IGS NEWS

NEWSLETTER OF THE INTERNATIONAL GEOSYNTHETICS SOCIETY

Dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies

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Proposed IGS Bylaw Change: Electronic Voting System

The IGS Council met in Seoul, Korea, in June 2004, at *GeoAsia 2004*, which was hosted by the Korean Chapter of the IGS. As a result of the analysis of the recent postal ballot electing the current Council, it was recognized that the postal ballot system may not be the most effective, democratic, and representative method of conducting the Society's business and communication with IGS Members.

Council identified the following three major obstacles with the currently used postal balloting system:

- low participation rate;
- many ballots cast are ineligible due to late arrival at the polling location; and
- high cost of postal ballots, both to the IGS and to many individual members.

To overcome these obstacles, Council strongly recommended that the Society immediately shift to an electronic balloting system on the basis that the majority, if not all, IGS Members have access to the internet and, thus, have the capability to vote electronically. Subsequently, the IGS Officers and Secretariat identified an independent software company that can ensure IGS ballots are confidential and secure, while dramatically reducing costs.

A total of seven IGS Bylaw articles require modification to incorporate an electronic balloting option. For six of the seven articles, the change is limited to inserting the words "*electronic*" or "*or electronic*" to the existing article. In the case of the seventh article, Article 8.02.01, it was agreed that this article lacked clarity, and it has been rewritten. A table listing each of the current and proposed modifications to the these bylaws can be found on page 2 of this issue of the newsletter.

A postal ballot is enclosed with this issue of *IGS News* proposing changes to the IGS bylaws to enable the adoption of an electronic balloting system for future voting occasions. IGS Members are requested to complete the enclosed postal ballot proposing changes to the IGS Bylaws, in consideration of the above arguments for the establishment of an electronic balloting system. Ballots are to be completed and returned to P.E. Stevenson, IGS Election Officer, by **10 January 2005**.

reported by Daniele Cazzuffi, IGS President, and Peter E. Stevenson, IGS Secretary

Inside this Issue of *IGS News*

NEW IGS MEMBERSHIP BENEFITS REQUIRE ELECTRONIC COMMUNICATION

Visit the IGS WWW site: *www.geosyntheticssociety.org*

Proposed IGS Bylaw Changes

Bylaw Number	Current IGS Bylaw	Proposed IGS Bylaw
6.01.02[(a)]	Corporate votes shall carry a weight of five in all General Assembly ballots and postal ballots held in lieu of General Assemblies. In all other meetings, they shall carry a weight of one, regardless of whether they attend as individuals or corporate representatives.	Corporate votes shall carry a weight of five in all General Assembly ballots and postal *or electronic* ballots held in lieu of General Assemblies. In all other meetings, they shall carry a weight of one, regardless of whether they attend as individuals or corporate representatives.
7.01.06[(a)]	Except when acting in accordance with 7.01.03, the Council may decide by a 2/3 vote to utilize postal ballots of the members instead of calling an Extraordinary General Assembly. 7.01.03 reads as follows: "Only fully paid members and officially invited guests may attend General Assemblies. Only fully paid members may vote at General Assemblies".	Except when acting in accordance with 7.01.03, the Council may decide by a 2/3 vote to utilize postal *or electronic* ballots of the members instead of calling an Extraordinary General Assembly
8.02.01[(b)]	The Council shall consist of at least 10 and no more than 16 persons, elected from the membership, half of which should be elected in conjunction with the Ordinary General Assembly meeting held concurrently with an International Conference, the other half to be elected at the mid-way point between those General Assemblies, either at a General Assembly or by postal ballot.	The Council shall consist of at least 10 and no more than 16 elected members. These are elected from the membership. The length of the term is the time period between two consecutive Ordinary General Assemblies held concurrently with an International Conference. Half of the elected members should be elected in conjunction with an Ordinary General Assembly held concurrently with an International Conference, the other half should be elected at the midpoint between those Ordinary General Assemblies. Before each vote, the Council shall decide the exact number of seats submitted to a vote. The votes that are held in conjunction with an Ordinary General Assembly shall be taken either at the General Assembly or by a postal or electronic ballot. The votes held at midpoint between Ordinary General Assemblies shall be taken by a postal or electronic ballot. All votes shall be secret.
8.04.03[(a)]	Emergency meetings may be called on two weeks notice, upon request of the President and the Secretary or of one fourth of the Council members. They must be called to elect Officer(s) during the period between Ordinary General Assemblies. Council members may be consulted by postal ballot.	Emergency meetings may be called on two weeks notice, upon request of the President and the Secretary or, of one fourth of the Council members. They must be called to elect Officer(s) during the period between Ordinary General Assemblies. Council members may be consulted by postal *or electronic* ballot.
11.02.03[(a)]	A Committee may confer and act using postal and telecommunications services.	A Committee may confer and act using postal, *electronic* and telecommunications services.
11.02.08[(a)]	The Council (or the General Assembly) must endorse committee recommendations before taking full effect. These can be adopted by postal vote upon decision by the Council	The Council (or the General Assembly) must endorse committee recommendations before taking full effect. These can be adopted by postal *or electronic* vote upon decision by the Council.
13.01.01[(a)(c)]	No alteration or amendment of these bylaws shall be made except at an Ordinary, or an Extraordinary General Assembly or a postal ballot.	No alteration or amendment of these bylaws shall be made except at an Ordinary, or an Extraordinary General Assembly or *by* postal *or electronic* ballot.

Notes: (a) The sole change to the bylaw is the addition of "electronic" or "or electronic" (see underlined and italicized text).
(b) The bylaw has been rewritten for clarity and simplicity.
(c) The word "by" has been added for grammatical correctness.

9th International Conference on Geosynthetics in 2010

Conference Sponsors Sought

The IGS invites Chapters and interested organizations to express their interest in organizing and hosting the *9th International Conference on Geosynthetics* (*9ICG*), which will be held in 2010. The history of the ICGs is as follows:

- First ICG, Paris, France, 1977
- Second ICG, Las Vegas, USA, 1982
- Third ICG, Vienna, Austria, 1986
- Fourth ICG, The Hague, The Netherlands, 1990
- Fifth ICG, Singapore, 1994
- Sixth ICG, Atlanta, USA, 1998
- Seventh ICG, Nice, France, 2002
- Eighth ICG, Yokohama, Japan, 18-22 September 2006

The IGS Secretary will provide prospective hosts with a detailed information package that informs and instructs interested parties on the proper procedure to prepare a bid to host the Conference. Interested Chapters and organizations should contact the IGS Secretary, P.O. Box 347, Easley, South Carolina 29641, USA, Fax: 1/864-859-1698, e-mail: igssec@aol.com.

GeoFilters 2004

19 to 21 October 2004, Stellenbosch, South Africa

The *Fourth International Conference on Filters and Drainage in Geotechnical and Environmental Engineering, GeoFilters 2004*, was held on 19 to 21 October 2004 at the Spier Estate near Stellenbosch in South Africa. The Conference was organized by the University of the Witwatersrand, under the auspices of the IGS, the Environmental Engineering Division of the South African Institution of Civil Engineering, and the Geotechnical Engineering Division of the South African Institution of Civil Engineering.

The Conference was attended by 54 delegates, with representation from 13 countries. Although 44 abstracts were accepted for presentation, only 20 were presented, with 25 appearing in the published Conference Proceedings. The theme of the Conference was "Proven Performance," with discussions focussing on aspects of proven success (or obvious failure in some cases) of mineral and geosynthetic filtration and drainage systems. This theme was indeed followed through many of the presentations and discussions that followed throughout the Conference.

Keynote Lecturer: Prof. R.K. Rowe

An extremely high standard was set from the outset with the opening Keynote Lecture given by Prof. R. Kerry Rowe of Queens University, Canada. Prof. Rowe's lecture (published in the Proceedings) was simultaneously comprehensive and easily comprehended. Titled, "Filtering and Drainage of Contaminated Water," it highlighted the many and various errors of understanding that currently prevail in the design of many landfill and waste disposal drainage systems.

The lessons illustrated highlighted common problems with both mineral and synthetic filters and drainage components and provided extremely useful suggestions on how to avoid many of the problems described. This paper will undoubtedly become widely read and cited over the years to come.

Special Lecturer: Prof. J. Fannin

Another unexpected delight was the Special Lecture given by Prof. Jonathan Fannin of the University of British Columbia, Canada. It was unexpected because Jonathan agreed to prepare and present the lecture at very short notice. Having just completed a Terzaghi Fellowship at the Norwegian Geotechnical Institute in Oslo researching the origins of the Terzaghi filter criteria, he was coerced into giving a presentation on the topic at *Geofilters 2004*. The lecture provided fascinating glimpses behind the Terzaghi mystique as well as a truly forensic examination of the development of the Terzaghi filter criteria. An extended version of this lecture is currently being prepared by Prof. Fannin.

Discussions and Debates

A pleasing feature of the Conference was that papers on mineral and synthetic filters were in equal proportion. The discussion sessions accordingly benefited from the insights provided by people with a range of expertise, with lessons learned from the failures of mineral filters providing useful lessons for the designers of synthetic filters and vice versa.

A fascinating aspect of the Conference was the range of applications in which filters and drainage systems are used and some of the extreme conditions in which they are required to perform satisfactorily, often for many decades. Examples included the retention of hydraulic backfill in underground mines at depths of 3,500 metres below ground, the protection of river banks in Bangladesh under flow conditions of over 150 000 cubic metres per second, and applications in earth dams in Iran of over 170 m in height.

As shown in some of the papers, where significant and catastrophic failures of these components were the order of the day and, as confirmed in the discussion sessions that followed, our current understanding of these systems are far from complete and some of the decisions that need to be taken by designers of these systems are extremely complex and taxing.

Outcomes/Recommendations

A theme that emerged clearly from the Conference was the need to develop standardized methods of testing of filter materials and systems. This was con-

Traditional African dancers and drummers entertained Conference participants.

J. Fannin (Canada), B. Indraratna (Australia), and A. Fourie (South Africa) joined in the cultural celebrations with traditional warrior face paint.

sidered to be particularly relevant to natural (or mineral) filters, where the tendency has been for researchers worldwide to use a wide range of testing equipment and protocols. Unlike the field of synthetic filters, where standardized procedures are more common, this has led to difficulties in comparing results published by researchers from different countries. It was agreed that this topic was worth following up and methods for doing so agreed upon.

Another recommendation arising from Conference discussions was the need to collect, collate, and publish measurements of long-term performance of filtration and drainage systems. Coupled with this debate was the acknowledged need to agree on standard sampling and storage procedures for these studies. These are all critical issues for future debates. One mechanism to ensure the continuation of these debates may be to either establish a dedicated Technical Committee of the ISSMGE dealing with Filtration and Drainage, or otherwise link these activities to those of another appropriate Technical Committee.

After some debate, it was agreed that there is sufficient merit in continuing the current series of conferences, with the next one to take place in 2008. The venue and exact dates were not decided upon and it was agreed that the current President of the IGS, Dr. Daniele Cazzuffi, would initiate discussions to decide these issues, which would include all the organizers of previous *Geofilters* conferences as well as other interested parties.

Social Events and Activities

Despite the intensity of debates that occurred at the Conference, social activities were not neglected. The first evening saw delegates treated to a feast of specialty foods from across the African continent, with delicacies including Kudu, crocodile, warthog, and local game fish. A group of superbly athletic African dancers and drummers entertained us and some delegates joined in the cultural celebrations by having their faces painted in traditional warrior fashion. The following evening saw dinner being taken at the Neethlingshof wine estate, preceded by a tour of the cellars and the all-important wine tasting session.

Conference Proceedings

Additional copies of the Conference Proceedings are available from the University of the Witwatersrand, South Africa, by contacting Lesley Stephenson at: lstephenson@ee.wits.ac.za.

reported by Andy Fourie, Organizing Committee Chair and IGS Member

Koerner Research Symposium

13 September 2004, Drexel University, Philadelphia, Pennsylvania, USA

All indications suggest that the Koerner Research Symposium was an outstanding success! The Symposium was held in honour of the research achievements of Dr. Robert (Bob) M. Koerner, Emeritus Professor of Civil Engineering Drexel University, Philadelphia, USA.

An open house was held at the Geosynthetic Institute (GSI) on Sunday, 12 September 2004 and the Symposium was held on Monday, 13 September at Drexel University in Philadelphia, Pennsylvania, USA. There were 130 Symposium participants and over 200 at the banquet that followed. A special message from Daniele Cazzuffi (IGS President) on behalf of the IGS was read. Participants at the Symposium heard 15 presentations that chronicled Bob Koerner's 40-year career at Drexel University. Each presentation is published in a 261-page proceedings that was distributed prior to the presentations.

Morning Session

The morning session commenced with Dr. Gordon Boutwell's (STE, Baton Rouge, Louisiana) discussion of Bob's graduate student days at Duke University along with selected aspects of landfill stability. This was followed by Dr. Alan Lawley of Drexel University discussing Bob's work with Project Themes: powder metallurgy, pharmaceutical powders, and then coal briquetting during the 1970s. Dr. Art Lord, a long-time physics colleague of Bob's at Drexel, discussed early U.S. EPA funding on dam monitoring. This was followed by Dr. Marty McCabe (Bob's first Ph.D. student) presentation on acoustic emission research conducted at Drexel in the late 1970s and early 1980s.

Dr. John Bowders (another former student, now at the University of Missouri) spoke on nondestructive evaluation methods, which included ground penetrating radar, electromagnetic induction, and other techniques to locate buried ground contamination. Mr. Joe

Welsh (Hayward Baker) presented early work done with Bob on synthetic fabrics for flexible forming systems and the origins of the first book on geosynthetics co-authored by Koerner and Welsh. Dr. Frank Ko (Drexel University) then spoke of textile engineering, and the session was closed by Dr. Bob Holtz (University of Washington) who spoke of early geotextile research and development. Both Drs. Ko and Holtz were close colleagues of Dr. Koerner in the early years of geotextile and geogrid research.

Afternoon Session

Mr. Gary Kolbasuk (Raven Industries) opened the afternoon session with a retrospective of the development and growth of the geomembrane industry. He was followed by Mr. Bob Landreth (U.S. EPA) who reviewed waste management control strategies for landfills. The U.S. EPA was the major sponsor of a considerable body of research conducted at Drexel with Dr. Koerner as the principal investigator. Dr. Greg Richardson (GNR Consulting, Raleigh, North Carolina) presented a number of geosynthetic design developments in a paper that spoke to the beginnings and early days of the Geosynthetic Research Institute (GRI).

Dr. Dave Daniel (University of Illinois) presented a review of the development and advancements in GCL research and the pioneering work that he and Bob did in the late 1980s. Mr. David Suits (New York State Department of Transportation) spoke on the 20 years of the ASTM International Committee D35 on Geosynthetics; Bob has been active in this group since its inception. Dr. Grace Hsuan (Drexel University) presented a compendium paper on lifetime prediction of polyolefin geosynthetics: work that was sponsored by EPA and the consortium members of GSI. Dr. George Koerner (GSI) presented the concluding paper of the day on GSI's efforts in the threefold sequence of generic specifications, laboratory accreditation, and product certification.

Dr. Georg Heerten (left), President Naue Fasertechnik GmbH and IGS Member, congratulates Dr. Koerner (right).

All of the presentations were interspersed with many personal anecdotes about Bob Koerner. The Symposium was closed by Dr. Koerner giving a summary of the days events along with thanks to the attendees, speakers, Drexel and GSI staff, his administrative assistant Marilyn Ashley, and particularly his wife Paula. The Symposium was initiated and arranged by Drs. Joseph Wartman, Y. Grace Hsuan, and George R. Koerner.

After the close of the symposium, Dr. Wartman demonstrated Drexel's new multiaxial geosynthetic test system. This was followed by an open party in which both Drexel's President (Dr. Constantine Papadakis) and Dean of Engineering (Dr. Selcuk Guceri) acknowledged Bob's contributions to Drexel University and to the geotechnical/geosynthetics professions.

After the banquet, Bob was mildly "roasted," which brought the evening to a happy end. A good time was had by all. The Symposium proceedings are available at cost from GSI. Contact Marilyn Ashley at mashley@dca.net for ordering information.

It is important to emphasize that Dr. Koerner's retirement event from Drexel University represents a new start for Bob in his full-time commitment to the Geosynthetic Institute. In this regard, he will be regularly available to the Institute members and (as much as possible) to the geosynthetic community. He can be reached at the following e-mail address: robert.koerner@coe.drexel.edu.

reported by George Koerner
IGS Member

First International Conference on Eco-engineering: The Use of Vegetation to Improve Slope Stability

13 to 17 September 2004, Thessaloniki, Greece

The *First International Conference on "Eco-engineering: The Use of Vegetation to Improve Slope Stability*" was held in Thessaloniki, Greece, 13 to 17 September 2004 under the auspices of the IGS. Over 100 participants representing 22 countries attended the Conference, which was split into eight sessions, a field trip, and an afternoon of workshops.

Sessions ranged from the fundamental understanding of root-soil interaction, to the application of eco- and ground-bioengineering techniques. Keynote speakers included T. Wu (University of Ohio, USA), R. Morgan (Cranfield University, UK), T. Fourcaud (Agricultural Research Centre for International Development, CIRAD, France), E. Cammeraat (University of Amsterdam, Netherlands), H. Nakamura (University of Tokyo, Japan), C. Koerner (Global Mountain Biodiversity Assessment, GMBA, University of Basel, Switzerland), and S. Mickovski (University of Dundee, UK). The workshops demonstrated a range of field and numerical techniques used in eco-engineering practice.

The prize for Best Talk was awarded to F. Rey (Cemagref, France), and the best poster was jointly awarded to P. Lorenzo (University de Vigo, Spain) and H. Khuder (National Institute for Agricultural Research, INRA-LRBB, France).

The following summarizes the general outcomes and conclusions on the current state of practice and research in

the use of vegetation to improve slope stability:

- Not enough is known about actual plant root *growth* on slopes, but experimental and numerical aspects of root *reinforcement* on slopes are better understood.
- Better quantification of the beneficial and/or adverse effects of vegetation on slopes is required not only with regard to root reinforcement and ecology, but also economic factors.
- More work on the screening of appropriate species on a given slope is necessary, while taking into concern native species and biodiversity.
- The duration of site monitoring should be longer and, in particular, climatic conditions and slope hydrology should be studied over the long-term.
- The training of eco-engineers is of utmost importance, not only at the researcher level, but also at the end-user and local stakeholder level.

Proceedings will be published in a volume of the series *Developments in Plant and Soil Sciences*, Kluwer Academic Publishers, Dordrecht. A selection of papers will also be published in special editions of the journals *Plant and Soil* and *Geological and Geotechnical Engineering*. The Proceedings and selected papers are currently scheduled to be published in 2005.

Conference participants in front of the National Agricultural Research Foundation (NAGREF) Center, in Thessaloniki, Greece, after an afternoon of workshops and a field trip to Thessaloniki Forest Park.

The *Second Eco-engineering Conference* is tentatively scheduled to be held in Beijing, China, in 2008. Further information can be obtained from Dr. Alexia Stokes (stokes@lrbb3.pierroton.inra.fr).

The Conference Organizing Committee Members, Ioannis Spanos (National Agricultural Research Foundation, NAGREF, Greece), Alexia Stokes (INRA-LRBB, France), and Joanne Norris (Nottingham Trent University, UK) would like to thank all speakers, chair persons, poster authors, and participants for their contribution to this Conference. We would also like to thank the patronage and cooperation of the IGS.

reported by Alexia Stokes, Ioannis Spanos, and Joanne Norris, Organizing Committee Members

29th Meeting of Technical Committee 189 of the European Committee for Standardization (CEN)

London, United Kingdom, 29 September to 1 October 2004

The European Committee for Standardization, Technical Committee 189 on Geosynthetics (CEN/TC 189) met in London, UK, from 29th September to 1st October 2004. This was the 29th meeting since the first meeting was held in 1989, in Brussels, Belgium. Seventeen European member countries attended and, for the first time, delegates from Ireland and Lithuania participated.

The working group meetings were held during the first two days, while the plenary session was held on the third day. CEN/TC 189 is structured in two product requirement working groups (Geotextiles, and Geosynthetic Barrier Materials) and four test-method working groups (mechanical testing, hydraulic testing, identification parameters, and durability).

In the future, there will be closer cooperation with the corresponding International Standards Organization committee (ISO/TC 221), mainly due to the application of the Vienna Agreement. The purpose of the Agreement is to avoid duplication of work and leads to the development of standards in one of the two organizations, followed by a parallel vote in both CEN and ISO. Due to the policy that ISO is the lead organization for revision of standards, work on (test) standards will be increasingly shifted from the CEN to ISO work program.

Since the last CEN meeting (The Netherlands, November 2003, see the March 2004 issue of *IGS News* for a synopsis), significant progress has been made and more than 30 work items were brought to the final draft stage, thus, leading to a major reduction in the work program.

The focus will now be on very specific topics such as very long-term geosynthetics durability (i.e., 100 years), geosynthetics-drinking water interaction, and asphalt reinforcement products. Several delegates expressed their concern regarding the negative impact of the current standards, which limit the

lifetime of geosynthetics to 25 years, even given evidence that much longer lifetimes are achievable. Such extreme over-design could harm the future of geosynthetics use and, as a result, a short guidance statement on this topic will be prepared.

29th CEN/TC 189 meeting participants in London, United Kingdom, 29 September to 1 October 2004. (Photos are courtesy of Mahnaz Nikbakht from Luxembourg.)

The reduced work program will also allow for new work on test methods such as a short-term compression test, or a method for the determination of water absorption by bentonite.

Three out of the five geosynthetic barrier standards were approved pending amendments, while the remaining two were rejected. Amendments have been made to three approved standards, and the two rejected standards were modified and are now ready for a second formal vote.

Completely in accordance with the good traditions of the committee, the UK host delegation invited all delegates to discover London from the famous London Eye (a giant Ferris wheel on the river Thames), followed by a dinner.

No formal commitments have been made regarding the date and venue of the next meeting. It is very likely that the 2005 meeting will be in Austria from 8 to 10 June and the 2006 meeting in Norway from 7 to 9 June 2006.

At the end of the meeting, Mr. Foubert was recognized for his ten years of service as the TC 189 Secretary.

reported by Fred Foubert, IGS Member and CEN/TC 189 Secretary

ISO TC 221 (Geosynthetics) Meeting

Seoul, Korea, 24 to 25 June 2004

ISO TC 221 on Geosynthetics held their annual meeting in Seoul, Korea on 24 to 25 June 2004 after the *GeoAsia 2004* Conference. The Meeting was hosted by the Korean Agency for Technology and Standards (KATS) and organized by FITI Testing and Research Institute (FITI).

Ten countries participated: Kenya, Australia, Germany, Japan, France, Italy, UK, USA, Turkey, and Korea.

Mr. David Suits (USA), Chair, commenced the ISO TC221 Plenary Meeting with an Opening Address and Welcome Address for KATS and FITI, and then reported on the last ISO TC 221 meeting held in London, UK, in 2003.

ISO TC221 meeting participants in Seoul, Korea, on 24 to 25 June 2004.

Working Group Meetings Outcomes

WG 3 (Mechanical Properties) (Convener Daniele Cazzuffi)

- "Procedure for simulating damage under interlocking concrete block pavement - roller compactor method" by Japan was reviewed and forwarded to enquiry.

WG 4 (Hydraulic Properties) (Convener Bernard Myles)

- "Methylene Blue Test of Geosynthetic Clay Liner," "Gas Permeability of Geosynthetic Clay Liner," and "Transmissivity Test of Geosynthetic Clay Liner" were reviewed and adopted as Working Items.

WG 5 (Durability) (Convener Sam Allen)

- TC 221 will not attempt to reinvent a test method for the Oxidation Reduction Test (OIT). TC 221 will issue a technical report on the use of ASTM D3895 and D5885

for determination of OIT for geosynthetics.

- "Guide to Derivation of Reduction Factors" to be continuously reviewed.

Notes of Appreciation

The effort by FITI in organizing the meeting, technical support, printing and copying, and assistance throughout the meeting was no less than outstanding. KATS and FITI organized a lavish banquet and invited numerous dignitaries from the South Korea government and technical societies to meet the ISO TC 221 delegation. After closure of the ISO TC 221 Meeting, a tour was organized of FITI's very impressive test facility. Special thanks goes to Drs. You-Kyum Kim and Hyun-Jin Koo for their hospitality and extraordinary effort. Also, thank you to Dr. Han-Yong Jeon for his quiet assistance and efforts.

reported by Han-Yong Jeon, IGS Member, and Bob Mackey

NAGS: Strategic Planning Retreat and Chapter Update

25 to 26 May 2004, Albany, New York, USA

The 2003-2004 North American Geosynthetics Society (NAGS) Board Members held a two-day Strategic Planning Retreat on 25 to 26 May 2004 to develop a new, clear direction for NAGS. With the help of NAGS President, L. David Suits, the meeting facilitator, Shirley Readdean, led the Board Members through thought-provoking activities and detailed discussions that enabled the group to set specific, reachable long- and short-term goals for NAGS.

NAGS New Vision Statement

NAGS is an organization of individual members representing all aspects of the geosynthetics community in North America.

NAGS will continue to be a recognized North American leader in advancing the education, research, and development of geosynthetics.

NAGS New Mission Statement

The mission of NAGS is to provide leadership in advancing the education and research of geosynthetics, in strong cooperation with the IGS, via the following ways:

- Organization of and participation in technical conferences, seminars, and workshops.
- Development and dissemination of tools for geosynthetics education.
- Recognition of technical contributions and innovations regarding geosynthetics.
- Stimulation of geosynthetics research and their applications through the NAGS Awards of Excellence Program.

"Where We Want to Go"

The following is the list of items that was created and agreed upon by the NAGS Board, and represents "Where We Want to Go".

1. Develop conference programs
2. Establish an Executive Director position, which would focus on advancing the NAGS Conference experience and increasing the membership.
3. Demonstration Site: (Education)
   (a) Contractor/QA education hands-on
   (b) Develop a video series
   (c) Live web cast
   (d) Paid student participation
4. Establish and maintain a continually updated Geosynthetics curriculum. (Education)
5. Create/maintain NAGS "hotline"
6. Awards Programs
   (a) Student scholarships and fellowships
   (b) Research awards, e.g., Award of Excellence
   (c) Innovation award
   (d) Student Competitions
7. Implementation of capital campaign (fund raising)
8. PR program/person (on staff)
9. Student Membership Recruitment Program
10. Establish formal promotion program to encourage geosynthetic related seminars, conferences, etc.
11. Develop a list of presenters to present non-commercial technical presentations using already existing programs (unbiased)
12. Collaboration with other organizers beyond formal conferences
    (a) Develop a voice in the development of codes and specifications
    (b) Strong NAGS visual promotion tools (booths, T-shirts, etc.)
13. Travelling Road Show for:
    (a) Consultants/Contractors
    (b) Educational institutions
    (c) Provide kits for educators
    (d) Short course/workshop format
14. Develop Distinguished Lecture Series.

NAGS retreat participants: back (L-R) Sam Allen, Dr. James Blatz, Mark Sieracke, L. David Suits; front (L-R) Shirley Readdean, Jane Harris, Dr. Shobha Bhatia, Dr. Grace Hsuan.

New Goals for NAGS

The following is a list of specific goals, organized into those that are "doable now," "doable within 1 year," and "doable within 2 to 3 years."

"Doable Now"

- Conference late 2005
- Awards of Excellence
- Student Paper Competition
- Student Membership Recruitment
- Develop job description for Executive Director position
- NAGS recruitment
- Organize demo sites
- Capital campaign program

"Doable Within 1 year"

- Items 11 and 12 on the list
- Develop PR strategy
- Item 13 (c) on the list

"Doable Within 2 to 3 years"

- Implementation of Executive Director position
- Creation of NAGS Hotline (with the help of Executive Director)

The retreat wrapped up on Wednesday morning, and the Board Members took away a fresh new scope of vision for NAGS, with concrete goals to start working toward. Much gratitude was extended to the facilitator (Shirley Readdean) and L. David Suits, for the creative tailoring of their Retreat format to suit the needs of NAGS. The event was a positive experience for all involved and proved to be a valuable tool in planning for the future of NAGS. Good things are in store!!!

For more information on the North American Geosynthetics Society (NAGS), or to become a member, please visit the NAGS web site at *www.nagsigs.org*, or contact them at their new address:

North American Geosynthetics Society
Attn: Jane Harris – Managing Director
P.O. Box 72030
Toronto, Ontario, Canada M9M 3A6
Tel: 1/416 741 8862
Fax: 1/416 741 9714

reported by Jane Harris, NAGS Managing Director and IGS Member

IGS Spanish Chapter Update

After a four-year mandate, which ended in 2004, council elections were held for the new 2004 to 2008 IGS Spanish Council on 22 June 2004. The new Spanish IGS Council members are as follows:

- *President:* Mr. Angel Leiro
- *Past President:* Mr. Vicente Cuellar
- *Vice-president*: Mr. Mario Garcia Girones
- *Secretary General:* Mr. Julio Garcia-Mina
- *Treasurer:* Mr. Julio Garcia-Mina
- *Board Member:* Mr. Inaki Amigot

The newly elected President, Mr. Angel Leiro, was the Vice-President in 2000 to 2004. Apart from newcomer, Mr. Inaki Amigot, the remaining elected members were previous council members.

The IGS Spanish Chapter was created in 2000. Under Mr. Vicente Cuellar (Past President, 2000 to 2004), it has grown to include six corporate members and over 45 individual members. During these four years, the Chapter organized and hosted a National Geosynthetics Symposium and at least one event per year. It has also participated in venues organized by other groups, created a web site, and established and written the Spanish Chapter bylaws, which have already been accepted and approved by the Interior Ministry.

Thanks to Mr. Cuellar's efforts, the Chapter is well positioned in the public and private geosynthetics realms. The Chapter has an excellent relationship with Cedex, an independent body reporting to the Spanish Ministry of Publics Works, which acts as the geotechnical and construction materials consultant and laboratory in Spain. Cedex has a very high degree of acceptance in the entire Spanish construction market.

The Spanish Chapter of the IGS and Spanish individuals in the geosynthetic sector recognize Vicente Cuellar's efforts and commitment over the past four years. It is due to his effort, reputation, and leadership that we now have a Chapter that is in a sound situation with regard to current and future geosynthetics research, technology transfer, and industry (e.g, manufacturing, construction, etc.).

Although Mr. Cuellar will no longer have an executive role in the Spanish Chapter, his reputation in the geotechnical world will still be one of our best assets as a Chapter.

Newly elected President, Mr. Angel Leiro, plans on building on Mr. Cuellar's success by increasing the Chapter's activity during the upcoming years.

reported by Mr. Julio Garcia-Mina, IGS Member and Treasurer of IGS Spanish Chapter

Vienna Terzaghi Lecturer: Dr. J.P. Giroud

The next (biennial) Austrian Geotechnical Conference will be held on 21 to 22 February 2005 in Vienna, Austria. The Conference highlight has always been the prestigious "Vienna Terzaghi Lecture," presented immediately after the Opening Ceremony. The IGS is very pleased and congratulates Dr. J.P. Giroud for being chosen to deliver the Vienna Terzaghi Lecture. The topic of Dr. Giroud's lecture will be: "Geosynthetics Engineering: Successes, failures and lessons learned."

The Conference will take place in the Festivity Hall of the Austrian Society of Engineers and Architects (ÖIAV) in the famous Palais Eschenbach (in the

Centre of Vienna), where, in the 1930s, Karl Terzaghi delivered soil mechanics lectures outside of the university setting to practising engineers. The ÖIAV has existed since 1848 and has, therefore, a very old tradition, being the "umbrella" society for Austrian engineers and architects; and, until 1918, it was the umbrella society for the entire Austrian-Hungarian Monarchy. Engineering history has been written at the ÖIAV: not only civil engineering, but also several other branches of engineering. There are numerous outstanding members of the ÖIAV, Karl Terzaghi, Ferdinand Porsche, and Leopold Müller (the "father" of Rock Mechanics), to name a few.

Each of the previously held Austrian Geotechnical Conferences attracted experts from approximately 20 countries, especially after the fall of the Iron Curtain. Since then, Vienna has increasingly intensified its function as a communication centre between Eastern and Western Europe. The geotechnical roots of this fruitful cooperation go back to the year 1964 when the idea of Danube-European Conferences on Soil Mechanics and Geotechnical Engineering was born in Vienna. Since then, these events have regularly brought together geotechnical professionals and, hence, also experts in geosynthetics.

Austria was represented in the pioneering group that founded the IGS and, in 1986, the IGS had its International Conference on Geosynthetics in Vienna attracting approximately 1,100 persons, whereby Dr. Giroud played a most active role. Therefore, the geotechnical community, together with the IGS, has great pleasure to welcome Dr. J.P. Giroud to Vienna once again, but now as the 2005 Vienna Terzaghi Lecturer. Consequently, the first day of the forthcoming Austrian Geotechnical Conference will be devoted to Geosynthetics.

The Conference organizers see this as an ideal opportunity for IGS and ISSMGE members to interact and exchange ideas. The detailed Conference Program will be available in December 2004.

For More Information

Further information is available from the Secretary of the Austrian Member Society of ISSMGE:
Dr. Manfred Fross
Technical University of Vienna
Institute for Soil Mechanics and Geotechnical Engineering
E-mail: m.fross@tuwien.ac.at

reported by Heinz Brandl
IGS Member

Geo-Frontiers 2005 Congress

24 to 26 January 2005, Austin, Texas, USA

Geo-Frontiers 2005 will combine the *Geo-Institute 2005 Congress,* the Geosynthetic Materials Association (GMA) *Geosynthetics 2005 Conference*, and the *18th Annual Conference on Geosynthetics* (*GRI-18*).

The Congress is being organized by the Geo-Institute (ASCE) and the GMA (Industrial Fabrics Association International, IFAI) and will be held at the Hilton Austin Convention Center Hotel in downtown Austin, Texas, USA from 24 to 26 January 2005. The event is being held under the auspices of the IGS and the North American Geosynthetics Society (NAGS).

Congress Tracks/Themes

Geo-Frontiers will have a broad and exciting technical program. The following are the nine Congress tracks:

- Earthquake Engineering and Soil Dynamics
- Erosion Control
- Foundations
- Geotechnical Professional Issues
- Pavements

Geosynthetic Institute
475 Kedron Avenue
Folsom, PA 19033, U.S.A.
Tel: (610) 522 - 8440
Fax: (610) 522 - 8441

- Site Characterization and Modeling
- Slopes and Retaining Structures
- Soil Improvement and Grouting
- Waste Containment and Remediation

Conference Features

The following are a few of the Conference highlights; for a complete schedule of events, visit the Conference web site listed below.

Terzaghi Lecture
23 January 2005, 5:30-7:00 p.m.

One of the highest honors in geotechnical engineering, the Terzaghi Lecture is an annual lecture given by and honoring a distinguished engineer.

The 2005 lecturer is Professor Delwyn G. Fredlund, Ph.D., P.E. of Saskatoon, Canada. Fredlund has spent more than 35 years conducting research into the behavior of unsaturated and expansive soils. Most of those years have been spent at the University of Saskatchewan and have resulted in the formation of the Unsaturated Soils Group. In addition to over 300 journal and conference research papers, he is co-author of the book *Soil Mechanics for Unsaturated Soil*, published in 1993, which has remained the key reference on unsaturated soil mechanics.

Opening Plenary Session
"Geo-Frontiers: The Perspective from Space": NASA Astronaut, James F. Reilly II, Ph.D.
24 January 2005, 8:30-10:00 a.m.

Selected by NASA in December 1994, Reilly reported to the Johnson Space Center in March 1995, and completed a year of training and evaluation, qualifying for flight assignment as a mission specialist. To date he has logged over 517 hours in space, including three spacewalks totaling 16 hours and 30 minutes.

Hero Lunch & Baker Award
24 January 2005, 12:00-2:00 p.m.

This event will honor Dr. J.P. Giroud, Dr. Robert M. Koerner, and Dr. Lymon C. Reese, who have demonstrated

exceptional innovation and leadership in the geo-technology industry.

The Wallace Hayward Baker Award was established by the Geo-Institute in recognition of the creative and innovative contributions of Wallace Hayward Baker in the field of ground modification. The award is given annually in recognition of ingenious innovation in the field of ground modification. Emphasis shall be placed on the resourceful development of a new technology or the creative application of existing technology to achieve field performance not previously demonstrated.

Guest Lecture by Dan McNichol
25 January 2005, 10:30 a.m.-12:00 p.m.

Dan McNichol is a best-selling author and nationally recognized expert on the Big Dig and the U.S. Interstate System. In 2003, McNichol was awarded Journalist of the Year by the American Society of Civil Engineer's Boston chapter. McNichol will discuss many topics, including his recently released book, *The Roads that Built America: The Incredible Story of the U.S. Interstate System.*

Peck Lecture
25 January 2005, 5:30-7:00 p.m.

An award established by the Geo-Institute in honor of Ralph B. Peck, Hon. M.ASCE, the Peck Lecture is an annual lecture given by a geotechnical engineer for outstanding contributions to the profession through the analysis and publication of case histories.

GRI Symposium
26 January 2005, 8:00 a.m.- 5:00 p.m.

The *18th GRI Annual Conference* will focus on the use of geosynthetics in transportation systems, geotechnical engineering, geoenvironmental engineering, and hydraulic engineering. Full registration and a Wednesday Daily Conference registration includes access to GRI-18 Sessions. Registration for GRI-18 alone is $175.

Short Courses

Soil Erosion - Problems, Regulations and Solutions

Coordinators:

- Jean-Louis Briaud, Texas A & M University
- Shobha Bhatia, Syracuse University
- six additional instructors

Static and Seismic Stability of Solid-Waste Landfills

- Jonathan Bray, U. of California at Berkeley
- Edward Kavazanjian, Arizona State University
- Ellen Rathje, University of Texas at Austin

QC/QA of Geosynthetics

- George Koerner, Geosynthetic Institute (GSI)
- Sam Allen, Texas Research International (TRI)
- Mark Sieracke, STS Consultants

Professional Practice 101: The Essentials of Risk Management and Profitability for Project Managers

- John Bachner, Bachner Communications, Inc.

Practical Geophysics for Geotechnical Investigations

- Ronald S. Bell, ENW Services
- additional instructors

Introduction to Waste Containment

- Craig Benson, University of Wisconsin at Madison
- Charles Shackelford, Colorado State University
- Jorge Zornberg, University of Texas at Austin

Construction Monitoring and Acceptance of Deep Foundations

- Jerry DiMaggio, Federal Highway Administration
- George Goble, Independent Consultant

Reinforced Soil Structures: Design Methods, Issues and Innovations

- Barry Christopher, Independent Consultant

Innovation in Grouting: The Developments 2000-2005

Coordinator:

- Donald Bruce, Geosystems, L.P.
- six additional instructors

Geo-Challenge Student Competition (Sunday, January 23, 3:00-4:00 p.m.)

In this new G-I student competition, student teams will be challenged to design and build miniature reinforced-soil retaining walls inside plywood forms, using sand with paper affixed to a poster board wall facing as reinforcement. Plywood forms, paper, tape, wall facing, and sand will be provided at the competition. Samples of sand and paper will be provided to each competing team. The winning team will build a structure that withstands the design load with the least amount of reinforcement.

Student Registration Information

- By Dec. 3, 2004 - $95
- By Jan. 7, 2005 - $100
- After Jan. 7, 2005 or on-site - $110

For a greatly reduced registration fee, full-time students can attend all Conference sessions and lectures, and will have tickets to the Networking Reception and the Barbecue Bash. Of particular interest to students will be the Geo-Challenge Student Competition. And there will be a Student Appreciation program during the Barbecue Bash.

Proof of current full-time student status required. Copy of Student ID or letter from Registrar's office is appropriate for this purpose. Student Registrations cannot be made online due to the requirement for proof of student status. Please send your registrations in by mail, fax or phone.

For More Information

Carol Bowers, Director, Geo-Institute

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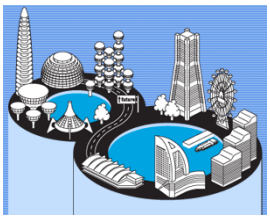
www.asce.org/conferences/geofrontiers05/events.cfm

8th International Conference on Geosynthetics

Yokohama, Japan, 18-22 September 2006

The *8th International Conference on Geosynthetics* (*8ICG*) will be held at Yokohama, Japan, 18-22 September 2006. The Conference is being organized by the Japan Chapter of the International Geosynthetics Society (JC-IGS) under the auspices of the IGS and with the support of The Japanese Geotechnical Society and The International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE).

The *8ICG* will appeal to all participants in the field of geosynthetics engineering, e.g., project managers, designers, contractors, manufacturers, suppliers, inspectors, regulators, researchers, instructors, consultants and laboratories, etc.



Conference Objectives

- To provide an exceptional opportunity for exchange between specialists and non-specialists as well as between experts in the various disciplines related to geosynthetics (geotechnical engineering, environmental engineering, civil engineering, hydraulics, geology, etc.)
- To provide new perspectives and overviews of technical innovations, by giving the widest possible forum to engineers and researchers and by welcoming papers devoted to new techniques and applications.

Conference Subjects

- Transport (roads, railways, tunnels, airports, etc.)
- Hydraulic structures (dams, canals, reservoirs, etc.)
- Erosion control and coastal works
- Soil improvement and reinforcement
- Mining
  - Waste landfills
  - Remediation of contaminated sites
  - Landscaping and environmental mitigation
  - Prevention of natural and technological risks
  - Agriculture and forests
- Innovative geo-materials and construction methods
- Education and technology transfer
- Others

Papers may cover any of the subjects described above (see the Conference web site for more details). The abstracts and final manuscripts will be reviewed by international experts appointed by the organizing committee in cooperation with the International Paper Selection Committee. These papers must be original, previously unpublished work and must not be of any commercial nature.

Key Dates for Abstracts

Deadline for receiving abstracts: 31 March 2005

Decision of Organizing Committee sent to authors: July 2005

Deadline for receiving completed papers: 31 October 2005

For details on abstract submission, please visit the Conference web site.

Contact Information

For more information on the submission of abstracts, full papers, and the Conference in general, contact:

Conference Secretariat
8ICG-Yokohama 2006
Tel.: 81/3 3837 2503
Fax: 81/3 3837 5818
E-mail: info@8icg-yokohama.org
www.8icg-yokohama.org

reported by Junichi Koseki, Vice Chair of Scientific and Program Division, Organizing Committee of 8ICG *and IGS Member*

"Criteria for Geotextile and Granular Filters"

by Dr. J.P. Giroud, 2004 IGS Award Recipient

Editor's Note: Dr. J.P. Giroud received a 2004 IGS Award for his contribution to "Criteria for Geotextile and Granular Filters." The following article was contributed by Dr. Giroud upon request. Rather than summarizing his award-winning work, Dr. Giroud explains below his motivation for working on filters and concludes with remarks on research and awards.

I was lucky in 1970 when I made the first filter application of a nonwoven fabric (the word geotextile did not exist at that time). Elementary prudence would dictate that this first application was in a simple project without risk, such as a gravel trench for temporary drainage. But it was in an earth dam, not even a small one: with a height greater than 15 m, Valcros Dam is in the category of "large dams". Clearly, the first time a nonwoven was used as a filter, it was used in a challenging situation.

I had never used "geotechnical fabrics" before. Discussions with my friend Etienne Leflaive, a pioneer in the use of nonwoven fabrics in geotechnical applications, with two years of experience at that time, had convinced me that this new material, which he had used for separation, could be used as a filter. Adequate sand (the granular material traditionally used for filters) was not available at the site and I decided to design the downstream drain of Valcros Dam with a nonwoven fabric as a filter.

For readers who are not familiar with dams, the downstream drain is essential to the performance of an earth dam. Since the soils used to build earth dams are not totally impervious, some water seeps through these dams. The function of the downstream drain is to prevent water that seeps through the dam from accumulating at locations where it would impair the stability of the dam. Numerous failures of earth dams have been attributed to the absence of a downstream drain or to the malfunctioning of the downstream drain. Fortunately, the downstream drain of Valcros Dam and its filter worked well and Valcros Dam is still operating, with a trickle of clean water at the outlet of the drain, as designed.

In 1976, six years after construction, I visited the dam. With me were Jean-Pierre Gourc (then a member of my research team and formerly one of my students) and Philippe Delmas (then one of my students). Both are now very well known in the field of geosynthetics. Together, we inspected the dam, performed a small excavation near the toe of the dam, and took samples of the geotextile filter. We presented a paper on Valcros Dam at the 1977 Paris Conference (eventually recognized as the first International Conference on Geosynthetics). It was well received: the attendees were more impressed by the fact that a geotextile had been used in a dam than by the fact that it was the first nonwoven filter (even though nonwoven filters would be the filters of choice since then). This successful application contributed to the promotion of geotextiles by lending credibility to these new construction materials.

Clearly, the first nonwoven geotextile filter was a success, but over the years, I realized I had been lucky with Valcros Dam. The filter had not been selected using a design method. I only had indications from earlier applications as a separator that this nonwoven fabric would work as a filter for the soil used to construct the dam. Because I had been lucky, I felt compelled to contribute to the advancement of knowledge in filter design. As I started thinking about filtration, I became fascinated by the amount of intelligence involved in the development of this discipline.

At the origin of the concept of filtration, was the invention of the sieve. I deeply admire the unknown man or woman who invented the sieve. The fact that thousands of years ago someone could conceive that discrete particles or grains could be classified by size is remarkable, and the degree of intelligence that was required to develop a tool, the sieve, to implement this classification is amazing.

Understanding that the particles that pass through the openings of the sieve are smaller than the openings must have been an intellectual feat at that time. Then, it took thousands of years to understand the difference between a sieve and a filter. More specifically, it took thousands of years to understand that particles smaller than the openings of a filter (i.e. particles that would pass through a sieve) can be retained by a filter. Separated by these thousands of years were two giants: the intellectual giant who invented the sieve, and the other intellectual giant, Karl Terzaghi, who understood the filter.

Terzaghi worked with granular (e.g. sand) filters. New challenges came with geotextile filters. Particularly challenging was the fact that geotextile filters are very thin compared to granular filters. Thanks to its thickness, a granular filter has many opportunities to stop a moving soil particle. In contrast, a geotextile filter has limited opportunities, a situation that demands rigorous design criteria. Clearly, with the advent of geotextile filters, more work was needed on design criteria for filters. Having no inclination for experimental work, no patience for long testing programs, I was left to my own devices: pen and paper.

As I was thinking about filtration mechanisms, Valcros Dam was often present in my thoughts. As I started understanding how filters work, I realized that, ironically, it was fortunate that I did not design the Valcros Dam geotextile filter. If I had known in 1970 that some people were designing woven "filter fabrics" with an opening size smaller than or equal to the d_{85} of the soil, and if I had used this criterion, it would have been a disaster. As I have demonstrated in several papers, this criterion is inadequate for soils with a large coefficient of uniformity, such as the soil used in Valcros Dam and in many other earth dams. The use of a filter thus designed in Valcros Dam would have resulted in internal erosion ("piping" in the jargon used in dam engineering), and the dam would have failed.

As a result of these thoughts, I was even more committed to develop rational criteria for geotextile filters. The model to follow was obviously Terzaghi's criteria for granular filters. Terzaghi's criteria for granular filters are remarkable because they were developed on the basis of a rational approach at a time when geotechnical engineering was still in limbo. During Terzaghi's time, the temptation was great to use empirical criteria, especially in a case, such as filtration, that seems to defy analysis.

Terzaghi's criteria for granular filters are also remarkable because they are expressed very elegantly. Terzaghi used the fact that the permeability and the opening size of a granular material are related to the particle size distribution of the material to express both the permeability criterion and the retention criterion in terms of particle sizes. Essentially, Terzaghi used a common language for two criteria that are somehow opposite: permeability and retention. However, elegance has a drawback: the smoothness of the presentation tends to hide the hard reality of the physical mechanisms, just like the body of a car hides the engine. As a result, many users tend to forget that the criteria correspond to two basic mechanisms, retention and permeability.

Developing criteria for geotextile filters required going back to basics because there are no simple relationships between the structure of a nonwoven filter and its permeability and opening size. This was a blessing because, by rethinking the mechanism of soil retention, it was possible to develop a retention criterion for geotextile filters that was more advanced than the classical retention criterion for granular filters. Essentially, departing from Terzaghi's expression (but being consistent with Terzaghi's approach) made it possible to make progress. Furthermore, what was necessary for geotextile filters appeared to be also applicable to granular filters.

As a result, a unified retention criterion was established for geotextile and granular filters, thereby making obsolete one of the most awkward practices in geotechnical engineering, the practice that consists of arbitrarily eliminating particles greater than 4.75 mm when using the retention criterion for granular filters. This practice is inelegant and cumbersome; it is, at best, approximate and, in some cases, it leads to errors. The work that started as technology transfer from geotechnical engineering to geosynthetics engineering ended as technology transfer from geosynthetics engineering to geotechnical engineering. As indicated in the citation at the beginning of this article, the development of unified criteria for the two classes of filters, geotextile and granular, is a key aspect recognized by the IGS for this award.

Writing this article leads me to wonder who deserves awards. I would deserve an award if I had developed filter criteria. In reality, I only discovered them. There is a major difference between developing and discovering. The fact that just brain, pen, and paper can lead to equations that elegantly express physical phenomena should inspire great humility to all of those involved in the discovery of equations. Indeed, if equations can be found just by thinking, this means that they were not very far, perhaps just slightly hidden by a veil of habits. The person who happens to write the equation for the first time has in fact a limited role. One should not say that the equation was "developed" whereas it was in fact merely discovered, unveiled. These two words clearly indicate that the equation was there, simply not visible because it was hidden by a cover or veil. I believe that all equations exist even before they are known. They are only hidden (or hiding), waiting to be discovered, not invented. We do not create equations. More modestly, we simply facilitate their birth. Professor Patrick Fox gave me an illustrious example that brilliantly expresses a similar philosophy: Michelangelo said that "every block of stone has a statue inside it and it is the task of the sculptor to discover it".

Therefore, this IGS Award is more an award for filtration than an award for me, and I am pleased with this recognition by the IGS of the importance of filtration. In the past decade, we have seen many awards and keynote lectures on soil reinforcement. This is, of course, understandable, considering the remarkable achievements in that field in the past few decades. However, it is appropriate that, at last, two IGS Awards are given for filtration (this award and the award given to Ennio Palmeira and Maria das Graças Gardoni). After all, geotextiles were called "filter fabrics" at the time of Valcros Dam design.

The reference of the award-winning paper is:

Giroud, J.P., 2003, "Filter Criteria", pp. 221-259, in *Jubilee Volume, 75th Anniversary of K. Terzaghi's "Erdbaumechanik" ("Soil Mechanics")*, H. Brandl, Editor, Reports of the Institute for Soil Mechanics and Geotechnical Engineering, Technical University of Vienna, Austria, 378 p.

To learn more about the Jubilee Volume, see *IGS News* Vol. 19, No. 2, p. 1.

"Contributions to the Study of Drainage and Filtration with Geotextiles"

by Drs. Maria G. Gardoni and Ennio M. Palmeira, 2004 IGS Award Recipients

Editor's Note: Drs. Maria G. Gardoni and Ennio M. Palmeira received a 2004 IGS Award at GeoAsia 2004 *in Seoul, Korea, for their "Contributions to the Study of Drainage and Filtration with Geotextiles."*

We are very honoured for being chosen for a 2004 IGS Award. Below is a summary of approximately 12 years of continuous research on drainage and filtration with geotextiles.

Geosynthetics have been used in filtration and drainage for some decades. They can be very cost-effective in substituting traditional granular materials in a large variety of engineering works. The study of such materials as drains and filters have concentrated mainly on laboratory tests, usually under no confinement or under low stress levels. However, under field conditions, geotextiles can be subjected to significantly high stress levels, e.g., when used under large embankments, mining waste piles, etc. In the field, other mechanisms, such as geotextile impregnation by soil particles, play a role in filter behaviour that may not be appropriately simulated in conventional laboratory tests.

The basis of our research was a combination of laboratory testing (using a wide range of soils, geotextiles, and stress levels), observation of filter behaviour in real applications, and laboratory simulations of in-service field conditions. Part of the research program involved the use of the gradient ratio test; see Figure 1, which is a photo of the gradient ratio test setup and permeameter. This special device, capable of applying normal stresses on the top of the soil sample up to 2000 kPa, was assembled and used in the gradient ratio tests.

These tests were performed to evaluate the variation of gradient ratio (GR) with normal stress, as well as the retention capacity of the geotextiles under confinement. For the latter, special techniques had to be employed to obtain the sizes of the particles capable of passing through the geotextile filter, due to the small quantities. Figure 2 shows results of variations of GR versus normal stress (Palmeira and Fannin, 2002). Laboratory tests were also carried out to study the porometry of nonwoven geotextiles under confinement. Figure 3 shows comparisons between values of geotextile opening sizes, as predicted by the solution proposed by Giroud (1996), with those obtained in bubble point tests on confined geotextile specimens (Gardoni and Palmeira, 2002).

Another aspect that has been overlooked in filter design is the presence of

Figure 1. Test set-up (left), including permeameter (right), for gradient ratio tests under confinement.

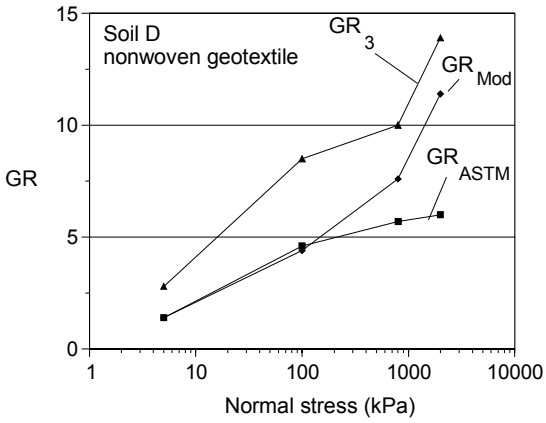


Figure 2. Gradient Ratio (GR) values versus normal stress.

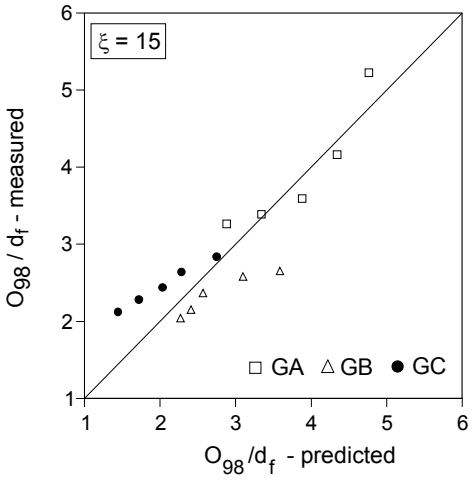


Figure 3. Predicted versus measured geotextile openings.

soil particles in the geotextile matrix, which may occur due to spreading and compaction of soils on the geotextile layer, depending on the characteristics of these materials. This impregnation of the filter influences physical and hydraulic properties of the geotextile. The compressibility of an impregnated geotextile is smaller than that of a clean one, which will influence geotextile hydraulic characteristics such as permittivity or transmissivity. Besides, the presence of particles in the geotextile voids will increase geotextile retention capacity when water flow starts and will establish different conditions for geotextile clogging than those assumed for a clean geotextile layer. Figure 4 shows microscopic investigations of geotextile specimens impregnated by glass beads under different stress levels.

When fill materials are spread, the normal stress on the underlying geotextile increases due to vibration/ compaction and the increased weight of fill. This can cause larger particles to intrude into the geotextile pore spaces. Figure 5 shows an example of a large soil particle in the voids of a specimen of a geotextile exhumed from a highway drain. The results in Figures 4 and 5 highlight the complex mechanisms of interaction between soil, geotextile, and fluid.

Another fundamental aspect of the interaction between soil and geotextile filter are the characteristics and properties of the base soil. As far as residual soils are concerned, this interaction can be even more complicated as clusters of soil particles, rather than individual soil particles, are retained by the filter, which further complicates the design of filters for such soils. In addition, residual soils may be internally unstable, which enhances the importance of the consideration of suffusion and geotextile blinding. Therefore, as part of the research, long-term filtration tests were also performed on compacted and undisturbed residual soil samples. For the materials and conditions of the tests carried out thus far, the geotextiles have performed well.

References

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Palmeira, E.M. and Fannin, R.J. (2002). Soil-geotextile compatibility in filtration. *7th International Conference on Geosynthetics,* Nice, France, Vol. 3, pp. 853-872.

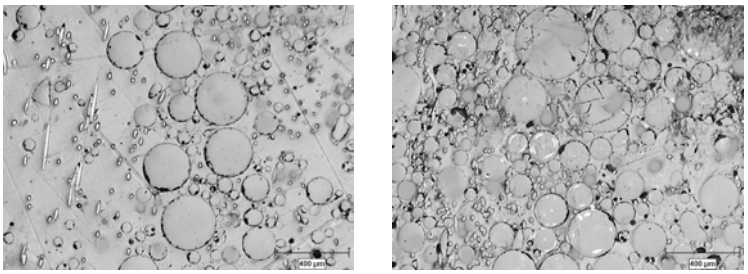

Figure 4. Impregnated geotextile under 2 kPa (left) and 1,000 kPa (right).

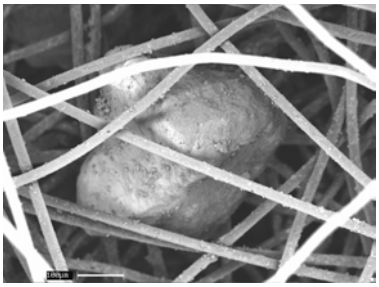

Figure 5. Large particle in a geotextile void.

"Advances in Geosynthetic Reinforced Soil Design"

by Dr. Jorge G. Zornberg, 2004 IGS Award Recipient

Editor's Note: Dr. Jorge G. Zornberg received a 2004 IGS Award at GeoAsia 2004 in Seoul, Korea, for his contributions to "Advances in Geosynthetic Reinforced Soil Design." The following article was contributed by Dr. Zornberg upon request.

Gone are the days when designs involving geosynthetic reinforcement struggled to demonstrate that these new systems are as reliable as and more cost effective than conventional structures. Instead, today's challenge is to demonstrate that geosynthetic reinforcement can be used to solve problems deemed unsolvable using conventional systems. These new challenges are being addressed through: (a) advances in design for conventional loads and geometries, (b) advances in design for unconventional loads and geometries, and (c) advances in reinforcement materials. This article comments on some of these advances, which were recognized by this IGS Award.

Advances in Design for Conventional Loads & Geometries

Geosynthetic-reinforced structures are conventionally designed using methods based on limit equilibrium. Current design guidelines for geosynthetic-reinforced soil structures disagree over the shear strength parameters that should be selected to characterize the backfill material. Most geosynthetic-reinforcing materials are classified as extensible inclusions for almost all practical applications. The extensible nature of geosynthetic reinforcements has often led to recommendations involving the use of the residual shear strength instead of the peak shear strength for design. However, common practice in the design of earth structures has been to use the peak shear strength. Accordingly, an experimental testing program involving reduced-scale models tested in a geotechnical centrifuge was conducted to evaluate this and other aspects in geosynthetic-reinforced soil design (Figure 1). The centrifuge results indicate that the stability of geosynthetic-reinforced slopes is governed by the peak soil shear strength (Zornberg 2002). There has been a significant debate on how such findings should be incorporated into design procedures. Yet, there is overall agreement that limit equilibrium approaches are suitable as the basis for design of reinforced soil structures (Zornberg et al. 1998, Zornberg and Arriaga 2003).

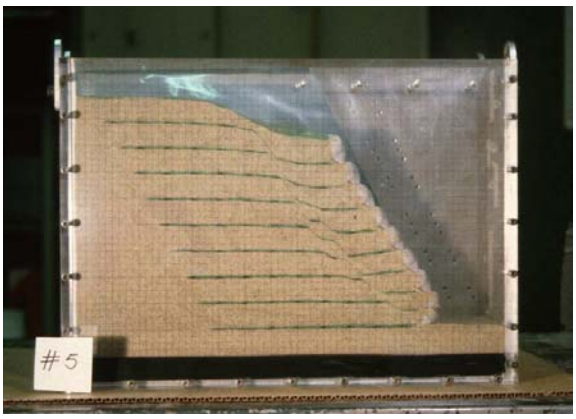

Figure 1. Geosynthetic-reinforced soil model brought to failure in a geotechnical centrifuge.

Advances in Design for Unconventional Loads & Geometries

Significant advances are taking place regarding the use of geosynthetic-reinforced soil structures to support unconventional loads. A good example is the use of reinforced soil systems as an integral component of bridge abutments and piers. Use of these systems to directly support both the bridge (e.g., using a shallow foundation) and the approaching roadway structure has the potential of significantly reducing construction costs, decreasing construction time, and smoothing the ride for vehicular traffic by eliminating the 'bump at the bridge' caused by differential settlements between bridge foundations and approaching roadway structures (Zornberg et al. 2001). The most prominent geosynthetic-reinforced soil abutment for bridge support in the US has recently opened to traffic near Denver, Colorado (Figure 2). The results from an extensive monitoring program of this structure indicate an excellent overall performance with negligible post-construction movements after an in-service period of one year (Abu-Hejleh et al. 2002). Geosynthetic-reinforced soil structures have also shown that they are particularly suitable in cases involving major differential settlements and seismic loads (Zornberg and Kavazanjian 2001). Of particular relevance, an evaluation of geosynthetics in seismic applications demonstrated that polymeric reinforcement maintains most of its original tensile strength after significant periods of sustained creep (Zornberg et al. 2004).

Geosynthetic reinforcements are particularly suitable in projects involving unconventional geometries. A good example is the use of geosynthetic reinforcements to stabilize steep veneer slopes such as cover systems for waste containment facilities. The use of uniaxial reinforcements placed along the slope and anchored at its crest has been a common design approach; however, there are other alternatives particularly suitable for steep veneer slopes. These include the use of uniaxial reinforcements placed horizontally (rather than along the slope) and anchored into the underlying mass, e.g., the reinforced cover system constructed as part of the final closure of the Operating Industries, Inc. (OII) Superfund landfill (Figure 3a). In this project, severe site constraints were overcome by constructing an alternative cover that incorporated horizontal geosynthetic veneer reinforcement (Zornberg et al. 2001). Figure 3b shows the typical veneer reinforcement detail. Approximately 500,000 m^3 of soil and 170,000 m^2 of geogrid were placed. The total area of geogrid placement exceeded 9.3 hectares, with reinforced landfill slopes up to 55 m in height. The different methods for stabilization of steep veneers using geosynthetics are summarized by Bouazza et al. (2002).

Advances in Reinforcement Materials

The development of new geosynthetic materials plays a significant role when confronting problems that cannot be addressed using conventional systems. A good example is the case of reinforcement of poorly draining backfills. Specifically, a promising approach for the design of reinforced marginal soils involves products that promote lateral drainage while providing soil reinforcement. This can be achieved using geocomposites with in-plane drainage capabilities. This design approach may even lead to the elimination of external drainage requirements (Zornberg and Mitchell 1994, Mitchell and Zornberg 1995).

A significant development regarding new reinforcement materials involves the use of fiber reinforcement. These reinforcement materials are particularly suitable for stabilization of thin soil veneers, where a small cohesion value has a significant impact on stability. Fiber reinforcement is also particularly adequate for projects involving the localized repair of failed slopes, where geometric constraints posed by the irregular shape of soil 'patches' are often difficult to solve using conventional continuous planar reinforcements.

Finally, the use of fiber reinforcement in seismically active areas can increase the yield acceleration used in design. A discrete approach for fiber-reinforced soil was recently developed in which fiber-reinforced soil is characterized as a two-component (soil and fibers) material (Zornberg 2002). This methodology can also be extended for inclusions involving recycled tire shreds (Zornberg et al. 2004). The proposed methodology treats the fibers as discrete elements that contribute to stability by mobilizing tensile stresses along the shear plane. Consequently, independent testing of soil specimens and of fiber specimens, but not of fiber-reinforced soil specimens, is used to characterize fiber-reinforced soil performance. Avoiding testing of fiber-reinforced soil specimens is a major achievement of the proposed approach since eliminating testing of composite specimens in design stages can encourage the implementation of fiber reinforcement in engineering practice.

In summary, while geosynthetic-reinforced soil structures are now well-established in conventional applications, their use in non-conventional projects continues to expand as a result of continued analytical, experimental, and field monitoring studies.

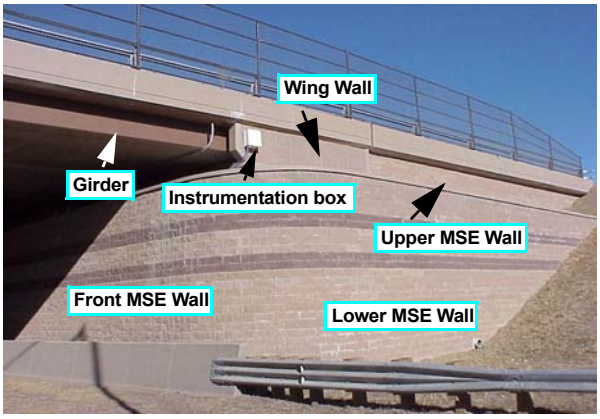

Figure 2. Founders/Meadows geosynthetic-reinforced bridge abutment.

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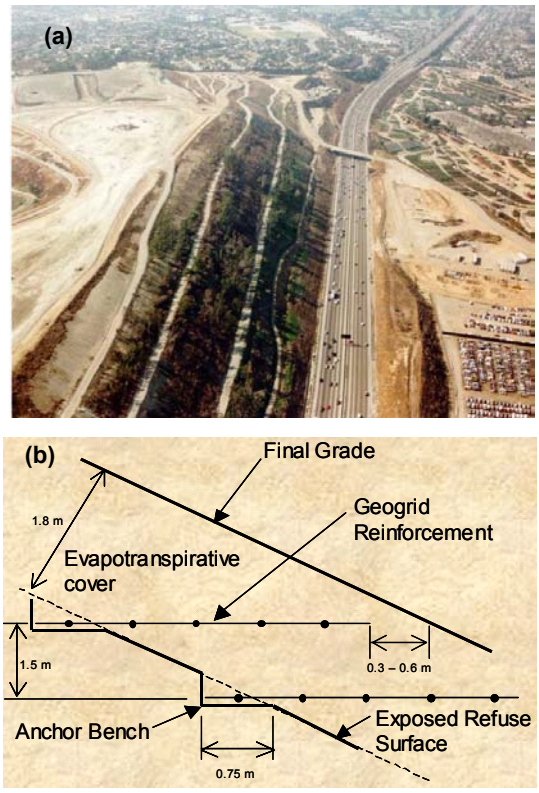

Figure 3. Reinforced cover at the Oll Superfund Site: (a) view of steep cover slopes; (b) detail of cover reinforced using horizontal geogrids anchored in solid waste.

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Terram Ltd. *UK (1988)*

Thai Nam Plastic Public Co., Ltd. *Thailand (1994)*

Tingeo, S.L. *Spain (2003)*

TMA, S.L. *Spain (2000)*

Tokyu Construction Co., Ltd. *Japan (1984)*

Werkos *Croatia (1999)*

Xtex, Inc. *USA (2002)*

Note: date is earliest year of continuous membership

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The International Geosynthetics Society

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The International Geosynthetics Society was formed with the following objectives:

- to collect, evaluate, and disseminate knowledge on all matters relevant to geotextiles, geomembranes, related products, and associated technologies;
- to improve communication and understanding regarding geotextiles, geomembranes, related products, and associated technologies, as well as their applications;
- to promote advancement of the state of the art of geotextiles, geomembranes, related products, and associated technologies; and
- to encourage, through its Members, the harmonization of test methods, and equipment and criteria for geotextiles, geomembranes, related products, and associated technologies.

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First, to contribute to the development of our profession.

By becoming an IGS Member you can:

- help support the aims of the IGS, especially the development of geotextiles, geomembranes, related products, and associated technologies;
- contribute to the advancement of the art and science of geotextiles, geomembranes, related products, and associated technologies; and
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- a directory of Members, the IGS Directory, published every year, with addresses, telephone, e-mail, and fax numbers;
- the newsletter, *IGS News*, published three times a year;
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- the possibility of being granted an IGS award.

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