and inclinometer readings were continued.

Lessons Learned

In this brief case history, the installation of the inclinometer casing was atypical and the execution was a challenge. There was also unforeseen damage to one of the inclinometer cas-

Figure 2. Centralizers in pipe pile section.

Figure 3. Custom welded inclinometer base.

ings in the midst of construction and the monitoring program.

Lesson learned 1: Work with clients, owners and contractors that value the benefits obtained from the monitoring.

With respect to the unforeseen pile details, a good relationship with the shoring contractor (Anchor Shoring & Caissons Ltd) was vital in permitting a practicable solution to be achieved. Flexibility was essential to adapt to the challenge presented as we worked together with good communication towards a solution.

It is our experience that this type of challenge can be addressed when the parties all understand the value of the monitoring. It is therefore important that those who do understand the value do all that they can to convince others.

Lesson learned 2: Have redundancy in the monitoring program.

When planning a monitoring program it is important to have back-up or build redundancy into the system. Inclinometers and targets on the piles utilize different methods to provide horizontal displacement data that can be correlated.

In this case, if the damaged inclinometer casing could not have been recovered, the targets on the piles were available as an alternative means of measuring movement of the shoring wall. In other instances, a string of targets on the piles have been added vertically to the face of the piles as a substitute for an inclinometer casing, although these alternatives would not provide data for sub- surface movements.

Marcelo Chuaqui, General Manager
Wing Lam, Instrumentation Specialist

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* Attn. engineering students ... Submit your Thesis Abstracts for publication in the June Issue of GN!

Since 1995, Geotechnical News has published the annual listing of North American PhD. theses in engineering.

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- Author name
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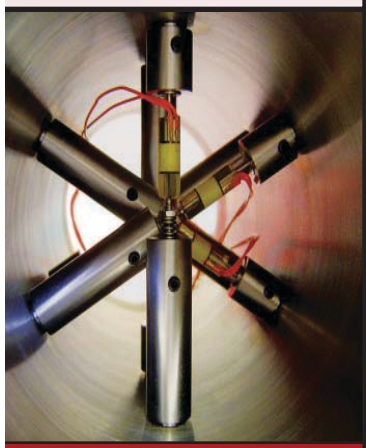

The University of Florida

Geotechnical Instrumentation (GI) for Field Measurements

April 7-9, 2013

Doubletree Hotel • Cocoa Beach, Florida

Course Director: John Dunnicliff, Consulting Engineer

COURSE EMPHASIS: is on why and how to use GI to monitor field performance. The course will include planning monitoring programs, hardware and software, recent developments such as web-based and wireless monitoring, remote methods for monitoring deformation, case histories, and lessons learned. Online sources will be included, together with an open forum for questions and discussion.

AUDIENCE: engineers, geologists and technicians who are involved with performance monitoring of geotechnical features of civil engineering projects and project managers and other decision-makers who are concerned with management of RISK during construction.

OBJECTIVE: to learn the who, why, and how of successful geotechnical monitoring while networking and sharing best practices with others in the GI community.

INSTRUCTION: provided by leaders of the GI community, respresenting both users and manufacturers:

Marcelo Chuaqui, Monir Precision Monitoring
Loic Galisson, SolData Group
Pierre Gouvin, GEO-Instruments
Aaron Grosser, Barr Engineering
Daniele Inaudi, Roctest/Smartec
Allen Marr, Geocomp
Paolo Mazzanti, NHAZCA
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Paolo Gazzarrini

Overture

30[iest] edition of the Grout Line, and for this issue I have a very interesting article about the use of dyed grout in a grouting job carried out in US, at Wolf Creek Dam-Kentucky.

The article has been prepared by Brook Brosi, P.G. and Clay Rathbun.

Mr. Brook Brosi P.G. is a geologist with the Army Corps of Engineers at the Wolf Creek Dam construction office. He has over 11 years of experience with the Corps in 3 different offices, including oversight on grouting jobs at Mississinewa Dam (IN), McAlpine Lock (KY), and Wolf Creek Dam (KY). (Brook.E.Brosi@usace.army.mil - US Army Corps of Engineers, Nashville District, 100 Power Plant Road, Jamestown, KY 42629).

Mr. Clay Rathbun is a Vice President at the Judy Company Inc in Kansas City, KS, where he has been working as a Geologist for the past 25 years. After spending 4 years in the Navy, Clay received his bachelors degree in science in geology at Kansas State University. (crathbun@judycompany.com- The Judy Company Inc, 8334 Ruby Ave, Kansas City, KS 66111)

It's again time to remind everyone interested in grouting that June 17-21, 2013 the Colorado School of Mine (Golden-CO) will hold the 34th Annual Short Course "Grouting Fundamentals and Current Practice".

The Course can be useful both for Engineers and Contractors interested in grouting and in general for rock/soil improvement. For additional info here is the web address: http://csmspace.com/events/grouting/

Use of dyed cement grouts in foundation grouting

Brook E. Brosi and Clay Rathbun

Abstract:

At Wolf Creek Dam, the US Army Corps of Engineers decided to use dyed grouts to be able to differentiate recent grouting efforts [2011-2012] from historic efforts [1940s and 1968-1975]. The contractor, The Judy Company, Inc., mixed dye with all of their grout. The use of dyed grout was a success. Dye is available to differentiate grouts. Dye also has the possibility

to reduce liability for Contractors—"That's not my grout, it's the wrong color!" A review of grouting textbooks reveals near-silence regarding the use of dyes in cement grouts. Future editions could be updated with information on grout dyes.

Background

A review of grouting textbooks reveals little information regarding dyes, which are also known as pigments or colorants. The US Army Corps of Engineers Grouting Manual, EM 1110-2-3506 (USACE, 1982), mentions iron oxide and chromium oxide dyes for grout on pages 6-30 and 6-31. Houlsby (1990) mentions colored/dyed grout only in passing on page 4 of his text; dyes are excluded from his discussion on grout materials [Chapter 3]. Weaver (1991) mentions dye on page 7, referencing O'Neill and Lyons (1963). Warner (2004) does not mention dyes in his chapter on grout materials [Chapter 3]. Weaver and Bruce (2007), in Chapter 4, entitled grout materials, do not mention dyes. ASCE (2010), the Consensus Guide for Compaction Grouting, does not mention dyes.

O'Neill and Lyons (1963) is the most-often referenced paper on grout dyes in textbooks. This paper, published in the 1960's, pre-dates the publication of ASTM C 979 in 1982, and adverse impacts on grouts by some trial dyes were noted. This paper is significantly out of date with respect to grout dyes.

The ASTM standard labeled ASTM C 979, entitled "Standard Specification for Pigments for Integrally Colored Concrete" was introduced in 1982 (ASTM 2010). The ASTM Standard requires that dyes be tested for chemical properties to ensure they are compatible with water and cement (ASTM 2010). The ASTM C 979 standard requires that colorants not degrade the setting times, air content and compressive strength of the concrete [or grout] mix (ASTM 2010). In addition, the percentage of dye is limited to ten-percent, by mass, of the concrete [or grout] mix (ASTM 2010). Since 1982, dyes have become widely used in the mass concrete business (Forgey, 2005). However, a literature search reveals the use of dyed cement grout is either rare or never publicized.

Figure 1. Location of the grout lines.

Trial location

Wolf Creek Dam is a combination concrete gravity and earthfill structure located at mile 460.9 of the Cumberland River near Jamestown, Kentucky. Wolf Creek Dam contains a hydroelectric powerhouse. Wolf Creek Dam's 5,736 feet of total length, includes the concrete section, which is 1,796 feet long, ties into the left abutment, and extends across the old river channel toward the right abutment. It has a maximum structural height of 258 feet (dam crest to base of concrete dam) and contains a gate control section, a powerhouse section, and non-overflow sections on both ends. The earth embankment is 3,940 feet long and includes a section which wraps around both the upstream and downstream sides of the right end of the concrete monolith. Normal storage in Lake Cumberland, created by the dam, is about four million acre-ft. Up to six-million-acre-ft can be impounded at a maximum pool elevation of 760. It is the largest reservoir east of the Mississippi River (by volume), and the ninth

largest in the United States. Immediately downstream of the dam is a trout hatchery operated by the US Fish and Wildlife Service.

Two grout lines were required by the contract. The first grout line was in the gallery tunnel near the base of the concrete gravity structure. A second grout line was along the downstream toe near the contact between the concrete and earth fill adjacent to the switchyard associated with the hydroelectric powerhouse. Both grout lines paralleled grout lines placed in the 1940s (gallery) and 1968-1975 (downstream toe). The designers decided that it would be beneficial to be able to differentiate between the modern grouts and historical grouts by color, and thus required dyed grout. In addition, it was thought that dyed grout would be easier to notice if grout found its way into the trout hatchery intake, which was located as close as 50-feet to the downstream toe grout line. Figure 1 shows the location of the grout lines, along with the trout hatchery.

Methods

A wet dye injection system was utilized for the injection of dye at Wolf Creek. Dye was provided by the supplier wet and injected wet. Colloidal grout mixers were utilized by the contractor to mix the grout, and the dye was mixed with the grout in the colloidal mixer. The ASTM C 979-compliant dye chosen by Judy Company was sourced from Solomon Colors, and yellow was the color chosen. The dye was mixed at 2.5-percent by weight of cementitious material (Portland cement plus fly ash).

Wasted grout is a fact of life on production grouting jobs, and dyed grout could complicate disposal. Grout that is not injected into grout holes is typically wasted; this includes the quantity used to fill the grout lines. Once hardened, the dye is trapped in the grout. However, in the liquid state or semi-solid state, when mixed with water, there is the probability that the water-soluble dye could enter

Figure 2. Dyed and un-dyed Grout Samples. Concentrations of dye (by weight of cement) are 0-percent, 2.5-percent, 5-percent, and 7.5-percent, as marked on the samples.

the waste water stream. Dyed water is pretty obvious when entering a watercourse.

A temporary waste water treatment plant was established at the beginning of the job to treat drilling fluids, rainwater, water from gallery drains, waste grout and other associated contract waste waters. The Corps had concern that some dyes may be very difficult to remove from the waste-water stream, and therefore did not specify the color to be used. Discharge of dyed water into the Cumberland River would be negative from several standpoints. The waste water treatment plant was able to successfully remove all traces of dye from the discharge water.

Effects of the dye on grout

There were rigorous grout testing requirements on this contract. A suite of six grout mixes was developed by the contract to meet contract requirements, with water-to-cement ratios ranging from 1.9 to 0.7. Grout mixes were tested every four hours for viscosity using a Marsh funnel and density using a mud balance. Every day, grout cubes were cast and later tested for compressive strength at 7, 14, and 28 days. Bleed and pressure-filtration tests were conducted weekly. Initial set time and final set time tests were conducted monthly. Testing showed the dyed grout to consistently be within specified limits.

One day, a batch of un-dyed grout was mixed immediately before a dyed

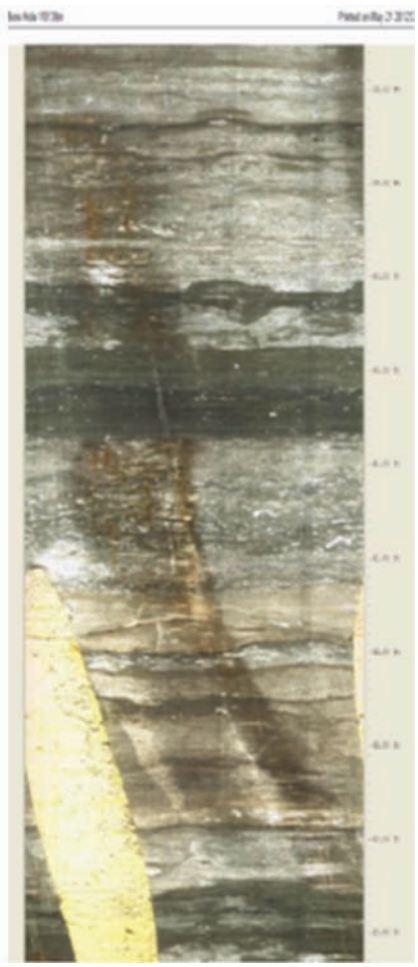

Figure 3. Dyed grout in an intersected hole in a downhole camera image. The image shows the entire circumference of the hole. Noted depth intervals are 6-inches on the right side, interval for image is 58.76 ft to 63.65 ft.

grout batch; testing showed little difference in physical properties between dyed and un-dyed grout. Compressive strength testing was performed on un-dyed and dyed grouts. The strength differences were negligible. The same batches were tested for Marsh Funnel Viscosity, Mud Balance Density, Bleed, Pressure Filtration, and Set Time. None of these tests showed any differences between the dyed and un-dyed grout.

Results

The dyed grout worked as desired. Figure 2 shows a photograph of hard-

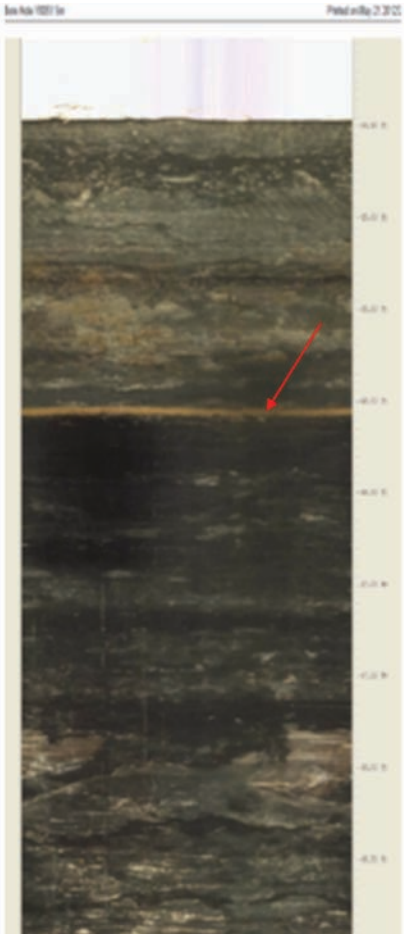

Figure 4. Dyed grout in downhole camera image. The image shows the entire circumference of the hole. Horizontal lens of dyed grout is from 46.05 to 46.10 feet (red arrow). Depth interval of the image is 44.02 to 48.92 feet. The white at the top of the hole is a PVC casing.

ened samples of dyed and un-dyed grout. The dyed grout was easy to differentiate from older grout. As an example, Figure 3 shows a down-hole camera image showing an intersected hole containing dyed grout. Either an old or new hole could have been intersected; the dye allows differentiation. The dyed grout was easier than un-dyed grout to note in the gray rock foundation. As an example, figure 4 shows a thin (less than 1/2-inch tall) horizontal stringer of grout in a downhole camera image. The dyed grout helped protect the adjacent trout hatchery from any damage; a single release of dyed grout was easily detected (Figure 5) and grouting was halted. The dye had no negative effects on the physical properties of the grout, as noted earlier.

Contractual discussion

Costs of dye injection mobilization and demobilization were paid for by lump sum, and grout was paid for by dry weight. The authors would discourage the use of dye 'per gallon of grout' or 'lump sum for the job' as it may temp a contractor to gradually reduce the amount of dye used unless the exact percentage of dye is established by binding agreement. Paying by the dry weight also allows the owner the flexibility to increase the concentration of dye if an especially bright batch of grout is desired. Cost estimates for work with this requirement should include costs for mobilizing, installing, operating, and demobilizing a dye injection system, as well as the cost of the dye.

Potential uses for dyed grout

A number of uses for grout dye can be determined, with a little imagination. Any time there could be a reason to differentiate grouts, dye can be utilized. The reason for the color differentiation at Wolf Creek was to distinguish the current grouting campaign from previous grouting campaigns.

Other ideas include dying different series of holes (Primary, Secondary, Tertiary, etc.) each being dyed a separate color. In multiple-line grouting, each separate line could be dyed a separate color. If two contractors are working on the same site, at least one could be required to dye their grout to differentiate their grouts. Low Mobility Grout could be distinguished from High Mobility Grout by use of dye. Dye could be used on microfine cement grouts to differentiate them from coarser cement grouts, if both are utilized on the same site. When grouting a mass concrete structure, dyed grout is potentially much easier to identify than un-dyed cement grout.

No grouting job is too small for the use of color. Quikrete produces single ASTM C 979-complaint liquid dye bottles, with each 10-ounch bottle of dye reportedly coloring roughly two bags of cement (Quikrete, 2012).

Figure 5. Dyed grout coming out into the river. This was a single occurrence and grouting was immediately stopped.

Quikrete products are widely available; this is a source of dye for small grout jobs.

Dye colors discussion

ASTM C 979 recommends the use of white Portland cement for dyed concrete [or grout]; the use should be minimally considered, but is strictly not necessary—it was not used for this trial (ASTM 2010). The authors believe any proposed dye should meet ASTM standard C 979 (ASTM 2010) to ensure that the dye is compatible with the cementitious grout. Gray should be discouraged as a color because Portland cement is commonly gray; black should be used with great care for the same reason. A contractor should be required to submit actual physical samples (e.g., hardened cubes or cylinders) of dyed grout, possibly at different concentrations, to ensure the owner is satisfied with the amount of dye included.

Conclusions

While dyed grout is not widely used for foundation grouting, there are no compelling reasons why it cannot be used, when a reason exists for differentiating grouts. ASTM C 979 should be specified for dyes when colored grouts are chosen to ensure that the dye is compatible with the cementitious grout. Contractors and owners should consider the benefits of dyed grout versus the costs.

Acknowledgements

The authors would like to thank the Nashville District Engineering Branch for the idea to dye the grout and championing the contract modification, in particular, Mr. Mike Zoccola. The authors would also like to thank the Judy Company for their work on the above mentioned project and for their support of this paper, in particular, Mr. Pat Carr.

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I hope you enjoyed the article as I did. I commonly use dye in grout mixes for jet grouting in test sections, so it is possible to better analyze, in the excavated columns, the behavior of the jet and the superficial results.

I agree with the authors that the use of dyed grout mixes can be beneficial in trying to understand better what is happening in the grouted fissures.

I additionally agree that little information is available about this topic, so if you have some experience on this intriguing subject, please send me your case history for publication.

For grouting stories, case histories or only to comment, you can write to me: *Paolo Gazzarrini, paolo@paologaz.com, paologaz@shaw.ca or paolo@groutline.com.*

Ciao! Cheers!

Does BH stand for bore-hole or borehole-hypothetical?

Robert P. Chapuis

During my career as a consultant, and then as a professor, I have had the privilege to be an expert witness in several cases of dispute, for all kinds of geotechnical and groundwater problems, most often for failure causation analyses. The work and duties of experts are defined by Procedure Rules, which depend on the country, state or province. In Canada, the plaintiffs and the defendants hire expert witnesses to technically evaluate facts or actions, typically complex issues beyond the general knowledge and experience of the judge, jury or court. In a few legal cases, however, the court, or the judge, can call upon an expert for technical help.

In Canada, each party will usually commission one or several experts to produce reports and statements for a professional fee. Each party's attorney then produces his expert reports to the court, which makes them available to other parties. The experts of the different parties rarely produce a joint statement detailing points of agreement and disagreement to assist the judge or court. This situation, an adversarial approach, frequently leads to consider that an expert witness works and testifies on behalf of one party to support that party's version of the case, and promote that party's interest over any other interest. Frequently, the judge recalls that an expert witness is required to provide independent assistance to the court by way of objective unbiased opinion in relation to matters within her or his expertise. However, there is a clear conflict of interests between this legal duty to the court and the financial link between the expert and the commissioning party. As a result, according to my experience, a "hired gun" position is frequent in engineering issues, but most often a judge perfectly grasps the situation. In one case for which I testified in court, the judge clearly had doubts but did not keep them for himself. He decided to clarify them by asking questions to the expert and his attorney, which revealed that the expert's fee included an hourly fee plus a commission depending upon the outcome of the dispute.

However, most often, the experts do not testify in court because the case never reaches it. A dispute may last several years before the court hearings. During this long period the experts help the litigation attorneys and the parties to clarify the facts. According to my experience, helping to clarify a situation is the main role of an expert witness in Canada, because 90 to 95% of disputes never reach the court, the parties finding an out–of–court settlement before court action begins.

An out–of–court settlement is a legal contract between the parties, which ends the dispute without a trial. The court may enforce the settlement, but frequently the parties file a notice that the case has been dismissed. In almost all cases concerning foundations and groundwater, the parties decide to keep its content and all other information sealed and confidential. As a result, an expert cannot publish on the technical issues and findings of the case. This is unfortunate for the engineering profession, because many failures and mistakes are never reported or documented in technical publications, which could avoid repeating the same mistakes.

This interdiction is unfortunate. Over the past few years, the author has asked for authorization to publish scientific issues on a few old cases, with a settlement typically older than 20 years, among over two hundred cases for which he was not authorized to publish. Authorizations by the owners and their current legal counsels have requested that all names and legal issues be kept confidential. In addition, no photograph can be published, which would enable identification of a site or person. For example, such conditions were requested for the recently published old case history of a municipal swimming pool (Chapuis 2010).

The next issues of Geotechnical News will present a few short papers on my "interesting" old cases, but unfortunately for the readers (and fortunately for those involved) without names and identifiable photographs. All cases include issues related to foundations, groundwater or the environment. A first case history is presented herein. It explains a situation that many professionals have heard of, but in which very few (I hope) have been involved.

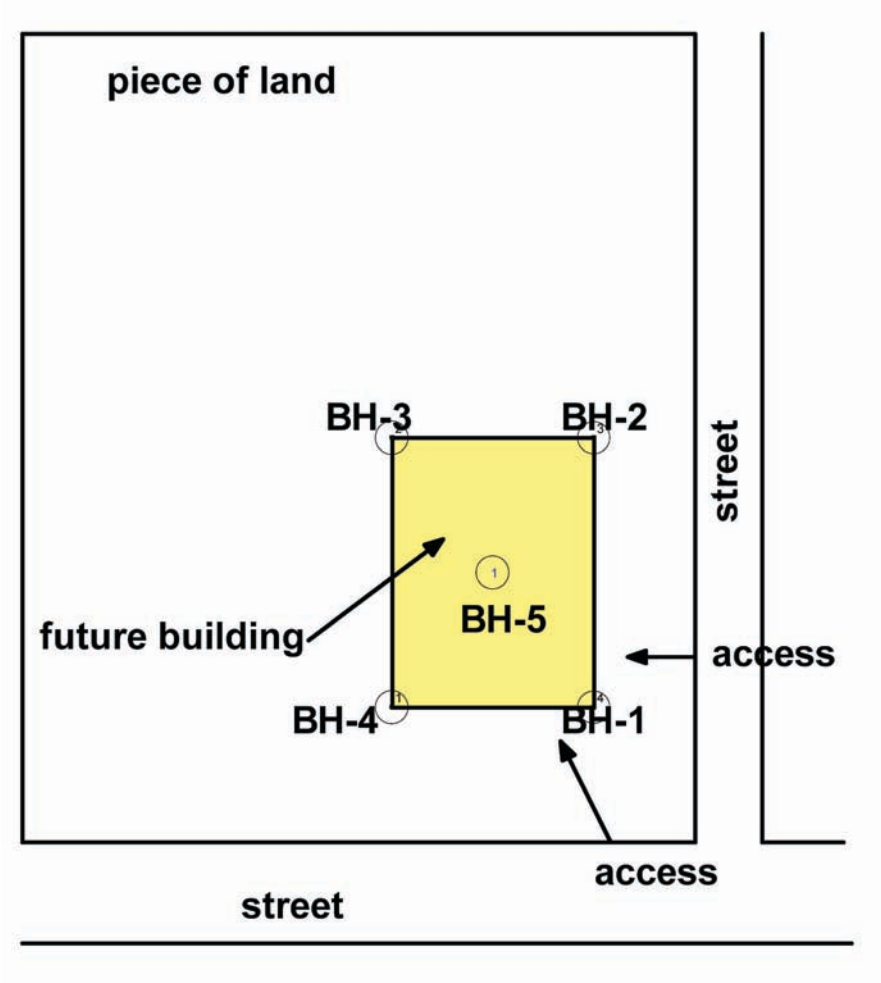

Figure 1. Sketch of the project with location of boreholes.

Field investigations

The owners wanted a new building for their recently bought piece of land. The land looked nice, had mature trees, and a good value, being very close to an urban area. The owners retained the services of a geotechnical company for the investigations, and the services of an engineering company for the technical specifications, drawings, call–for–tenders documents, and quality control of the construction, including as-built drawings.

A sketch of the piece of land is shown in Fig. 1, with two accesses from the streets. The owners and their consultants agreed to perform a field investigation with five boreholes, one in the middle of the planned edifice, and four at the corners. The geotechnical company did the investigations, established the stratigraphy, collected soil samples, and installed two monitoring wells in BH-1 and BH-5. According to the geotechnical report, the soil was a thick deposit of gravely sand, with some silt and cobbles. The standard penetration tests indicated that the deposit was dense in its upper 2 m and very dense below. The presence of some construction debris, in the upper 2 m, led the geotechnical company, in its report, to suspect some backfill. The water table was at a depth close to 5.5 m. Taking into account the soil type and the water table depth, no groundwater problems were anticipated during the planned excavation down to a depth of about 2.5 m. The boreholes were stopped at a depth of about 9 m without reaching the bedrock.

Excavation and discoveries

When the excavation proceeded, there was a big surprise. Below a silty gravely sand about 1.5 m thick, a very old dump was found under about three quarters of the piece of land, with all types of rubbish down to a depth of about 5 to 5.5 m (Fig. 2). The contractor threatened the owners for unanticipated soil conditions, and for extra costs (excavating 3 m deeper than anticipated, having a broader than expected excavation, transporting the rubbish to the dump, buying acceptable backfill material, backfilling the big pit in layers and compacting them to be able to support the new building, etc.).

It was discovered that many years ago, the previous land owners used their lot to extract soils and sell them to contractors. An old pit was deepened until it reached the water table and the limits of the lot, except in the access zone. Then, the owners realized they could make money by letting people and companies bring rubbish to the pit. The pit was filled in, and the rubbish somewhat settled due to decomposition and a few fires. Finally, the surface was covered with five feet (1.5 m) of backfill, more or less compacted, the plan being to make the piece of land look more natural and get more value. The lot was sold and bought many times between the old events and the recent acquisition. This gave enough time for trees to mature and make the land look natural.

Clearly, the geotechnical investigation should have discovered the large dump. Being asked more money by the contractor, the owners were furious against the geotechnical company for having misled them. For the owners, it meant that the geotechnical company had not properly done its work, and that the cost of the project was notably increased. Keep in mind, however, that this project was done a long time ago, when the environmental rules

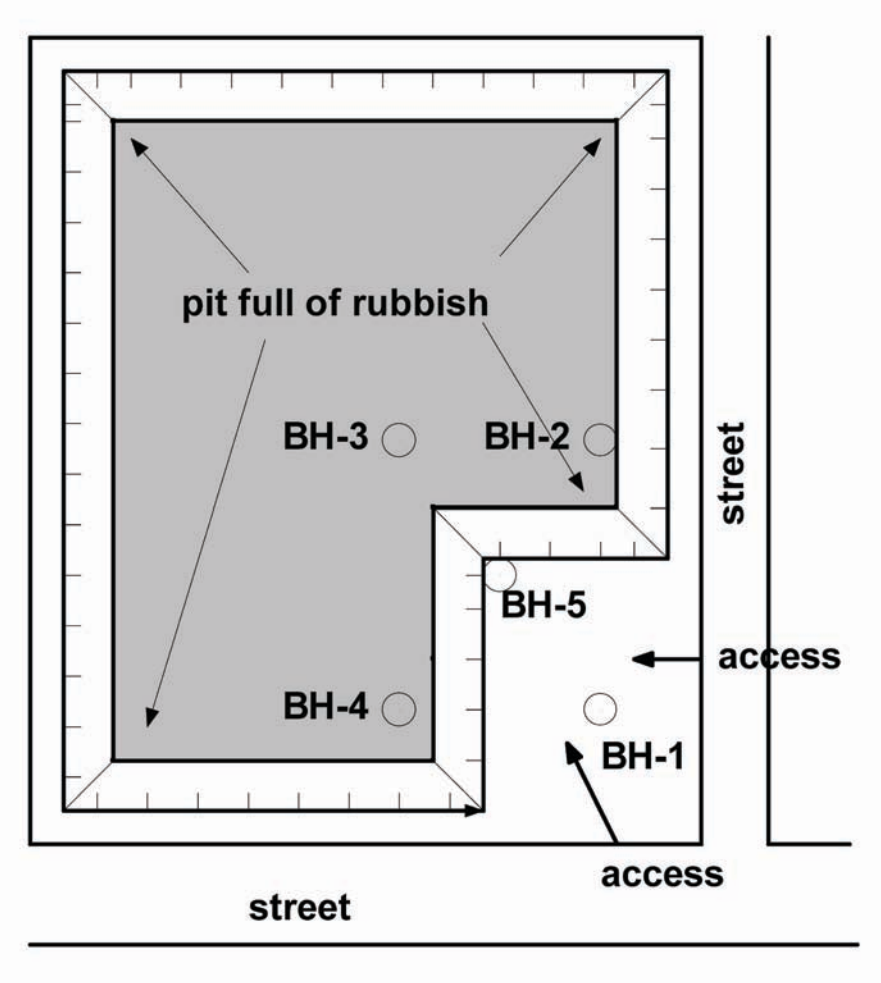

Figure 2. Sketch of the excavation: plan view of the hidden pit full of rubbish.

were not as severe as nowadays. Yet, the incurred extra expenses were unexpected and significant. For the engineering company, it meant that their fees had to be increased because the cost of the project was increased.

Dispute and settlement

The contractor threatened to sue the owners, who threatened to sue the geotechnical company. The consulting engineer threatened to sue the geotechnical company, but took care to not threaten the owners. The discussion between the three parties and their attorneys quickly progressed, but without informing or calling upon the professional liability insurance. During the first meeting, the head of the geotechnical company acknowledged that only BH-1 and -5 were real, the three other BHs being hypothetical. Considering the similarity of initial results (stratigraphy, nature of soils, compactness, and water table position), the geotechnical company had decided to fabricate the logs of the last 3 BHs, based on the results of the first two BHs.

The debate about the incurred costs was especially interesting. The attorney of the geotechnical company made it clear that, whatever his client had done, the dump was real. Therefore, even if the owners had known its presence before hiring the contractor, the rubbish had to be excavated, and replaced with an acceptable compacted backfill. At the end of the first meeting, the confusion and embarrassment were palpable.

During the second meeting, the discussion focused on the delays due to lack of preparation, increased financial needs to negotiate with the bank and related extra costs, etc. After that, a confidential agreement was reached between the three parties at a third and final meeting.

Conclusion

This case history teaches us a few things. First, unprofessional work may be kept secret. Here, it received a financial penalty, in private, but this did not harm the professional's standing. Next, since the professional never called upon his professional liability insurance, one may infer that the unprofessional work never produced an increased premium. Finally, since both the case and its settlement never went public, as they would have in court, the professional order or corporation was kept unaware of the situation. This is a negative aspect of the confidentiality rules, which work against the order or corporation's mandate to protect the public.

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Characteristics of municipal solid waste incineration residues and potential disposal methods in China

Ping Chen, Qimao Cai and G.W. Wilson

Introduction

In China, the rapid growth in the urban population has resulted in the generation of an exceptionally large amount of municipal solid wastes (MSWs). At present, the annual generation of MSWs is 245 million tonnes with an annual increase of approximately 7%. Because of rapid urban expansion and limited land space, incineration has become one of the primary methods for MSW disposal. The latest statistics show that incineration has accounted for 15.8% of the total solid waste that has been disposed of in 2011. Incineration treatment not only significantly reduces the volume of MSWs, but also recovers energy from wastes (e.g., generating electricity). In addition, support from government policies also contributes to the rapid increase in the proportion of incineration in China.

By the end of 2011, there were 109 MSW incineration plants that have been put into operation in China. Collectively, all of the plants are capable of combusting 94,110 tonnes of MSWs each day and 25,993,000 tonnes of MSWs each year. Most of the incineration plants are located in the eastern developed regions. For example, the two provinces of Zhejiang and Jiangsu in the eastern coastal region have 42 plants in total. In Hangzhou, the capital city of Zhejiang Province, there are two incineration plants with a total daily incineration capacity of 3,000 tonnes, which accounts for 50% of the city's total daily waste generation. MSW incineration plants are continuing to increase rapidly both in number and capacity. The latest information shows that about 150 incineration plants were built in China by the end of 2012.

The annual production of MSW incineration residues in China is estimated to be 5.2-7.8 million tonnes, 80% of which are bottom ashes and 20% are fly ashes. Compared to the fast development of incineration technology, the disposal technology for MSW incineration residues in China falls behind. Although some of the incineration plants try to reuse the incineration residues as engineering materials, the feasibility of resource utilization relies on an understanding of the characteristics of the MSW incineration residues.

This paper mainly presents the particle size distribution, mineralogical and chemical composition, leaching toxicity of heavy metals, and engineering properties of the incineration residues generated in representative cities within China. Based on the observations, potential disposal methods for the residues are discussed.

Table 1. Physical composition of the bottom ash generated from a mass burning MSW incineration plant in Shanghai.

Physical composition	Slag	Brick	Glass	Gravel	Pottery	Metals	Organics
Percentage by weight (%)	65	15.4	7.6	4.9	4.8	1.8	0.5

Characteristics of MSW incineration residues

Production and classification of MSW incineration residues

There are primarily two types of MSW incinerators in China: mass burning and fluidized bed, which accounts for 64% and 36% of the incinerators in China, respectively. The incinerators produce two types of residues, which include bottom ash generated from the furnace and fly ash collected from the air pollution control system for flue gas. The amount and characteristics of the bottom and fly ashes depend on the type of MSW incinerators producing the residue. The bottom ash generated from the mass burning incinerators constitutes approximately 20-25% of the waste, whereas fly ash constitutes 2-4% of the waste. The amount of bottom ash and fly ash generated from the fluidized bed incinerators is more comparable, both being approximately 10-15% of the waste.

Table 1 shows the physical composition of bottom ash generated from a mass burning MSW incineration plant in Shanghai [1]. The bottom ash is mainly composed of slag, brick, glass, gravel, pottery, metals, and other non-flammable organics. After bulk materials larger than 10 mm are removed, the bottom ash looks like a sandy soil with gravel (see Figure 1). The chemical composition, leaching toxicity of heavy metals, and engineer-

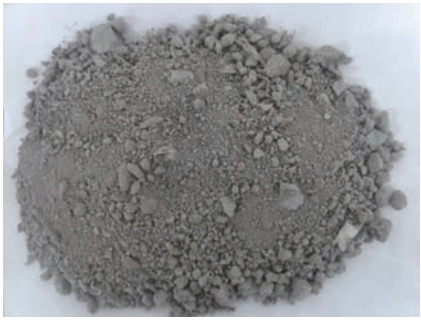

Figure 1. Bottom ash without bulk materials.

ing property of the bottom ash will be presented later in detail.

The fly ash collected from the air pollution control system is primarily composed of fine dust with particles sizes ranging from 50 to 250 µm. The colour of fly ash usually varies from gray to black. Table 2 shows a representative measurement of the heavy metal content in the fly ash [2]. It can be seen that the fly ash contains high levels of Pb, Zn, Cu, Cr, and Cd. In addition, Ye et al. (2007) showed that the fly ash also contains persistent organic pollutants such as dioxin and polycyclic aromatic hydrocarbons [9]. Therefore, the fly ash can be categorized as a hazardous waste, and it should be collected, stored, and transported separately from the bottom ash using the methods set by the Pollution Control Standard for Municipal Solid Waste Incineration (GB18485-2001) as stipulated by China's Ministry of Environmental Protection. The standard requires that all the fly ash be disposed of safely in a landfill with a double liner system.

Chemical composition and leaching toxicity of bottom ash

Table 3 shows the chemical composition of the bottom ash collected from five major cities in China, including Beijing, Shanghai, Guangzhou, Shenzhen, and Kunming [3]. It can be seen that the primary chemical compositions of the ash include SiO_2, Al_2O_3, CaO, and Fe_2O_3. A certain amount of SiO_2 and Al_2O_3 in the bottom ash are in amorphous form and have potential activity.

As seen in Table 3, the bottom ash contains some heavy metals and soluble salts, so its leaching toxicity should be evaluated before disposal or utilization. Table 4 shows a representative result for the samples collected from Shanghai from 2004 to 2006 [4]. It can be seen that the leaching concentrations of heavy metals in the bottom ash is lower than the limit values regulated in the national standard (GB5086 [5]), thus bottom ash is not considered a hazardous material and can be placed in a landfill directly.

Engineering properties of bottom ash

The disposal or utilization of bottom ash requires an understanding of its engineering properties, including the particle size distribution, unit weight, water permeability, shear strength, etc. Table 5 shows representative data of the particle size distribution for bottom ash [6]. The particle sizes of the bottom ash range from 0.07 to 10 mm, and 70-85% of the particles are as large as sand. It was found that the particle size distribution depends on the type of MSW incinerator producing ashes. Compared with that from the mass burning incinerator, the bottom ash generated from the fluidized bed incinerator has a higher fraction of particle sizes in the range of 2-10 mm and a lesser fraction in the range of 0.45-0.9 mm.

Table 6 shows a comparison of engineering properties between the bottom ash and a gravely sand with a similar particle size distribution [7]. The specific gravity and density of the bottom ash are smaller than that of the sand. The bottom ash has a higher water absorption capacity than the sand. The water permeability of the bottom ash is in the same order of 10^{-4} cm/s as that of the sand. The friction angle of the bottom ash ranges from 40°to 45°and is greater than that of the sand. The greater friction angle is attributed to the irregular shape and rough surface of bottom ash.[8].

Table 2. Content of heavy metals in fly ash (mg/kg).

Heavy metals	Pb	Zn	Cu	Cr	Cd	Hg
Content (mg/kg)	3084	4745.6	587.6	160.8	125.0	5.8

Table 3. Chemical composition of the bottom ash collected from five major cities in China.

City	SiO_2	Al_2O_3	CaO	Fe_20_3	MgO	K_2O	Na_2O	P_2O_5	TiO_2	S and others
Beijing	56.7	13.8	9.7	6.1	2.9	2.6	1.9	2.48	0.9	2.92
Shanghai	39.1	16.4	24.3	6.8	2.2	2.00	2.4	2.30	0.87	3.63
Guangzhou	53.55	13.56	14.34	3.07	1.06	1.69	0.67	3.12	1.18	7.73
Shenzhen	48.07	10.47	17.77	5.95	1.14	1.97	1.30	3.40	1.22	8.71
Kunming	46.22	11.56	18.74	15.33	0.94	1.87	1.03	2.40	0.82	1.09

Table 4. Leaching toxicity of heavy metals for the bottom ash generated in Shanghai.				
Heavy metals	Sample collected in October 2006 (mg/L)	Sample collected in August 2005 (mg/L)	Sample collected in March 2004 (mg/L)	Limit regulated in GB5086 (mg/L)
Hg	0.000014	ND	ND	0.05
Pb	ND	ND	ND	3
Cd	ND	ND	ND	0.3
Cr	0.048	0.021	ND	10
CR^{+6}	0.020	0.009	ND	1.5
Cu	0.524	0.405	0.049	50
Zn	ND	0.004	0.008	50
Be	ND	ND	ND	0.1
Ba	0.102	0.356	0.449	100
Ni	ND	ND	ND	10
As	ND	ND	ND	1.5
F	0.040	0.40	0.35	50
CN^-	ND	ND	ND	1.0
Note: ND indicates a value lower than the minimum detection limit of the instruments.				

Utilization of MSW incineration bottom ash as civil engineering materials

As discussed previously, the bottom ash generated from MSW incineration has the engineering properties of aggregates and is low in leaching toxicity. Thanks to these characteristics, bottom ash has been utilized as civil engineering materials in China in recent years. Such utilization has many advantages including mitigating the stress of disposing bottom ash in limited landfill space, thereby reducing the cost of landfilling operations, and providing a substitute material for the shortage of natural aggregates for civil engineering. However, the adverse impact of using bottom ash in civil engineering projects include the risk of environment pollution, which should be evaluated in advance. MSW incineration plant operators are trying their best to find safe and economic approaches to utilize bottom ash. Presently, there are mainly three approaches which are detailed herein.

Table 5. Particle size distribution of bottom ash (%).					
Type of MSW Incinerator	Particle size (mm)				
	2~10	0.9~2	0.45~0.9	0.07~0.45	<0.07
Mass burning incinerator	15.07	15.74	27.52	40.88	0.78
Fluidized bed incinerator	31.41	12.38	18.23	35.48	2.51

Table 6. Comparison of engineering properties between bottom ash and sand.					
Material	Specific gravity	Maximum dry density (kg/m^3)	Water absorption capacity (%)	Water permeability (cm/s)	Internal friction angle (^{0})
Bottom ash	1.50-2.44	1264-1760	4.1-17.0	10^{-4}	40-45
Gravely sand	2.65	1900	<2	10^{-4}	32-45

Using bottom ash as filling materials for subgrades

Using bottom ash as filling materials for road subgrades and embankments has been a major means of utilizing bottom ash in China. First, particles greater than 10 mm are removed by a screening technique, and then metals and other substances that are harmful to the environment are removed through a magnetic separation technique. The resultant bottom ash is then similar to a lightweight aggregate in terms of engineering properties. The filling materials can be easily compacted to the prescribed density for roadwork. Engineering practice shows that subgrades filled with bottom ash have sufficient bearing capacity, stability, and permeability, meeting engineering requirements [10] .

Using bottom ash as daily cover material for MSW landfills

Regardless of the rapid increase in the incineration of MSWs, landfilling remains the primary disposal method in China. In many cities, newly built incineration plants are located near the landfill sites. Landfill operations require a lot of fine soil for the daily and intermediate cover of wastes. Daily cover is used to prevent wastes from blowing away, to prevent animals from getting into the waste, and to mitigate the spreading of odour. Some landfill operators are starting to utilize bottom ash as daily cover mate-

rial. This does not require pretreatment of the bottom ash and does not pose a risk to the environment because modern landfills are equipped with a barrier system and a leachate collection/treatment system. In addition, the high permeability of bottom ash prevents the formation of a low-permeability layer in the MSW landfill. In terms of technically sound practice and protecting the environment, the utilization of bottom ash as daily cover material in landfills is a very good option, particularly for regions with a shortage of cover materials.

Using bottom ash as aggregate for making bricks and blocks

Some MSW incineration plant operators try to use bottom ash as an aggregate for making bricks and blocks, and this practice is currently being done in Shanghai, Hangzhou, and Suzhou. Some believe that the solidification process associated with the brick/block making technology has a stabilization effect on the contaminants in the bottom ash. However, since the bricks and blocks are generally used in road engineering, the bottom ash needs to be treated to prevent environmental damage. Oversized materials, metals, organics, and other substances harmful to the environment, and therefore lowering the production quality of the bricks/blocks, need to be removed. It was found that bricks/blocks made with bottom ash are prone to cracking, and thus the bottom ash contents should be controlled properly [11]. This approach to utilizing bottom ash should be further investigated in terms of pretreatment techniques, the cost of the techniques, and the environment.

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A round robin test on tunnels under seismic actions

Emilio Bilotta and Francesco Silvestri

Introduction

The seismic behaviour of urban tunnels can be predicted by simplified pseudo-static approaches and dynamic methods of analysis, i.e. procedures that take into account the dynamic nature of the seismic loads and the cyclic soil behaviour [1]. These latter methods can either uncouple the analysis of free-field soil response from that of the tunnel ('simplified dynamic analysis'), or use more complex procedures ('full dynamic analysis') accounting for soil-structure interaction, which is basically kinematic.

The calibration of all such methods should require validation against experimental data, which are seldom available at the prototype scale. In fact, experimental measurements of seismic internal forces on real-scale structures during earthquakes are very difficult, firstly because of the random occurrence of such events. Moreover, the instrumentation routinely adopted for static tunnel monitoring generally has too large sampling intervals to record seismic time histories. It measures therefore only the internal forces before and after the earthquake, which cannot completely describe the transient nature of dynamic soil-tunnel kinematic interaction mechanisms.

On the other hand, the evolution with time and the peak increments of internal forces in the lining appear crucial for the engineering assessment of the seismic performance of a tunnel. To such a purpose, finite element or finite difference methods of analysis can be the most useful and reliable predictive tools. If suitable constitutive laws for the soils are well-calibrated on laboratory and field tests and the most appropriate geometrical and physical description of the boundary problem is performed, FEM and FDM analyses can provide a reliable evaluation of both free-field (e.g. [2]) and soil-tunnel (e.g. [3]) dynamic response.

Centrifuge modelling is definitely an alternative powerful tool to produce 'artificial case histories' for calibration, back-analysis or benchmarking among different analytical approaches. This paper outlines the main features of RRTT, a Round Robin numerical Test on Tunnel centrifuge models, organized by the Authors and jointly promoted by three Technical Committees of ISSMGE.

Reference centrifuge tests

A typical damage pattern due to the longitudinal and transversal components of ground motion is that of

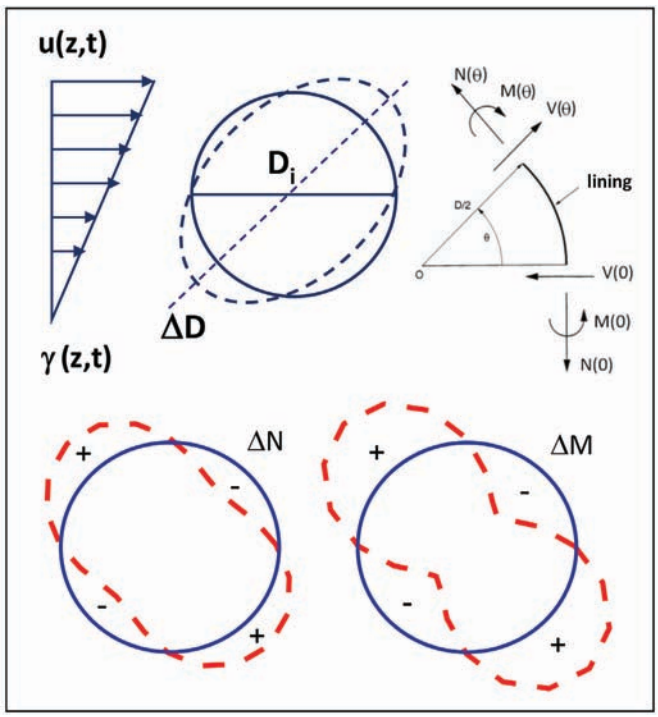

Figure 1. Ovalization during shaking and increments of internal forces.

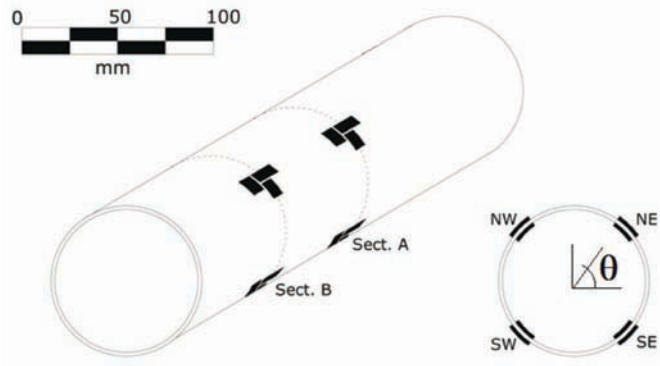

Figure 2. Instrumented model tube. Positions of the strain gauges.

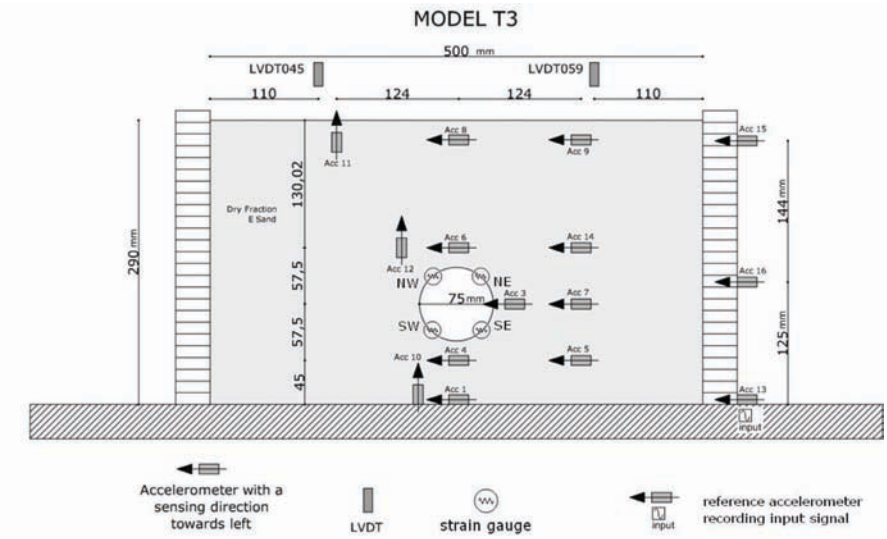

Figure 3. Model T3: layout of the instrumentation.

extension cracks along the tunnel lining. In the transverse section of a circular tunnel, for instance, the ground shaking induces ovalization of the lining ([4]). Hence, depending on the stress level of the lining under 'static' conditions, cracks may open where tensile stress increments arise during shaking (Fig.1).

Although it is quite difficult to measure such increments of internal forces during real earthquakes, centrifuge modeling allowed an experimental assessment of these quantities during 'artificial seismic events'; the results may be used for benchmarking simplified to complex prediction methods.

Four centrifuge tests were carried out in 2007 at the University of Cambridge (UK) on tunnel models in sand ([5], [6]), for the assessment of different analytical methods developed in the framework of a research project (www.reluis.it) funded by the Italian Civil Protection Department. After the end of the research project, the experimental data have been made available online to the scientific community to be used for benchmarking simplified to complex dynamic numerical methods. In 2011, such a predictive exercise, called RRTT (*Round Robin Tunnel Test*) was officially launched at the TC28 conference 'Underground constructions in soft ground' in Rome ([7]).

All the models were made using dry Leighton Buzzard sand (grade E) reconstituted at two different relative densities Dr (about 50% and 80%). A detailed characterization of the sand used in tests was purposely performed in laboratory by means of triaxial and resonant column - torsional shear (RCTS) tests ([8]). The RCTS apparatus was an upgrading of a Stokoe-type fixed-free model ([9]), originally developed at the University of Napoli Federico II ([10]).

Table 1. Earthquakes fired in test T3 - T4.

Earthquake #	*N*	*Frequency (Hz)*		*Duration(s)*		*Nominal PGA (g)*	
		model	[prototype]	Model	[prototype]	model	[prototype]
1	80	30	[0.375]	0.4	[32]	4	[0.5]
2	80	40	[0.5]	0.4	[32]	8	[0.10]
3	80	50	[0.625]	0.4	[32]	9.6	[0.12]
4	80	60	[0.75]	0.4	[32]	12	[0.15]
5	40	50	[1.25]	0.4	[16]	6	[0.15]

The tunnel lining was modelled using an alloy tube having an external diameter D=75 mm and a thickness t =0.5 mm. At N=80g, the model would correspond to a 6 m diameter prototype tunnel with a shotcrete lining of about 6 cm.

Miniature piezoelectric accelerometers were used to measure horizontal and vertical acceleration in the soil and on the model container during earthquakes. The device has a resonant frequency of about 50 kHz and maximum error of 5%; the transducer weight is about 5 grams.

The tube has been instrumented in order to measure bending moments (BM) and hoop forces (HS) at 4 locations along 2 transverse sections (Fig. 2).

The main instrumented section was located at the mid-span of the tube and a second section 50 mm aside. The strain measurements on the tube were purposely performed in two sections, in order to check that no boundary effects occurred and the plane strain conditions were ensured. In total 16 Wheatstone bridges (4 locations x 2 sections x 2 force measurements) were glued to the tube and wired.

The vertical displacement of the surface during centrifuge tests was measured by linear variable differential transformers (LVDTs) placed in two gantries above the model.

Benchmark testing programme and experimental data

The tests selected for the benchmark, T3 and T4, are two models of deep tunnel in dense and loose sand, respectively; the layout of the first of them is drawn in Fig. 3. The model was prepared by pluviation of about 50 kg of sand in the container, obtaining the

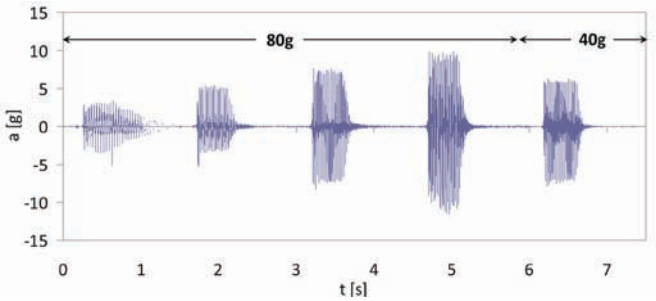

Figure 4. Shaking applied to model T3.

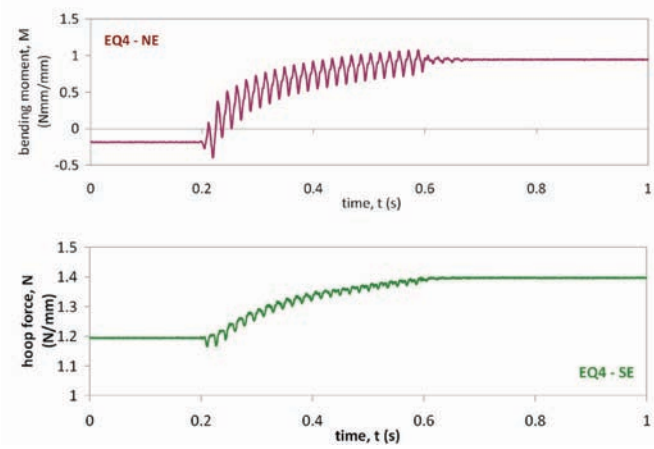

Figure 5. Time histories of bending moment and hoop force during shaking.

desired average void ratio and relative density. Of course the procedure of model making was carefully controlled, since it is well known that the mechanical behavior of a reconstituted granular soil is strongly dependent on the deposition procedure both in the lab (e.g. [11]) and in the centrifuge ([12]).

Four earthquakes were fired at 80g and one at 40g, with variable nominal peak acceleration amplitude and frequency. The main features of each earthquake are shown in Table 1, at the model and prototype (bracketed values) scales; their time histories, as recorded by the reference accelerometer (Acc13 in Fig. 3) are summarised in Fig. 4.

The experimental values of both bending moment, M, and hoop force, N, in the lining were derived from the strain gauges records during each seismic event. It is apparent (e.g. fig. 5) that, after the shaking, the residual values of the internal lining forces are significantly different from the initial conditions. This behaviour was observed almost systematically for any event in all the models, and seems to indicate that permanent deformations occurred around the tunnel during shaking. This is qualitatively consistent with the observed densification of the sand during the shaking, shown by the surface settlements.

Round Robin Tunnel Test organisation

The Round Robin Tunnel Test (RRTT) was jointly promoted by three ISSMGE Technical Committees, i.e. TC104 (*Physical modeling in Geotechnics*), TC203 (*Earthquake Geotechnical Engineering*) and TC204 (*Underground construction in soft ground*). All participants were enabled to use the selected test data, i.e. the reference accelerograms (Fig. 4) and the results of laboratory tests on LB sand, which were delivered through website with a restricted access. The analyses were initially intended as 'blind' predictions of the behavior of the first of the selected centrifuge model tests (model T3).

Six of the initial fourteen teams, belonging to academic departments of several countries (see Table 2), completed the analyses in time for a workshop organised after one year from the launch, at the 2nd International Conference on PBD in EGE in Taormina (2012). During the workshop the results of the numerical blind predictions were presented to the floor, thereafter compared and freely discussed.

Each group adopted a different numerical code and a different constitutive model for the soil, as shown in A significant issue for all the participants was the calibration of the constitutive model on the results of the laboratory tests in order to correctly reproduce the decay of soil stiffness from small to large shear strain.

Although the interpretation of tests to calibrate an advanced constitutive model should be regarded as a back-analysis of a non-linear boundary value problem ([13]), it is commonly accepted that a laboratory test is

Table 2. Main features of numerical analyses.

Group	*Adopted constitutive law*	*Numerical code*
AUT (Greece)	Visco-elasto-plastic model	ABAQUS (FEM)
UCT (Italy)	Visco-elasto-plastic model	ADINA (FEM)
TUD (Germany	Hypoplastic (von Wolffersdorff model)	TOCHNOG (FEM)
TVG (Italy)	Visco-elasto-plastic model	FLAC (FDM)
UTL (Portugal)	Elastoplastic multi-mechanism (Hujeux model)	GEFDYN (FEM)
NEW (UK)	Generalized plasticity (PZ-III model)	SWANDYNE II (FEM)

equivalent to the application of a uniform and controlled stress (or strain) path to a soil element. This assumption may however complicate the assessment of the stress-strain properties if the results of different kind of tests on the same soil are not compared in a single framework. In particular the results of triaxial and torsional shear tests are traditionally plotted in terms of (E:εa) and (G:γ), respectively, since this facilitates simplified computations of stress-strain behaviour of the ground through equivalent linear analyses. In this case two different criteria may be adopted to represent the results of both set of tests in the same scale (e.g. [14]): one which equates the maximum values of shear stress an strains (equality of Mohr's circles diameters), another which equates the deviatoric stress and shear strain invariants ([13]). The results of calibration may be different, depending on which criterion is followed. For such a reason the participant groups were asked to calibrate their constitutive model on the results of both sets of tests and to discuss the possible drawbacks at the level of laboratory test interpretation, before attempting to model the boundary problem of the centrifuge tests.

A number of interesting points of discussion arose about the differences among numerical predictions performed with several numerical and constitutive models of various degrees of complexity, as well as between predictions and experimental measurements. Overall, the acceleration time histories were well-predicted by all the groups, and the accumulation of internal forces during the events was qualitatively reproduced by those models which were able to simulate the dynamic densification of sand. Nevertheless, on the average the calculations under-predicted the observed cumulated deformations and related lining force increments.

The general feeling at the workshop was that the work that was started by blind predictions should be better continued by making use of the available centrifuge results to improve the reliability of numerical predictions. This procedure could reduce uncertainties arising from calibrating the constitutive models on the basis of the laboratory "soil element" tests, as discussed above. Therefore, the participants were recently allowed to access to the whole T4 test data, and to calibrate the constitutive models on the basis of both T3 and T4 test results. Obviously, such further numerical predictions cannot be considered as blind but rather as back-calculations. A comparative analysis of the results of both blind predictions and back-analyses will be published once the latter will be completed.

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Soil confinement system in soil erosion

Hamed Niroumand, Khairul Anuar Kassim, Ramli Nazir

Abstract

Erosion is defined as process of detachment and transportation of soil particles by weathering agents such as water, wind, tide and glacier. It is a phenomenon that changes the earth surface. It could be caused by either nature or man-made. Since erosion could be a signal of slope failure, there is a need to study the behavior of erosion and the method used in abasing the adverse effect of erosion. Nowadays, there are many technique have been developed for the erosion control. Generally, these techniques can be classified as geosynthetics and bioengineering techniques. Soil confinement system is a geosynthetics method used in erosion control and protection of slope from any failures. Confinement system could improve both vegetated and non-vegetated slopes' resistance to erosive forces by confined and reinforced the infill material. Confinement system prevents down-slope transportation of soil particles caused by gravity and hydraulic traction. The current research studied on soil confinement system in soil erosion.

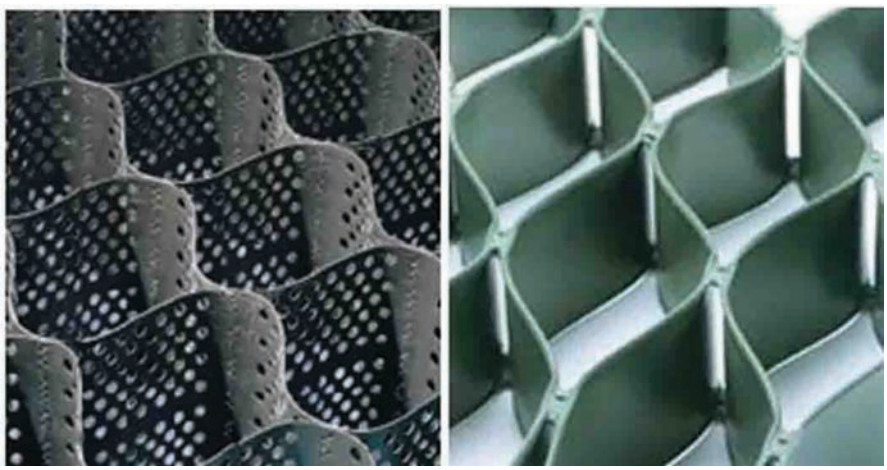

Figure 1. Soil confinement system.

Soil confinement system

Soil confinement system or geocellular confinement system (the product is called geocell and as shown in Figure 1 & 2) works in a unique fashion in that strength or stabilization by confinement is achieved by a series of three-dimensional cells up to 20cm. The cells normally are made by polyethylene or polyester. When expanded into position, the cells have the appearance of a large honeycomb, one of the nature's most efficient structures. After installation, the cells are backfilled with soil, sand or gravel depending on the application. The soil backfilled are seeded, fertilized and covered for revegetation purpose. As the vegetation establish, the mulches provide surface protection while the cells greatly reduce the chances

Figure 2. Soil confinement system with the infill.

of subsurface failure and act as a deeper rooted biotechnical composite. However, there is a limitation for the vegetated confinement system where the flow velocity should be limited from 2 to 3 m/s due to the tendency of the nearly impermeable cells to sustain scouring under high flow velocities. Therefore, the confinement system can be filled with concrete of gravel to create a hard armor in high flow conditions. Generally, a geotextile will be placed beneath the confinement system to provide separation and/or filtration. For soil erosion control, the confinement system can apply at steep slope revegetation, channel liners, shoreline revetment, retaining walls, boat ramps and low flow stream crossings.

History and background of soil confinement system

Geosynthetics is a very diverse and important group of construction materials during the past 35 years. They are produced from a range of base polymers, most notably are polyester, poly ethylene and polypropylene. These polymers are characterized by high flexibility, low weight, high strength and outstanding durability. Geosynthetics products has been designed and adapted to meet a number of specific functions such as filtration, drainage, separation, confinement, and the retention and reinforcement of soil. The first use of geosynthetics in major soil stabilization projects is in the early 1970s when both woven and non-woven geotextiles were used as key component in road base stabilization and erosion control projects. Now, geosynthetic products include an extensive range of woven and non-woven geotextiles, geogrids, geomembranes, geonets and geocells. Geocell confinement system was developed from a co-operative development effort between the Presto Products Company and the US Army Corps of Engineers. Geocells were originally evolved to provide load support to military vehicles traveling over soil of low shear strength. Other applications include soil retention in gravity and geogrid reinforced retaining walls and erosion protection in channel linings and slope protection. The potential value of geocell confinement system in erosion control was first recognized in the early 1980s. Today, the state of the practice for geocell systems in slope protection and channel lining applications includes the use of Kevlar tensile tendons to assist in distributing the down slope driving forces to the stable subgrade and pre-engineered perforations to improve drainage and infill material retention.

Installation of soil confinement system

The installation of confinement system may be little different, depends on the product company. However, generally the way of installation is mostly to be the same. The installation of confinement system on slopes is relatively simple and even can be easily performed by unskilled labours. The following procedures are based on Tenax Tenweb Geocell:

1. Site preparation
   - Clearing and grubbing the site
   - Site should be graded as specified by the designer
   - The surface should be as smooth as possible
2. Placement of the geocell panels
   - Geocell panels will be expanded to the full open dimension and parallel to the flow direction. Each panel will be anchorage at the top of the slope in a trench whose dimensions are determined by design engineer. If it is possible, the anchorage trench at the top can be filled with concrete (to reduce the embedded length).
   - Along the slope the geocells will be anchored with pins. The spacing between the pins will be determined by the design engineer. Pins have shape and length depending on the soil characteristics. Pin diameter should be 8 mm minimum. Each pin should be placed at the junctions of the panel. Pins are placed in stagger pattern so that like the number 5 on a dice.
3. Junction between panels
   - Adjacent panels should be fixed by pins, one pin every 2-4 cells.
4. Infill the geocells
   - Infill in the geocells is influenced by hydraulics, soil conditions, and aesthetics. The geocells can accommodate infills and finishes such as soil/grass, gravel. Infill can be placed by the use of a front

end loader, backhoe, bottom dump bucket, conveyor system or ready mix truck. Soil or granular infill material should be about 2 cm above the top of the cells and compacted to the required density

5. Finishing details

- Seeding with suitable essences allows fast vegetation. Seeded areas may be protected with synthetic or natural fiber blankets (jute).

Dimensional analysis

Dimensional analysis is a method to describe a phenomenon by developing a dimensionally correct equation among certain variables. There are two objectives of dimensional analysis:

1. To reduce the number of variables for subsequent analysis, and
2. To provide dimensionless parameters that numerical values are independent of any system of unit.

Dimensional analysis provides a similarity law for the phenomenon under consideration. Similarity means certain equivalence between two physical phenomena that are actually different. By using dimensional analysis, a model can be related to a prototype. Sets of independent parameters are chosen to build up the complete characteristics of the actual event. Then dimensional analysis will reduce the quantity of variables and produce dimensionless parameters. Experiments or tests need to be carried out to verify these parameters. Dimensionless values often used for interpreting the prototype value from small model tests. Similarity between model and prototype is attained when the dimensionless parameters have the same value in both model and prototype.

Buckingham's Pi theorem

Buckingham Pi Theorem is the basis of most dimensional analysis, asserts that any complete physical relationship can be expressed in term of a set of independent dimensionless products composed of the relevant physical parameters. Bridgman has stated that, "If the equation F(q1, q2, q3 … qn) = 0 is complete, the solution has the form $f(\pi 1, \pi 2, \pi 3 \ldots \pi n\text{-}k) = 0$, where the π terms are independent products of the parameters q1, q2, etc., and are dimensionless in the fundamental dimensions." In other word, a complete dimensional homogeneous equation, relating n physical quantities which are expressible in term of k fundamental quantities can be reduced to a functional relationship between n-k dimensionless products. For example, if there are nine physical quantities involved in the relationship of the physical problem and three fundamental physical quantities, six set of dimensionless groups would be form.

Laboratory simulation of rainfall and erosion

Experiments for erosion can be classified as field experiments and laboratory experiments. Field experiments principally involve long-term measurement of soil loss in small fractional-acre plots under natural conditions. Such field tests are often expensive and time consuming, but are useful in gaining data on actual soil loss under various land management practices. However, they are not useful in studying the physics of the soil erosion process. Laboratory experiments are carried out under the control over meteorological conditions where rainfall intensity, soil type, slope and other conditions can be controlled and varied in a logically designed experiment. Laboratory tests measure the rate of soil loss under conditions that simulate natural conditions and process. The factors that can be varied in the laboratory test are:

a. The amount, intensity, and frequency of rainfall
b. Soil properties such as mean particle size, size distribution, surface texture, clay and organic content, bulk density, and moisture content
c. Slope and length of the flow path
d. Surface cover such as vegetation and/or erosion control system.

Various laboratory systems have been developed to generate rainfall and overland flow in order to study runoff, infiltration and erosion. Conditions simulated include of rainfall with various average drop sizes, range of drop sizes, terminal fall velocities and intensities; controlled discharge at ground level to generate varying levels of overland flow; and slope with adjustable inclinations and lengths. Rainfall is considered the most important and difficult to simulate. The design of simulators should be able to reproduce drop-size distribution, drop velocity at impact, and intensity of natural rainfall with a uniform spatial distribution. The energy of natural rainfall is generally regarded as less important in the rainfall simulators (Bubenzer, 1979). Numerous types of rainfall simulators have been developed. Bubenzer (1979) have reviewed a large number of simulators produced by different researchers and classified the simulators into two group. The first group uses a series of nozzles of sprinklers to produce rain with a widely varying drop size and size distribution. These systems are easy to install and maintain, but they generally produce non-uniform rainfall distribution. Also, the drop trajectories are not generally vertical when they impact the ground. This is of concern when trying to simulate soil detachment by raindrop. The second group of rainfall simulators uses modules of multiple drop formers to generate a near-uniform rainfall distribution with drops of uniform and controlled size. The early simulators used pieces of yarn to form the raindrop that more uniform than those produced by nozzles. However, the raindrop formed by the yarn was found to change, resulting in non-uniform drop size. Then the later systems used small diameter tubing fixed to the bottom of a rigid plate. Other types of drop former are glass capillary tubes, hypodermic needles, and polyethylene, copper, brass or

stainless steel tubes. These drop formers need clean water to avoid clogging and to maintain a uniform flow. They produce a narrow range of drop sizes (2.2-6.2mm) and require a well balanced set-up to generate a spatially uniform rainfall distribution. The fall height for establishing a drop's velocity at impact is varied from about 1m to about 12.3m.

Conclusion

Soil confinement system is a method used in soil erosion control. Based on the result obtained from erosion model test, the erosion rate for slopes with confinement system was found out to be less than the slopes without confinement system. Obviously, the soil confinement system could effectively reduce the erosion rate of the slopes. The soil confinement system reduces the erosion rate by confined the soil particles into partitions or cells and reinforced the soil particles inside the cells. The cells improve the infill material strength by increasing the infill's shear strength and stiffness. Each cell generates confinement forces that utilize the passive resistance of each adjacent cell. When a load is applied to soil confinement system, the resulting displacement force is distributed over the neighbouring cells while containing the infill. This passive resistance of adjacent cells, combined with the confinement forces within cells provide a stable matrix to soil. Thus, the soil confinement system prevents the traditional progressive failure of an unsupported soil mass and stabilizes the structure on the confined soil surface.

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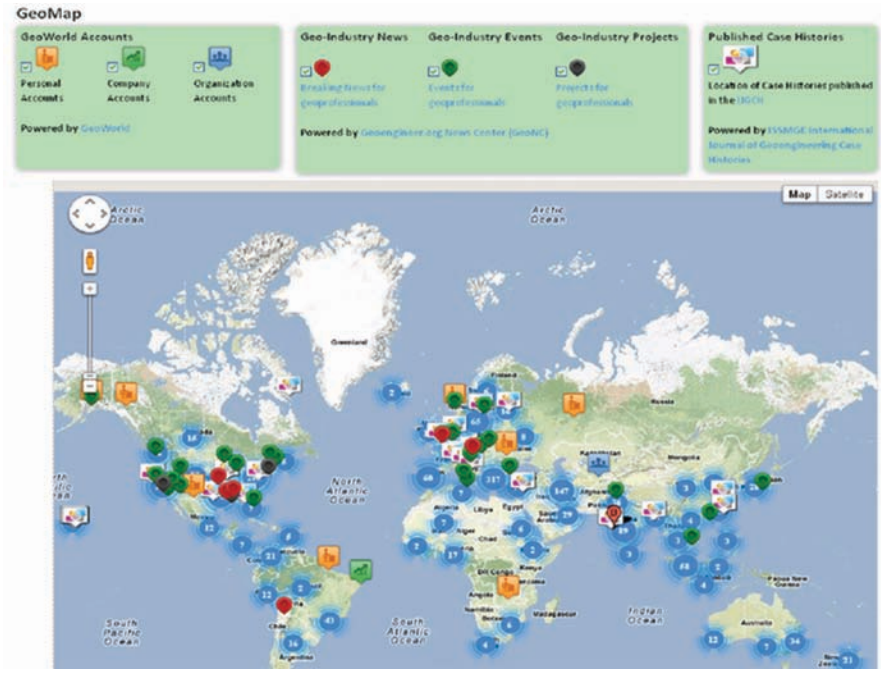

Geoengineer.org is pleased to announce GeoWorld's most recent innovative feature: The New, Extended GeoMap (http://www.mygeoworld.info/map)!

GeoMap has been enriched with a new database which encompasses the following content customized for geoprofessionals:

- breaking news of the geo-industry of the latest 30 days
- The most comprehensive database of upcoming geo-events (including conferences, symposia, workshops, webinars etc.)
- selected projects of geotechnical companies

These additional resources are all provided by the Geoengineer.org News Center (http://www.geoengineer.org) and are positioned on the interactive worldwide map according to each item's specific geographical location.

Besides these new additions, GeoMap still includes:

- all personal, company and organization accounts of GeoWorld (**over 2,220** active members in January 2013)

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All visitors are able to select which type of information to view on GeoMap, **but ONLY GeoWorld members are able to view the names and professional profiles** of GeoWorld members, so sign up today by visiting http://www.mygeoworld.info, at zero cost, and get instant access!

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ASFE

A not-for-profit association established in 1969, ASFE's purpose is to help geoprofessionals maximize their importance and value to the marketplace, achieve business excellence, and manage risk. ASFE creates more awareness of geoprofessionals' value through outreach activities targeted to organizations of clients and those that influence them. It increases the supply of trusted geoprofessional advisors through high-impact programs, services, and materials it creates for the personnel of ASFE-Member Firms.

The First Six Months: President David A. Schoenwolf, P.E. Reports

ASFE President David A. "Dave" Schoenwolf, P.E. delivered the following remarks on October 27, to members attending the 2012 Fall Meeting in Denver, Colorado.

It's an honor for me to stand before you as president of this amazing organization. ASFE was created to look after the business needs of geoprofessionals and we have kept ASFE true to that course, evolving as business needs have evolved; changing as the nature of business risks have changed.

Part of our evolution has involved modification of our purpose, from an organization that focused almost solely inside – creating umbrellas our members use to protect themselves from what's raining down – to an organization that also has an outside focus, to help change the nature and extent of the rain, not just to reduce the risks of geoprofessional practice, but also to reward those who strive for excellence and to encourage more to do so. Achieving our common goal of overcoming the commoditization and marginalization geoprofessionals too often must contend with depends upon having more outstanding geoprofessional practitioners available to serve as their clients' trusted professional advisors. But to be outstanding, individuals need more than great technical skills. They need the business skills, including the interpersonal skills that all outstanding service providers seem to possess. Not only do those skills enhance the bottom line; they help in the area of risk management, if only because, as we all know, friends don't sue friends.

...neutralize an extremely dangerous paper...

We created a strategic plan to help us achieve our purpose; we update that plan every three years, to provide a path going forward based on experience; knowledge of what works and what doesn't. We're now in the fourth year of our efforts, focused on **helping our members maximize their importance and value to the marketplace, achieve business excellence, and manage their own risks and those of other project participants.**

Of course, the real reason I'm here is to answer the question, "What has ASFE done for me lately?"

One of our most important initiatives has been developing a response to a situation that was covered in the latest issue of NewsLog. In essence, we have been working diligently behind the scenes to **neutralize an extremely dangerous paper** that appeared in ASCE's *Journal of Geotechnical and Geoenvironmental Engineering*. The paper, by William N. Houston and John D. Nelson, includes a discussion of the legal theory behind the standard of care concept; a discussion the authors are not qualified to present in any type of authoritative manner, and which they got just about 100% wrong. Since the paper was published in a professional journal, it could be cited in court by hired-gun experts who make their living by assassinating the character and competence of their peers. Worse, the paper purported to discuss what the standard of care actually is for "Foundation Engineering on Expansive and Collapsible Soils," based upon research methods that were not revealed, but which we know involved geotechnical reports that were as much as 35 years old, and excluded anything less than five years old, even though the standard of care MUST be based on what is happening at the time under consideration, which in this case is NOW. Fortunately, it appears that our two rebuttal papers, prepared by Ji Shin and Michael Byrne for the Legal Affairs Committee, and Dennis Shallenberger for the Geotechnical Committee, will be published and that ASCE may be considering some changes to the peer review process that permitted these papers to be published in the first place. We will keep you informed so that, in turn, you can keep your attorneys and insurers informed.

We have known for some time that papers such as this, and the work of hired-gun experts nationwide, could be countered if we could somehow develop a **formal standard** that identifies the specific types of actions a civil engineer should take to be able to testify properly on what the standard of care was at a certain time and place. ASFE conceived a plan to get this done and has been leading the charge for close to ten years. Now, it appears

we have had a break-through, thanks in part to fallout from the Houston/Nelson paper, and in particular to the diligence of Bob Thompson, who is heading the standard-development committee that has been green-lighted by ASCE. The goal is to develop a standard that says, in essence, if you're going to testify about the standard of care, you should first learn what it actually was. If we can get this done, it could have a huge impact on liability exposures. That would be a good thing for all design professionals, not just us.

To achieve our purpose requires us to achieve **more outreach** to other organizations that represent clients and those that influence clients; organizations and memberships that need to realize that ASFE-Member geoprofessionals, when wisely selected and deployed, can help project owners save time, save money, and manage their risk. However, if we are going to have our outlooks take hold, all quality-oriented geoprofessionals will have to sing from the same hymnal: geoprofessionals in independent private practice, like ourselves; those employed by government agencies that review our deliverables; those employed by private-sector and public-sector clients; those involved in construction, working for constructors of different type; and those in education, both as faculty and students. We need all of them to do more to inculcate awareness of just how important geoprofessionals really are. And we have been working diligently toward that end in an effort to create **The Geoprofessional Foundation**, a stand-alone group that will represent the dozens of geoprofessional organizations and thousands of geoprofessionals who have much to benefit through combined efforts: to achieve more recognition of geoprofessionals; to create more awareness of what wise selection and deployment are all about; to affect codes and standards that affect us and all the American people; and similar activities that will be of mutual benefit. We have much to thank the External Relations Committee for in this endeavor. They have been tenacious and effective. I am confident we'll get to where we need to be, possibly before we meet in South Carolina next April.

As another part of outreach, ASFE is now a founding member of the **Institute for Sustainable Infrastructure**. We are joining other major organizations to develop green initiatives for geoprofessionals and civil engineers. ISI initiatives are also creating opportunities for new services ASFE-Member Firms can offer, and I certainly hope you are taking advantage of them.

ASFE has also joined an association of some 35 organizations called **ConsensusDocs**, an AGC-led group that develops model contracts. By becoming involved, we believe we can influence what these contracts require, especially when it comes to services geoprofessionals are retained to provide.

Our commitment to do more for all our members requires ASFE itself to become a larger organization with more money and volunteered efforts to invest in achieving our goals. To do that, we must **increase membership** and, toward that end, we created the new Membership Director position on staff. We have been highly successful despite the weak economy. Last year we added 25 new ASFE-Member Firms, almost a 10 percent growth rate. Year to date this year we have added 13 new ASFE-Member Firms. As most of you are aware, we now have a new Membership Director – Tamara Kukla – and with her enthusiasm and know-how, I'm looking forward to reporting the addition of 30 new ASFE-Member Firms when I next address you. To help fund this effort, we have encouraged the involvement of a limited number of **meeting sponsors** – sponsors thank you very much; your involvement is much appreciated – and we've also opened *NewsLog* and our website to a limited amount of **advertising**.

We are also looking at our programs, services, and materials. I can tell you that John Bachner's monthly **webinars** on writing, especially focusing on writing and risk management, have been very well received. For that reason, starting in January, we are going to start offering two webinars a month, one focusing on writing and the other on risk management. I don't have to tell you that it's sometimes difficult to make webinars not just an effective learning experience, but something that almost all staff find enjoyable. I believe you'll agree that ASFE's webinars are refreshingly different and highly effective.

Also on tap this year is an **overhaul of some of our most important materials**, starting with our message flyers; brief documents that focus on one issue, for use as handouts to clients and colleagues, and for use as in-house professional-development tools. Most need to be refreshed; all of them need to be reformatted to accommodate downloading, as we **continue to get greener**.

We'll also be looking at our ***Practice Alert*** monographs. We intend to categorize existing *Practice Alerts* and all new ones as focused on an issue of the moment or on a best practice that should remain viable for long-term application. As part of this effort, we have created a new **Branding Task Force**, to coordinate our efforts and make it clear to clients, those who influence clients, and prospective members that ASFE is *the* organization to join if you're serious about wanting to improve your business.

There's more change we're working on, too: Our IT/Website Task Force is developing **improvements to our website**. These are taking effect piece by piece, because we have to work with a third-party website provider to get things done. It's not easy, but because of the tenacity of Sarah Lanning, we are making it happen. We've

been looking at our **meeting format**, too, and you can expect to start seeing some changes over the next few meetings, beginning with our 2013 Spring Meeting in Charleston. Most of you have met Barb Nappy, our new Program Director, and we'll be taking advantage of the tremendous experience and know-how she brings to bear on our behalf.

I believe it's clear that we are in not just a period of transition, but a period of rapid transition. ASFE sees this as an opportunity to reach out to more so we can create a far better business environment for our members; more respect and demand for those who believe in continuous improvement, and more and better tools for dealing with the perils we know that exist and – more important – know how to manage. Rest assured that every member of ASFE's leadership understands that we have a history of excellence and innovation to maintain; a history that has benefited not just our members and all geoprofessionals in private practice, but really, all of our nation's design professionals. **Limitation of liability** was an ASFE innovation. We were vilified for believing that geoprofessionals should not be required to accept an unreasonable amount of liability for what we did. Today, limitation of liability is commonly used by all design and environmental professionals.

Alternative dispute resolution was another major development for which ASFE is responsible. We created the first new ADR method in 100 years, then developed another five or six for good measure, helping to make disputes faster, easier, and far less costly to resolve.

We also created **Peer Review**. In 1999, contemplating its 125th anniversary, *Engineering News-Record* selected ASFE as the only trade association or professional society in America to have contributed a major innovation to the construction industry in the prior century and a quarter, and that innovation was Peer Review.

We can also thank ASFE for conceiving and leading the development of ***Recommended Practices for Design Professionals Engaged as Experts in Construction Industry Disputes***, a document now endorsed by more than 40 national and international organizations that has helped resolve an untold number of disputes, especially because of faulty work by expert witnesses on the other side.

And let us not forget one of the most important innovations of all; one that came into being at the same time as ASFE, when the people who created ASFE also created Terra Insurance Company, which today is the highest-rated professional-liability insurance company in the United States.

You can rest assured that ASFE will continue to lead the way in an effort

to make the marketplace a more welcoming, more appreciative, and less risk-prone place to work. We have many laurels to rest on, but if you know ASFE, you know we don't rest. There's too much to do. I greatly appreciate the opportunity you've given me to help get it done.

From the Bench

Vern Haugen, the CEO of North Peak Construction, LLC ("North Peak"), owned a hillside lot in Scottsdale, AZ. Although the lot afforded an extraordinary view of the city, the view was limited because of the lot's irregular shape. Haugen retained Architecture Plus, Ltd. to design a home that would take maximum advantage of the view. Haugen met with Mark Fredstrom – the principal of Architecture Plus – to emphasize the importance of home orientation and to present a topological map that illustrated the corridor within which the house had to be aligned. Fredstrom submitted preliminary architectural plans and, soon thereafter, Haugen sold the lot and the plans to Russell Scaramella. Scaramella then entered into a separate contract with Architecture Plus "for further design and alterations to the [home]." The contract contained the same written terms as the agreement between Haugen and the architect. Fredstrom signed and sealed the final plans.

Plans in hand, Scaramella hired North Peak to build the home. North Peak began construction in 2006 and quickly discovered that Fredstrom's plans aligned the home so it faced a water tank and mountain rather than the city lights. North Peak subsequently alleged that it incurred damages of $164,803 to demolish construction work it had already performed and then rebuild the home. Seeking recovery of those damages, North Peak in January 2009 filed a complaint against Architecture plus and its owners – Mark Fredstrom and his wife, Audrey – asserting one claim for breach of implied warranty and another for negligence. In its breach-of-implied-warranty claim, North Peak said it had relied upon the architect's "design plans and their implied representation that such plans were prepared with the reasonable skill, care, and diligence of a competent design professional, in a non-negligent manner, and in conformance with the project specifications as provided by Messrs. Haugen and Scaramella." North Peak alleged the architect had "breached the implied warranty by providing deficient and substandard workmanship in designing and orienting the custom home on the [l]ot without maximizing the views of the city lights as expressly required." North Peak also requested attorneys' fees, citing an Arizona law providing that "[i]n any contested action arising out of a contract, express or implied, the court may award the successful party reasonable attorney fees.") North Peak also alleged negligence, claiming the architect fell below the standard of care when it "failed to orient the custom residence so to properly provide the views of the city lights."

The architect filed a motion to dismiss the breach-of-implied-warranty claim, arguing that "the essence of [North Peak's] claim is one for negligence" and that "there is no contractually-based claim for breach of implied warranty insofar as design professionals are concerned." According to the architect, North Peak asserted the implied-warranty claim in an "attempt to convert an action for which attorneys' fees are not recoverable into one in which attorneys' fee[s] are recoverable."

The trial court dismissed the breach-of-implied-warranty claim because it agreed with the architect's assertion. The trial court also dismissed the negligence claim, citing the economic loss doctrine, which Arizona upholds. (According to the economic loss doctrine, a design professional cannot be sued in tort (as for professional negligence) when the loss is purely economic; purely economic losses may be recovered only through breach-of-contract actions, effectively limiting such claims to the clients involved.)

North Peak appealed the ruling to the Arizona Court of Appeals, stating that the trial court erred when it dismissed the breach-of-implied-warranty claim. (North Peak agreed that dismissal of the negligence claim was appropriate.)

In rendering its decision, the appellate court cited *Donnelly Constr. Co. v. Oberg/Hunt/Gilleland* (139 Ariz. 184, 186, 677 P.2d 1292, 1294 (1984)), where the state's supreme court held that a claim for breach of an implied warranty may be brought against a design professional even in the absence of a contractual relationship. There, the court recognized that design professionals give an implied warranty "that they have exercised their skills with care and diligence and in a reasonable, non-negligent manner." Accordingly, the court held that Donnelly was able to go forward with its breach of implied warranty claim and its negligence claim.

According to the Arizona Court of Appeals, "The facts before us are analogous to Donnelly. North Peak, alleging it relied to its detriment on Architect's faulty design plans, brought claims for negligence and breach of implied warranty against Architect. No privity of contract exists between North Peak and Architect. Because Donnelly recognizes that breach of an implied warranty is a valid cause of action against a design professional and can be brought in addition to a claim for negligence, we must conclude that the court erred in dismissing North Peak's implied warranty claim….Although we base our decision on Donnelly, we are also mindful that our supreme court has held that a claim for breach of an implied warranty of habitability and workmanlike performance sounds in contract rather than tort….Additionally, we disagree with Architect's argument that North Peak cannot assert a cause of action for breach of implied

warranty because the design contracts did not expressly require the home to be designed to ensure a specific view. North Peak did not assert a claim for ordinary breach of contract or for breach of an express warranty. Rather, the complaint alleges that by providing design plans that did not properly align the house, Architect breached an implied warranty that it had exercised its skill with care and diligence and in a reasonable, non-negligent manner. In addition, nothing in Donnelly suggests that implied warranty is dependent on the design professional breaching any specific contractual provision. Accepting the allegations in North Peak's complaint as true, we conclude that North Peak properly pleaded a claim for breach of implied warranty against Architect.

"Architect also argues that the judgment in favor of Defendants Mark Fredstrom and his wife should be affirmed for the separate reason that Mark Fredstrom signed the contract with Scaramella in his capacity as president of Architecture Plus, Ltd. and not in his personal capacity. We disagree, because North Peak's implied warranty is not based on Scaramella's contract with Architecture Plus, Ltd. Rather, the implied warranty is based on (1) North Peak's alleged reliance on the architectural plans and specifications, (2) Donnelly's recognition that 'design professionals' warrant 'that they have exercised their skills with care and diligence and in a reasonable, non-negligent manner."

Bottom line: While the economic-loss doctrine still exists in Arizona, a breach-of-implied-warranty claim creates an effective work-around. In a word, **BEWARE**.

Terra Stock Achieves 96th Record-High

ASFE-Member Firms that obtain their professional liability insurance from Terra Insurance Company saw their investment in the company grow 7.5% between June 30, 2011 and June 30, 2012, as the company announced a new-record-high $312.95 book value per share (BVPS) at the end of the second quarter 2012. Terra is a risk-retention group: By law, each insured must also be an owner of the group; only insureds may own the stock. According to Terra CEO David L. Coduto, "Since converting to risk-retention-group status in 1988, Terra has achieved positive earnings for 97 consecutive calendar quarters and a new-record-high BVPS in 96 of 97 of those quarters. But Terra is far more than just an investment."

Mr. Coduto explained that "Terra's refined corporate culture emphasizes excellent financial and claim management, the creation and continuing improvement of outstanding insurance products, and superior services to support those products. By focusing on the risk-management and loss-prevention activities of our owner/insureds, we help improve both their and Terra's profits and operating efficiency. We never forget that each policyholder is an owner and deserves to be treated as such. We respond immediately to their requests, be it for contract review, negotiation guidance, or other services. We reimburse many of our policyholders' professional-development pursuits.

...we're animals, meaning that conflict is inevitable...

Our telephones are always answered by staff members during normal business hours; all Terra employees, including upper management, are readily available and easily accessible to policyholders and anyone interested in learning about the company. Policyholders and prospective policyholders speak directly with the decision makers; there is no middleperson or filtering device between management and an insured or a prospective insured. This strong corporate culture and experience is what we call 'The Terra Difference.'"

A.M. Best Company, the internationally recognized insurance company rating organization, qualitatively rates Terra "A, Excellent." Terra also enjoys an implied qualitative rating of "A++, Superior," pursuant to its score on Best's Capital Adequacy Ratio (BCAR) analysis.

Terra provides a variety of professional-liability insurance products to geoprofessional firms whose gross revenues range from $300,000 to more than $100 million annually.

More information about Terra and the products it offers, as well as free risk-management publications and videos, can be found at www.terrarg.com, or by contacting Terra Insurance Company, 2 Fifer Avenue/Suite 100, Corte Madera, CA 94925; tel. 1/800-872-0077 (in CA, 415/927-2901); e-mail terra@terrarg.com.

Upcoming meetings

Mark your calendar! You don't want to miss any of the upcoming meetings of **ASFE/The Geoprofessional Business Association**.

April 25-27, 2013
ASFE Spring (Annual) Meeting
Wild Dunes Resort
Isle of Palms, South Carolina

October 10-12, 2013
ASFE Fall Meeting
Boston Marriott Copley Place
Boston, MA

April 10-12, 2014
ASFE Spring (Annual) Meeting
The Fairmont Orchid, Hawaii
The Big Island, Hawaii

Business 101

Why can't we all get along? Because we're animals, meaning that conflict is inevitable as long as food, mates, and territory are limited. (In the case of humans, add money to that list.) These conditions are aggravated at work because the workplace is com-

monly a small, closed system where recognition, promotions, and raises are in great demand but extremely short supply. In other words, no matter how effective a firm's leaders believe their management systems may be, people and their different personalities, ethics, and outlooks create situations that make it impossible to minimize conflict. **NOT**! In fact, effective management *can* reduce conflict, and – that being the case – one can surmise that employee conflict can be a sign of ineffective management, frequently associated with the following issues.

Centralized functions like HR, IT, and marketing can create conflicts because they put all the related resource eggs in one basket. Try to put enough eggs in the basket to meet all usual needs, or possibly consider an alternative or supplementary resource-distribution method.

Lack of accountability can leave people lost, resulting in finger-pointing, backstabbing, and other forms of conflict. ("She got the promotion I should have gotten, because….") Lack of accountability commonly manifests itself when poorly defined objectives and/or metrics result in poorly constructed bonus, compensation, and promotion programs.

Shared or unclear responsibilities are blueprints for conflict. If responsibilities are to be shared, they must be clearly circumscribed: In fact, who is responsible for what? For that matter, any responsibility should be closely delineated, to help prevent people from stepping on one another's toes.

Unstructured compensation and review systems are perennial conflict creators, because employees have little knowledge of: how they're regarded by superiors, peers, and other coworkers; what they need to do to improve; the objectives management would like them to achieve in the upcoming months. Unstructured systems take on a veneer of structure by rewarding tenure rather than merit or embracing criteria that are vague and subject to interpretation, resulting in more exceptions than rules.

Overly structured compensation and review systems can be just as problematical, especially when their lack of flexibility prevents managers from recognizing rising stars by giving them a career ladder that helps them rise faster.

Poorly managed growth can create conflict when it results in an organization holding on to fundamental processes – like those associated with forecasting, operational and strategic planning, and budgeting – that worked well for the smaller organization that used to exist, but no longer does.

The "Peter Principle" holds that some people get promoted to a position they are not qualified for, and they stay in that position until they finally get it right. Which they usually never do. The result? Qualified individuals get stuck working for a boss or coworker they disrespect, creating conflicts between the qualified and the unqualified, as well as the decision-makers who, for whatever reason, are unwilling to replace the unqualified with those who are capable.

Human resources management

The temperature in your office is too hot. It's also too cold. At least that's what one should infer, it seems, from a CareerBuilder.com survey of 4,285 full-time, nongovernment U.S. workers. While more than half – 54% – said the office temperature was "just right," 29% said it was too hot and 19% said it was too cold. Who cares? You should, because numerous studies show that temperatures that are too hot or too cold cause a productivity drop-off. They can also lead to conflict: Ten percent of the respondents said they had fought with a co-worker over the office temperature. If the temperature setting could be a problem, try these tactics:

- Set To Please: Identify which thermostats affect which areas. Ask workers in each affected area what a preferred setting or range would be. Seek compromise.
- Encourage Layers: When one setting cannot please all, encourage layering, so workers can add or subtract layers to help achieve harmony with the indoor environment as the day progresses.
- Be Flexible: If a particular space, time of day, or combination of the two creates conditions that are too hot or too cold, encourage those affected to speak up. It may be possible to find an area (like a conference room) that works better, or possibly the answer could be telecommuting.

Editorial

The world is run by those who show up. Geoprofessionals – along with most other scientists and engineers – don't show up. Oh, they're there all right, behind closed doors, hiding from the limelight for fear, perhaps, the limelight may be a form of kryptonite. And that would be something for them to fear, because – in reality – they *are* super. Take away their contributions to American society and what do you have? A populace living in mud huts with a life expectancy of 42. Is there any wonder why our infrastructure is rotting into oblivion? It's because those in the best position to make waves about it do not *ever* rock the boat. Not that they could: They don't show up. And is there any wonder why we are finding it so difficult to populate the ranks of engineers and scientists, given that their next generation, as the current and those before it, seems to live where the sun – or the limelight, at least – doesn't shine, and likes it just that way.

A few years ago, a group of ASFE past presidents and this editor started an organization called Engineers' Leadership Foundation, which, in turn, established a program called Engineering Better Readers. The goal: Get engineers involved in the community – in the limelight – via an innovative (and, so far, highly successful)

effort to encourage kids to read. In each pilot, kids' reading improves significantly and, more important, the program-sponsoring engineers have been featured in newspaper articles and on TV. OK: So they're not yet members of the all-powerful Standing Committee of the Chinese Communist Party, which is, at heart, an engineers' club. But they are making a difference for the kids and, in the process, for their community, for themselves, and for the professions they represent: The proverbial "just a single step." But will it truly help fill the ranks? Consider this…

In various settings, geoprofessionals have been asked to raise their hands if a parent, sibling, other relative, friend, or trusted advisor encouraged them – overtly or tacitly – to enter their profession. Generally, about half or more respond affirmatively. As such, those who serve as mentors in the Engineering Better Readers program could be encouraging any number of kids to at least look into the mentors' professions simply because the kids admire and respect the mentors. Of course, being able to read is essential, too, and that helps society. And who knows: Maybe if more engineers and scientists got into the limelight, where they could share their insights, preferences, and profound intelligence about just about everything, we'd have more youngsters get involved, and not just those who regard limelight as a threat.

And here's yet another thought: President Obama, just as President Bush before him, has called for more students to get involved in STEM – science, technology, engineering, and math – because, historically, those who have – your forebears – *really* created this nation. Sure: George Washington was successful in the burgeoning nation's first war, and let's give a shout-out, too, to Andrew Jackson, Winfield Scott, Ulysses S. Grant, et al. – but wars do not make a nation great: They destruct. STEM folks *con*struct. And unless we develop more STEM folks, our nation will lose its historic edge, the one that made us so great. So, how are we going to do it? By promoting STEM as the greatest thing since sliced bread, just as we have – unsuccessfully – for the past 50 years? Or might we want to instead take a cue from Engineering Better Readers: Put the STEM people – starting with engineers and geoprofessionals, if you don't mind – in the limelight. After all, Messrs. Presidents, if engineers and geoprofessionals are so important, where's the Engineer of the Capitol? Where's the President's Engineering Advisory Board? Where's the Department of Infrastructure? Where are the engineers who should be in the Cabinet?

"They need to get there on their own," some might say, because – when all is said and done – the world is run by those who show up. Well, let us submit that, in this case, after decades of extraordinary accomplishments while working in the shadows, STEM folks need some help. They need a national, political leadership that says, in essence, "We're going to make you show up. We're going to put you guys in the limelight, for everyone to see, learn, and appreciate, so young Americans make the connection: You really want to be a big wheel in the USA? Get involved in the geoprofessions; get involved in engineering." You deserve that helping hand. More to the point, those like me who rely on you for so much need for you to have it.

ISI Envision checklist available

Become familiar with the sustainability aspects of infrastructure-project design – and help your clients become familiar with them, too – by using the new Institute for Sustainable Infrastructure (ISI) Envision Checklist available on the ISI website. Use the checklist as a free-standing assessment tool for comparing sustainability alternatives, or to prepare for a more detailed sustainability assessment. Structured as a series of Yes/No questions, the checklist is organized into five categories:

- Quality of life addresses a project's effect on surrounding communities, from the health and well-being of individuals to the well-being of social fabric as a whole.
- Leadership encourages and rewards the communication and collaboration effective leaders apply to produce a sustainable project that contributes positively to the world around it.
- Resource allocation focuses on the quantity, source, and characteristics of resources needed to build infrastructure and keep it running, and their impact on overall project sustainability.
- Natural world considers the way in which a project is located within natural-world systems – including habitats, species, and nonliving natural systems – and it can be adjusted to interact with natural systems in a positive manner, while reducing negative effects.
- Climate and risk considers techniques for minimizing emissions that could contribute to increased short- and long-term risks, and ensuring that infrastructure projects are resilient in terms of their ability to withstand short-term hazards or altered long-term future conditions.

Checklist users can determine how their project's concepts and designs are sustainable on a smaller scale and their potential infrastructure performance. ASFE is a charter member of the ISI.

EPA releases stormwater and wastewater planning approach framework

The U.S. Environmental Protection Agency (EPA) has *issued Integrated Municipal Stormwater and Wastewater Planning Approach Framework* to help local governments meet their Clean Water Act obligations. The new framework helps EPA regional offices, states, and local governments develop voluntary stormwater- and

wastewater-management plans and implement integrated approaches to reduce wastewater-systems overflows and stormwater pollution. EPA says "an integrated planning process has the potential to identify a prioritized critical path to achieving the water quality objectives of the Clean Water Act (CWA) by identifying efficiencies in implementing competing requirements that arise from separate wastewater and stormwater projects, including capital investments and operation and maintenance requirements. This approach can also lead to more sustainable and comprehensive solutions, such as green infrastructure, that improves water quality as well as supports other quality of life attributes that enhance the vitality of communities."

The framework "will help communities as they develop plans that prioritize their investments in storm and wastewater infrastructure." The framework highlights the importance of managing stormwater and wastewater releases into the nation's waters. According to EPA, "When wastewater systems, many of which are aging, overflow they can release untreated sewage and other pollutants into local waterways. These overflows can carry a variety of harmful pollutants that can threaten communities' water quality, including bacteria, metals, and nutrients, and can contribute to disease outbreaks, beach and shellfish bed closings, and fishing or swimming advisories. Stormwater discharges can also contain many of these pollutants, and municipalities are often faced with difficult choices about how to direct their funds to solve the most critical problems first." Obtain a copy of the new framework by clicking here, or by sending your request to info@asfe.org.

Road warrior

Heads up: Car-rental companies are becoming far more aggressive in terms of billing customers for dents, dings, and scrapes that allegedly occurred while the vehicle was in a renter's possession. ***Protect yourself***: Use your smart-phone still-photo or video camera to document the vehicle's condition – focus on dents, dings, and scrapes – before you leave the lot. It can save you significant heartache (not to mention wallet-ache) later.

Dr. English

Do some of your reports include a table of contents? If so, you may begin the page with the title TABLE OF CONTENTS. But if you look closely, or even if you don't, you'll see it's not a table: It's a listing that is commonly referred to as a "table of contents." Using "table of contents" to refer to a contents page is fine: What's not fine is titling the page TABLE OF CONTENTS, because it's not a table. So, what should the title of your contents page be? Simple: CONTENTS…and let it go at that.

…How do you create a strategic plan when the future of your most important issues is uncertain?…

Planning for uncertainty: The new *ASFE practice alert no. 55*

How do you create a strategic plan when the future of your most important issues is uncertain? That's exactly the problem that confronted participants in the Crystal Ball Workshop hosted by ASFE's Emerging Issues and Trends Committee. The solution? Scenario planning, characterized by the Committee as "a powerful tool in planning for uncertainty: You don't have to get the future 'right' from the outset. To make it work, you need to choose significant and relevant trends, and select appropriate 'triggers' for implementation of various strategies." The economy and infrastructure funding were the two uncertain trends considered at the workshop and discussed in the new *ASFE Practice Alert: No. 55*, "Planning for an Uncertain Future." (Trends considered certain were discussed in *ASFE Practice Alert No. 53*, "The Crystal Ball Workshop: Ten Certain Trends To Consider Now.") The strategies developed – 30 of them – are categorized as "No Brainers" (those that make sense for all scenarios), "No Regrets" (strategies that work best for one scenario but won't be harmful if another scenario plays out), and "Contingent Possibilities" (strategies that make most sense for one scenario, but could be harmful if others materialize).

The new *Practice Alert* is now available to ASFE members free of charge at www.asfe.org.

You've just got to be kidding

The national capital area is not unique for its growing use of speed cameras, the cash-cow devices that jurisdictions throughout the nation are installing to encourage better driving. But the area may be in the vanguard with respect to the citizenry's response and, in particular, the police response to the public protest that begin in April, when someone unholstered a gun and shot an Upper Marlboro, MD camera. Two weeks later, someone knocked over a camera located near Prince George's Community College. (Because of the camera's weight, two or three people had to have been involved, police believe; i.e., it takes a village.) In May, someone walked up to a camera near FedEx Field and cut off one of its legs. (Police say it wasn't that big a deal. They fitted the camera with a prosthetic device and put it right back to work.) Two months later, however, someone torched a speed camera near Bowie State College and put it out of commission. Permanently.

According to Prince George's County Police Major Robert V. Liberati, the human (we assume) in charge of the

Automated Enforcement Section, "It costs us $30,000 to $100,000 to replace a camera. That's a significant loss in the program. Plus it also takes a camera off the street…so there's a loss of safety for the community." (Yeah, right.)

So what's the solution? You guessed it! The police are installing surveillance cameras to watch the speed cameras, because, under Maryland law, speed cameras can't be used for security purposes; they can only take pictures of speeding. Liberati says the new cameras do not create a Big Brother atmosphere, nor are they designed to help localities enact a cash grab: It's just a matter of police trying to keep the public safe from reckless drivers. (Yeah, right.) "We've taken the additional step of marking our cameras to let people know that there is surveillance," Liberati added (probably in a curious monotone). Of course, the markings also create great targets.

New members

We are delighted to extend a hearty "Welcome aboard" to eight new ASFE-Member Firms and to ASFE's newest Faculty Member. The new Member Firms are:

AquAeTer, Inc. is a multidisciplinary engineering firm with professional staff located in Colorado, Georgia, Kentucky, Maryland, Montana, and Tennessee. Established in 1992, the firm provides scientific and technical services in projects related to energy, engineering, environmental, sustainability, and risk analyses. AquAeTer's clientele includes energy companies, oil and gas facilities, manufacturing, and waste management facilities. The firm also works with financial institutions, real-estate developers, law firms, commercial businesses, and telecommunications companies. Stephen L. Wampler, P.E. is a vice president of the firm. *(AquAeTer, Inc. / 7430 East Caley Avenue / Suite 310 / Centennial, CO 80111 / tel: 303/771-9150 / fax: 303/771-8776 / http://www.aquaeter.com/)*

Bryant Consultants, Inc. comprises scientists, geologists, civil engineers, field representatives, and laboratory technicians who provide a wide range of earth-science and civil-engineering services. Founded in 1996, the firm focuses on GEOFORENSICS™, geotechnical and geostructural consulting, as well as consulting for site development for builders, developers, and owners. John T. Bryant, P.G. is the contact for the firm. *(Bryant Consultants, Inc. / 3360 Wiley Post Road / Suite 100 / Carrollton, TX 7506 / tel: 972/713-9109 / fax: 972/713-9171 / http://www.geoneering.com/)*

Crawford & Associates, Inc. provides an array of geoprofessional services from its headquarters in Sacramento and its branch office in Modesto, CA. Services include geotechnical engineering, construction management, construction materials engineering and testing, Special Inspections, hazardous-materials assessments, expert witness, and drafting and renderings. Benjamin D. Crawford, P.E., G.E. is the principal of the firm. *(Crawford & Associates, Inc. / 3128 O Street / Suite 1 / Sacramento, CA 95816 / tel: 916/455-4225 / http://www.crawfordinc.com/)*

Hunt Engineering Company is a woman-owned business established in 1980. Its services include civil engineering, geotechnical engineering, structural engineering, land surveying, and landscape architecture. Jeffrey M. Hunt, P.E. is a principal of the firm. *(Hunt Engineering Company / 22 East King street / PO Box 537 / Malvern, PA 19355 / tel: 610/644-4600 / fax: 610/644-2466 / http://www.huntengineering.com/)*

Isherwood Associates specializes in geostructural engineering. Formed in 1972, Isherwood has been responsible for excavation shoring, underpinning and foundations for many prominent Toronto structures. Nadir Ansari, M.E..Sc., P.Eng. is the ASFE contact for the firm. *(Isherwood Associates / 3-3100 Ridgeway Drive / Mississauga, ON L5L 5M5 / tel: 905/820-3480 / fax: 905/820-3492 / http://www.isherwood.to/)*

Integrated Testing and Engineering Company of San Antonio, L.P. serves all of Texas from its offices in San Antonio, Austin, Dallas, and Houston. Founded in 1991, and known as InTEC, the firm's professional staff is supported by field representatives, laboratory technicians, and drilling crews who together provide geotechnical engineering, construction materials engineering and testing, environmental-site assessments, and geologic site assessment services. E. A. Palaniappan, Ph.D., P.E. is the contact for the firm. *(Integrated Testing and Engineering Company of San Antonio, L.P. / 12028 Radium / San Antonio, TX 78216 / tel: 210/525-9033 / fax: 210/525-9032 / http://www.intectesting.com/InTECHomeOld.htm)*

Nobis Engineering, Inc. is a 23-year-old, multidisciplinary consulting firm providing diversified environmental, geotechnical, and civil-engineering services to commercial, federal, and state and municipal clients throughout the U.S. The company is a small disadvantaged business (SDB) and is certified as a DBE/MBE by multiple state agencies. Ken Koornneef, P.E. is the firm's president. *(Nobis Engineering, Inc. / 585 Middlesex Street / Lowell, MA 01851/ tel: 978/683-0891 / fax: 978/683-0966 / http://www.nobisengineering.com/)*

Resource Development Consultants Ltd provides specialist services in: geotechnical engineering, geological services, CPT and SCPT testing, and geophysics for ground engineering. Established in 2006, the firm's projects include open-cast and underground mines, and infrastructure comprising support for greenfield mine projects, foundations in soft ground, and land stability. The contact for the firm is Cameron Wylie, MIPENZ, CPEng, MAusIMM, CP. *(Resource Develop-*

ment Consultants Ltd / 15 Havelock Road corner Porter Drive / Havelock North, 4130 New Zealand / tel: 6468771652 / http://www.rdcl.co.nz/)

Our new ASFE Faculty Member is Muhannad T. Suleiman, Ph.D. an assistant professor of geotechnical engineering in Lehigh University's department of civil and environmental engineering. Dr. Suleiman has had 37 peer-reviewed journal and conference papers published with another five being under review. And that doesn't include the 46 conference papers, invited presentations, and research reports also to his credit. *(Muhannad T. Suleiman, Ph.D. / Department of Civil and Environmental Engineering / Lehigh University / 326 STEPs Building / 1 W Packer Avenue / Bethlehem, PA 18015 / tel: 610-758-2592 / fax: 610-758-5856 / e-mail: mts210@lehigh.edu).*

Too big to fall

"On August 1, 2007, the I-35W Bridge in Minneapolis collapsed during rush hour, killing 13 people and injuring 145. The bridge had been designated as structurally deficient, due to insufficient maintenance, ***and*** fracture critical, because the failure of a single component could result in the failure of the entire structure. These designations are not unique. There are 7,980 other bridges in the U.S. that have been designated structurally deficient and fracture critical. These bridges are still in use in communities across the U.S. today and pose a danger to the public unless they are soon remediated.

"Since the I-35W Bridge's collapse, other dangerous bridges have been identified and closed. As recently as September 8, 2011, inspectors closed the I-64 Sherman Minton Bridge carrying six lanes of traffic across the Ohio River between Louisville, Kentucky, and New Albany, Indiana. This bridge like the I-35W Bridge was designated as fracture critical and was rated by inspectors as structurally deficient. It could have collapsed had serious cracks in the bridge not been discovered. While the Sherman Minton Bridge was closed in time, similarly designed bridges remain open."

...the failure of a single component could result in the failure of the entire structure...

So begins the home page of Save our Bridges *(http://saveourbridges.com/)*, created by Barry B. LePatner, attorney and author of *Too Big to Fall: America's Failing Infrastructure and the Way Forward* (University Press of New England, 2010), What's really special about the website is the Save Our Bridges interactive map. It allows the people to easily locate bridges in their area that Federal Highway Administration and/or state transportation agencies have classified as both structurally deficient and fracture critical. The intention of the map is to raise public awareness of the state of America's infrastructure by pinpointing hazards close to home.

How many people in your community know that the bridges they use every day may be on that map? And if the bridges are there, who would be in a good position to advise them about the hazard and what they could try to do to get it eliminated? Could that be you? Of course it could be, as long as you don't mind being regarded as an informed, concerned professional who wants to make fellow citizens aware of what's been going on. As usual, it's not a matter of could. What's really at issue is should and would.

Professional selling

Editor's Note: This "Professional Selling" tip was submitted by ASFE NewsLog's intrepid "Grape Press" tasting crew.

Most folks have a passion for one thing or another, ranging anywhere from mountain climbing to spelunking; from opera to football. What are the passions of your firm's client representatives? You should know, because that gives you the opportunity to strike up a conversation, send relevant clippings, or purchase a Christmas or birthday gift geared specifically to the individual (as opposed to a one-size-fits-all turkey or ham). What about wine? Our experience has been that most folks like it, and many love it. While they may not be passionate about it, many are eager to learn, since learning requires tasting. Do your client reps like wine? We bet at least some do. And we also bet that they'd be eager to attend a weekly, biweekly, or monthly wine tasting sponsored by your firm. While many approaches are popular (see this issue's Grape Press column), one of the simplest is just to gather an array of wines from the same year and region, like Bordeaux, Malbec from Argentina, Shiraz from Australia, and so on, then let people taste and grade on their own. It wouldn't hurt that your own personnel would enjoy it, too, and that you'd give client reps something to look forward to on a regular basis…as long as they keep retaining your firm, of course!

How many of your local client representatives like wine? You really should know.

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