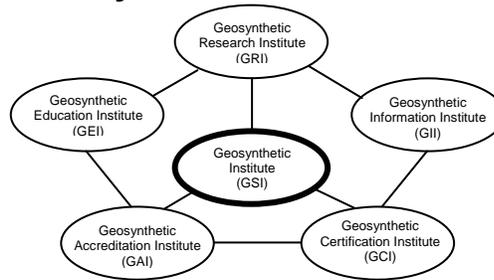


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 21, No. 1

March 2007

This quarterly newsletter, now in its 21th year, presents the activities of GSI and its related institutes to all who are interested. It is available on the institute's home page at www.geosynthetic-institute.org. It also serves as a quarterly report to its member organizations. Details are available by contacting Robert M. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at robert.koerner@coe.drexel.edu or mvashley@verizon.net.

Activities of the Institute Directors & GSI Board of Directors

1. The Board of Directors agreed that GRI's Specifications, Guides, and Practices should be copyrighted and this process has been initiated. Note that the GRI Test Methods will not be copyrighted, but users are encouraged to give proper citations and acknowledgement when they are used and/or modified.
2. A modification to White Paper #4 on Reduction Factors has been necessitated due to some designers wanting to use RFs on geomembranes. Hopefully the added text will resolve the questions of why this is not recommended.
3. Additional Centers-of-Excellence were discussed at the January Board of Directors Meeting. Possibilities are focused on GSs in Agriculture (presently being set up) and GSs in Mining (Kent von Maubeuge is inquiring).
4. The GRI-21 Conference will be embedded in GeoAmericas set for March 2-5, 2008 in Cancun and our dual topics will be GSs in Agriculture and Aquaculture.
5. The GRI-22 Conference will be embedded in the Global Waste Management Symposium set for September 7-10, 2008 in Cooper Mountain, Colorado. Our topics will be GSs in Walls and Slopes for added landfill space and erosion control measures for final covers.
6. Since her return to GSI, Jamie Koerner (Geo's Wife) is spearheading our survey program and the following two recent reports are available.

NOTICE: Due to the increasing cost of printing, shipping and handling, this Newsletter/Report will be made available on our Home Page at www.geosynthetic-institute.org. It is in the open section under the heading "Newsletter/Report". Please share it with your friends and colleagues.

- #31 - Status of Adoption and Use of the AASHTO M288 Geotextile Specification
- #32 - Solid Waste Landfill Liner and Cover Systems: Part I - USA Status
Part II - worldwide Status is working
- 7. By actions taken within the flexible polypropylene geomembrane group we have delisted our GRI-GM18 specification and efforts will be taken within ASTM. Please contact us for additional information in this regard.
- 8. A listing of your GSI Board of Directors follow. Please don't hesitate to contact any of them with respect to GSI activities and programs. Congratulations go to Tony Eith, Boyd Ramsey and Sam Allen who have been re-elected for 3-year terms. Tony Eith has been selected as the BoD Chairman.

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Term Ends 2007

David Jaros - Corps of Engineers (Government Agencies)
Rex Bobsein - Chevron/Phillips Co. (Resin Producers)
Kent von Maubeuge - NAUE GmbH & Co. KG
(International)

Term Ends 2008

Dick Stulgis - GeoTesting Express (Consultants and Testing Laboratories)
Gary Kolbasuk - Raven (Geomembranes and GCLs)
Mark Sieracke - Weaver Boos Consultants, Inc. (At-Large)

Term Ends 2009

Tony Eith (Chairman) - Waste Management Inc. (Owners and Operators)
Boyd Ramsey - GSE Lining Technology, Inc. (Geotextiles and Geogrids)
Sam Allen - TRI/Environmental, Inc. (At-Large)

Overview of GRI Projects (Research)

Each issue of our Newsletter/Report provides a brief glimpse and update of current GRI research projects. Details and full briefings are available to member organizations at their request. Dr. Grace Hsuan, Associate Director of GRI can be contacted for additional information as can the other project managers listed in the following write-ups. **Projects marked with an asterisk have been written up as short "in-progress" papers.** Grace can be reached by phone at (610) 522-8440 or e-mail at <grace.hsuan@coe.drexel.edu>.

- 1. Stress Cracking of Geomembranes and Geopipe*** - Dr. Grace Hsuan is project manager of our ongoing efforts to evaluate stress cracking of geomembrane resins, sheets and seams. In addition to her ongoing evaluations of HDPE geomembranes, Grace is presently focusing on HDPE drainage and duct pipe mainly for the Florida DOT. The goal for both geomembranes and geopipe is to include technically viable test methods and limiting values in generic specifications.
- 2. Durability and Lifetime Prediction*** - Last summer we reconfigured our 20-columns simulating landfill conditions for the purpose of estimating half-life of LLDPE geomembranes. The study was meant to extend the previous lifetime study of HDPE geomembranes which took approximately 10-years to conclude. The study uses elevated temperatures of 85, 75, 65, and 55°C to hasten degradation, followed by Arrhenius modeling to obtain the predicted lifetime. Unfortunately, our master temperature controller went "out-of-control" and became extremely hot with some columns having temperatures of over 100°C. This, of course, was way beyond our desired statistical control of temperature thereby

negating all incubation to date. As a result, we have abandoned the present 20-columns and must start over again from "scratch". We will see what the Winter brings since there is significant physical work necessary to set up these columns.

- 3. Durability of Polypropylene Geotextile Fibers** - Incubation at temperatures of 75, 65 and 55°C in high oxygen pressure containers is ongoing using PP-woven geotextile fibers. This study periodically measures changes in density, dimensions, mass, morphology, strength, elongation, modulus, melt index, OIT and carbonyl content. Dr. Hsuan is in charge of the project.
 - 4. In-Situ Temperature Monitoring of Liner and Cover Geomembranes in Dry and Wet Landfills*** - Dr. George Koerner is measuring the in-situ temperature behavior of liner and cover geomembranes and has installed 60± thermocouples for long term measurements in both wet and dry municipal solid waste landfills in Pennsylvania. Presently data for 13-years is available. This is clearly the longest in-situ measurement project in all of geosynthetics.
 - 5. Bioreactor (aka, Wet) Landfill Behavior and Properties*** - The above temperature monitoring has segued into a major effort under sponsorship of GSI and Waste Management, Inc. The wet cell under investigation is at field capacity, hence it is a true anaerobic bioreactor. Dr. George Koerner is in charge of considerable monitoring which includes the following:
 - waste moisture content
 - waste temperature
 - leachate chemical analysis
 - waste gas analysis
 - perched leachate within the waste
- Data is being collected on a monthly basis. The timeline of the project calls for monitoring for 5 to 10 years. This activity will now extend to an adjacent landfill to see how reproducible the data is with a slightly different waste mass.
- 6. Flow Behavior of Fully Degraded Waste*** - A field project under sponsorship of GSI and Waste Management investigates the drainage of highly degraded MSW placed directly on leachate collection systems. The leachate collection systems consist of both natural soils and geosynthetic drains. The project is now in its second year and is at a landfill in the Philadelphia area.
 - 7. Hydrostatic Creep Puncture of Geomembranes*** - The effect of sustained long-term hydrostatic and geostatic pressures on the puncture strength of geomembranes is an ongoing project. A series of tests using 600 g/m² protection geotextiles on 1.5 mm thick HDPE

geomembranes is being evaluated; the time is currently 10-years. The four-test setups use truncated cone simulations of coarse subgrade stones against the geotextile protecting the underlying geomembrane. The behavior of the geomembranes under these tests is a combination of creep and stress relaxation. The purpose of these tests is to better define the creep reduction factors used in the design method.

8. **Long-Term Benefits of Geotextile Separators*** - A full-scale field database of using geotextile separators on firm soil subgrades is being developed and maintained by Dr. George Koerner. Monitoring is proposed for up to 20-years. The target sites are paved highways, driveways, parking lots, etc., where control sections without geotextiles are also available for comparison purposes. This database will be national and perhaps even international in scope. Included are sites which meet the following criteria:

- sites must have both geotextile and nongeotextile control sections
- known type of geotextile(s)
- known soil conditions
- known traffic conditions
- available hydrologic and environmental conditions
- capability of quantifying the original condition of the pavement surface vs. the aged condition... this will be accomplished visually as well as by using falling weight deflectometers.

There are currently 14-sites included in this program. If you have additional sites to add, please contact George at (610) 522-8440.

9. **UV Exposure of Geomembranes*** - GSI is using its Xenon Arc device along with its two existing UV-fluorescent devices to evaluate the simulated outdoor lifetime of nine different types of geomembranes; HDPE, LLDPE, 4 fPPs, PVC, EPDM and PE-R. The effort is considered as part of GSI's Center for Polymers in Hydraulic Structures (CPHyS), but has relevancy in many other applications as well.
10. **UV Exposure of Geogrids** - We have recently begun the UV-fluorescent exposure of three different biaxial geogrids which are used at the exposed surfaces of welded wire mesh retaining walls.
11. **Technical Guidance Document on QC/QA of Waste Containment Facilities** - Drs. Dave Daniel and Bob Koerner have completed the Second Edition of this Technical Guidance Document by greatly updating the original 1993 EPA report. It is available through ASCE Press Stock #40859, 368 pgs. - hardcover, List Price

\$110, ASCE Members \$82.50. If members want a free draft copy on CD, please contact us.

12. **Generic Specifications** - A major effort is ongoing with respect to the development of generic geosynthetic specifications. The current status of these specifications is as follows:

Completed and Ongoing

GM13 – HDPE Geomembranes*
GM17 – LLDPE Geomembranes*
GM21 – EPDM Geomembranes
GM22 – Exposed Temporary Covers
GM19 – Geomembrane Seams
GT10 – Geotextile Tubes
GT12 – Geotextile Cushions
GT13 – Geotextile Separators
GCL3 – Geosynthetic Clay Liners

*An important note regarding textured geomembranes was recently added to the effect that direct interface shear testing should always be performed to assure against slope instability.

Working Within Focus Groups

GCXX – TRMs for Erosion Control
GTXX – High Strength Reinforcement Geotextiles

Delayed or Off in the Distance

GGXX – Bidirectional Geogrids
GGXX – Unidirectional Geogrids
GNXX – Geonet Drainage Composites
GCXX – Drainage Geocomposites

The completed specifications are available to everyone (members and nonmembers) on the open section of our Home Page. Please download and use them accordingly. Also note that this is where the latest modification will always be available.

These specifications are also available as a separate power point CD which shows photos of the test devices and can be used as a presentation to your clients and customers, as well as being an in-house training vehicle... don't hesitate to use and share this information which is on the open part of our Web Site.

13. George Koerner is presently testing three different high strength geotextiles from three manufacturers (TC Nicolon, Huesker, and Propex) in preparation of the high strength specification noted in the previous item.

Activities within GII (Information)

We are currently supporting 2-Home Pages. The first is the GRI Home Page which is accessed as follows:

<<<http://www.drexel.edu/gri>>>

This home page is very introductory as far as geosynthetics knowledgeable people are concerned, and is meant to be promotional (for prospective students and potential institute members). It is probably only of nominal interest to most readers of this Newsletter/Report.

The second home page is the primary GSI Home Page and is accessed as follows:

<<<http://www.geosynthetic-institute.org>>>

It has been reconfigured through the fine efforts of Marilyn Ashley. Everyone (members and nonmembers) can access the open part, which has the following menu:

- Introduction to GSI
- Prospectus
- Associate Membership (Agencies)
- Members by Focus Groups
- GSI Publications
- GRI Specs, Guides, White Papers
- CPReS
- CPHyS
- Laboratory Accreditation
- Product Certification
- Newsletter/Reports
- Internet Courses
- Geosynthetics Links
- GSI Member Meetings
- Courses at GSI
- CQA Insp. Cert.

To go further one needs a members-only password. Your contact person (see the last section of this Newsletter/Report if you do not know who it is) must get a password from Marilyn Ashley. Marilyn can be reached by e-mail at mvashley@verizon.net. When you get into this section, the following information is presented. This includes:

- GRI Test Methods
- GRI Reports (Summaries)
- GRI Technical Papers (Citations)
- Notes of GSI Meetings
- Links to the GSs World
- Keyword Search for Literature
- Example Problems
- Frequently Asked Questions (FAQs)

The keywords section contains about 17,000 citations of all of the geosynthetics literature published in English. It's quite easy to use provided that you have a specific topic, or area, in mind. This is the section that we (and others we are told) use the most in our entire website.

Progress within GEI (Education)

We currently have five 1-day long courses available that are taught on an "irregular" basis. They are the following:

1. GSs in Waste Containment
2. GSs in Transportation Engineering
3. GSs in Hydraulics Engineering
4. GSs in Private Development
5. QA/QC of Geosynthetics

The enrollment in these courses, however, has been decreasing. George, Grace and I are presently deliberating as to the future of these courses and we

would like your input as well. The deeply discounted price for GSI Members and Associate Members only covers our costs and if you don't send participants the offerings become less significant. We would like to hear commentary from the membership; e.g.,

- (a) Are the GSI Courses meaningful to you?
- (b) Should we continue these offerings?
- (c) Should we standardize the timing of the courses?
- (d) Do you have any comments/suggestions?

Please advise and thanks in advance.

Activities within GAI (Accreditation)

The Geosynthetic Accreditation Institute's (GAI) current mission is focused on a Laboratory Accreditation Program (LAP) for all geosynthetic test methods. George Koerner is in charge of the program. The GAI-LAP was developed for accrediting geosynthetic testing laboratories on a test-by-test basis. GAI-LAP suggests that laboratories use ISO 17025 as their quality system model.

It should be made clear, however, that GAI-LAP does not profess to offer ISO certification, nor does it "certify" laboratory results. GAI-LAP provides accreditation to laboratories showing compliance with equipment and documentation for specific standard test methods, usually ASTM or ISO standards. GAI-LAP verifies that an effective quality system exists at accredited laboratories by way of proficiency testing.

There have been significant additions to the number of GAI-LAP tests. There are currently 167 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of March, 2007, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel and telephone numbers are also listed.

- 1^A - TRI/Environmental Inc. (118 tests)
Sam Allen -- (512) 263-2101
- 3^A - Golder Associates (43 tests)
Henry Mock -- (770) 496-8280
- 4^C - Geosynthetic Institute (114 tests)
George Koerner -- (610) 522-8440
- 5^A - NTH Consultants, Ltd. (52 tests)
Debra Klinger -- (610) 524-2300
- 6^A - GeoSystems Consultants (27)
Craig Calabria -- (215) 654-9600
- 8^B - Synthetic Industries Inc., Ringgold (19 tests)
Toni Ruppert -- (800) 258-3121
- 9^B - Synthetic Industries, Inc., Alto (10 tests)
Melvin Wallace -- (770) 532-9756
- 11^A - STS Consultants Ltd. (13 tests)
Bill Quinn -- (847) 279-2500
- 13^A - Precision Laboratories, CA (95 tests)
Ron Belanger -- (714) 520-9631

- 14^A - Geotechnics (61 tests)
Randy O'Rourke -- (412) 823-7600
- 18^A - EMCON/OWT (55 tests)
Rasheed Ahmed -- (845) 492-3170
- 19^A - HTS Inc. (42 tests)
Larry McMichael -- (713) 692-8373
- 20^A - GeoTesting Express, MA (58 tests)
Gary Torosian -- (978) 635-0424
- 22^B - CETCO Arlington Heights (12 tests)
Jim Olsta -- (847) 392-5800
- 23^B - CETCO Cartersville (10 tests)
Sid Weiser -- (706) 337-5316
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
- 25^B - Ten Cate Nicolon (11 tests)
Beth Wilbanks -- (706) 693-2226
- 26^B - Agru America Inc. (14 tests)
Grant Palmer -- (843) 546-0600
- 29^C - FITI Testing & Research Institute (70 tests)
Moon-Hyun Jeong -- (011-82-2-960-8034)
- 31^D - NYS Dept. of Transportation (9 tests)
James Curtis -- (518) 457-4735
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
- 34^B - GSE Richey Road (16 tests)
Jane Allen -- (281) 230-6726
- 37^B - GSE Chile (16 tests)
Mauricio Ossa -- 56-2 6010153
- 38^C - Sageos/CTT Group (82 tests)
Eric Blond -- (450) 771-4608
- 40^B - GSE Lining Technology Inc. (14 tests)
Charles Miller -- (843) 382-4603
- 41^A - SGI Testing Service, LLC (18 tests)
Zehong Yuan -- (770) 931-8222
- 42^C - NPUST (GSI-Taiwan) (39 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
- 43^A - Ardaman & Associates (18 tests)
George DeStafano -- (407) 855-3860
- 44^B - BBA Fiber Web, Inc. (9 tests)
Ken McLain -- (615) 847-7575
- 45^B - Polyfelt Geosynthetics SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
- 46^B - Bentofix Technologies (13 tests)
Pat Thiffault -- (705) 725-1938
- 47^A - Precision Laboratories, TX (13 tests)
Ron Belanger -- (866) 522-0843
- 48^B - Tenax Corporation (9 tests)
Tim Bauters -- (410) 522-7000
- 49^B - Engepol Geossinteticos (20 tests)
George Nastas -- (55) 11-4166 3001
- 50^B - ADS, Inc. Hamilton (7 tests)
Terry McElfresh -- (513) 896-2065
- 51^B - Solmax International Inc. (14 tests)
Guy Elie -- (450) 929-1234
- 53^B - Polytex Inquique (13 tests)
Cristian Valdebenito -- 011 56 57 42 90 00
- 54^B - ADS, Inc. Finley (9 tests)
David Gonso -- (419) 424-8377
- 54^B - Atarfil Geomembranes (21 tests)
Isabel Merida Fernandez -- 34 958 439 278
- 55^B - Polytex Santiago (11 Tests)
Jamie Morales -- 56-2-627-2054

^AThird Party Independent ^CInstitute
^BManufacturers QC ^DGovernment

If you are interested in this program and would like a copy of the GAI-LAP directory, please advise accordingly. A directory is published annually in December, and is also kept current on GRI's Home page at <http://www.geosynthetic-institute.org>. For additional information on the GAI-LAP program contact:

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Fax: (610) 522-8441
E-mail: gkoerner@dca.net

Activities within GCI

(a) Inspectors Certification Program (ICP)

This new venture for GCI was initiated in January, 2006 and presently consists of a certification program for Construction Quality Assurance field inspectors for installation of geosynthetic materials and for compacted clay liners. It is focused on landfill liner and cover systems, as well as surface impoundments, waste piles, and related geoenvironmental applications.

The requirements are as follows:

1. Candidate must be recommended by a Professional Engineer (or equivalent) who knows and can attest to at least six months of acceptable field experience performing CQA activities with geosynthetic materials and/or compacted clay liners.
2. Pay a one-time \$400 fee for either geosynthetic materials or compacted clay liners, or \$500 for both material systems each of which covers a 5-year period upon successful completion of an examination.
3. Successfully pass a written examination proctored by GCI or a GCI designated individual and subsequently graded by the Geosynthetic Certification Institute.

There are separate examinations for both geosynthetic materials and compacted clay liners. This Spring we anticipate 100 to 150 people taking the examinations in addition to the 150 who have already passed.

The GCI Steering Committee is as follows:

Jeff Blum of STS	Jim Olsta of CETCO
Maria Tanase of Earth Tech	Boyd Ramsey of GSE
Rick Thiel of Vector	Te-Yang Soong of CTI
Jeff Fassett of Golder	Steve Wintheiser of CTI
Sam Allen of TRI	Dan Rohe of EPI
Mark Sieracke of Weaver Boos	Jim Goddard of ADS

(b) Product Certification Program (PCP)

We have discontinued our GCI-PCP as of July 10, 2006. for commentary on this decision please contact Bob or George Koerner.

The GSI Affiliated Institutes

It has long been realized that the information generated within the GSI group should have a timely outlet to all countries, and in all languages. To this end, GSI has created affiliated institutes in two countries (Korea and Taiwan), and potentially many others in the future. These affiliated institutes are full members of GSI and are empowered to translate and use all available information so as to create similar institutes and activities in their respective countries. We introduce these institutes to you in this Newsletter/Report and will present ongoing details of their respective activities.

GSI-Korea was formed on February 9, 1998 as a collaborative effort between FITI Testing and Research Institute (a quasi-government organization) and INHA University (through its Geosynthetics Research Laboratory).

FITI is a 30-year old testing organization located in Seoul focusing on interlaboratory proficiency; environmental protection; safety and flammability; hazardous substances; in-house quality control; consumer protection; complaint analysis; quality marking; procurement; household and industrial applications; and materials approval. It employs 120 people (8 with doctoral degrees) and 42 engineers. The geosynthetics testing group within FITI has 12 people (2 with doctoral degrees) and 10 engineers. The geosynthetic laboratory is GAI-LAP accredited for 70 geosynthetic test methods. Dr. Jeonghyo Kim is the general manager within FITI's geosynthetics activities.

INHA University is located in Incheon (50 km west of Seoul) and the geosynthetics laboratory is led by Professor Han-Yong Jeon. Dr. Jeon has 10-students working on geosynthetic-related projects and is extremely active both nationally and internationally. The ongoing efforts of both FITI and INHA will be described in future Newsletter/Reports.

GSI-Taiwan was formed on August 18, 2000 and is wholly contained within the National Pingtung University of Science and Technology in Nei Pu, Pingtung (southern Taiwan). It completely parallels GSI in that it has specific units for research, education, information, accreditation and certification. The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Director of the Computer Center. GSI-Taiwan has an Taiwanese consortium of geogrid/geotextile manufacturers who work toward producing quality products according to the draft GRI geogrid specifications and the associated test methods. As such, GSI-Taiwan is a GAI-LAP accredited laboratory for 32 geosynthetic test methods. Dr. Hsieh has 10-

students working on geosynthetic-related projects and is extremely active nationally and internationally. The ongoing efforts of GSI-Taiwan will be described in future Newsletter/Reports.

The Geosynthetic Institute Centers-of-Excellence

1. The Center for Polymeric Reinforced Structures (CPRoS) was formed on Dec. 27, 2002 for the purpose of proper use of geosynthetics in walls, slopes, and foundation reinforcement. It involves Dov Leshchinsky of Delaware, Grace Hsuan of Drexel and George Koerner of GSI as Co-Directors. The mission statement and goals are available on the GSI Home Page at <geosynthetic-institute.org>. Ongoing projects are the following:
 - (a) Dov Leshchinsky is modifying and incorporating two important aspects of reinforced walls into his widely-used computer program "MSEWall". They are; design to accommodate short reinforcement lengths when full space is unavailable, and the incorporation of drainage geocomposites in accommodating low permeability backfill soils. The first topic was presented at GRI-17 and a paper is available. The second topic will be presented at GRI-19 in December, 2005.
 - (b) Grace Hsuan is utilizing the Stepped Isothermal Method (SIM) for assessing the long-term behavior of various geosynthetic reinforcements including geofoam. Graduate student Sang-Sik Yeo, is performing the requisite research. A paper will be presented at GRI-19 in the Student Paper Session.
 - (c) George Koerner has supervised the construction of a segmental retaining wall at GSI which has 3-different masonry block types. He is measuring the pH-values directly between block surfaces and will do so for many years into the future... the following photograph is of the "GSI Wall". Data is currently available. [As a comment, this wall has geogrid reinforcement between every block layer and is backfilled completely with AASHTO #57 stone. It will not collapse or even deform!]



2. The Center for Polymers in Hydraulic Structures (CPHyS) was formed on June 20, 2003 for the purpose of proper use of geosynthetics in dams, canals, reservoirs, tunnels, pipes and related hydraulic systems. Jorge Zornberg of the University of Texas at Austin, Grace Hsuan of Drexel, and George Koerner of GSI are Co-Directors. The mission statement and goals are available on the GSI Home Page at <<geosynthetic-institute.org>>. Initial projects are being decided upon, but two are certain.

- (a) Grace Hsuan is focusing on exposed geomembrane durability and lifetime. (See Item 10 previously). This issue is critically important to gain confidence regarding polymer lifetime in the minds of owners, regulators, designers and specifiers in the focused application areas.
 - (b) Jorge Zornberg's activity, via a GSI funded graduate student, Christine Weber, will focus on drainage behind exposed geomembranes on dams.
 - (c) George Koerner's activities are within GSI and focus on the Xenon Arc and UV fluorescent devices.
3. In both CPRoS and CPHyS, Bob Koerner will act in an advisory manner and as quality assurance! In both centers existing GSI Members and Associate Members are fully entitled to the information that is developed and their interaction is encouraged. No additional funding is anticipated. We will keep the membership advised as to progress in this regard. We sincerely hope that the membership is supportive of these initiatives and your comments/suggestions are always solicited.
4. There is a distinct possibility for additional centers of this type. In particular we are looking to team with a university specializing in CAFO's, i.e., large-scale agricultural operations and possibly mining operations as well. Please contact Bob Koerner with suggestions and ideas.

Items of Interest

1. High-Speed Train Debuts in Taiwan

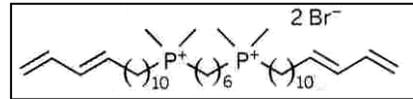
Last month, after 20 years of controversy over safety and economic issues, Taiwan's high-speed rail system finally made its debut. The \$15-billion project had been under construction since 2000 and had been expected to go into operation in late 2005. That date, however, was missed because of delays in the system's core electrical systems as well as failure to obtain safety certification from an independent verification and validation firm. The first public operation was a 216 mil (347 km) trip between Taipei and the southern city of Kaohsiung that included a single stop in T'aichung. The trip took only 90

minutes—approximately two and a half hours less than required by conventional trains making the same trip. The train travels at a maximum speed of 190 mph (300 km/h).

(Associated Press)

2. 'Breathable' Rubber Could Up Protection

A new material that blocks toxic substances—but transmits water vapor could be used to make improved protective garments for chemical workers, military personnel, and others who might encounter noxious compounds (Adv. Mater., DOI: 10.1002/adma.200601156).



3. Fate of Dam Safety Bills to Be Decided

ASCE assigned dams a grade of "D" in its 2005 Report Card for America's Infrastructure, and since then there have been modest gains in improving the quality of the more than 3,500 dams in the nation that have been deemed unsafe. Experts estimate that more than \$10 billion will be needed over the next 11 years to address all "critical" nonfederal dams, that is, dams that would pose a direct risk to human life if they failed.

Whether as part of the WRDA or as stand-alone legislation, ASCE's Pallasch expects Congress to reauthorize the National Dam Safety Program this year. The ASDSO's Iarossi also expresses optimism on the subject. "We expect that this important national legislation will be passed," he says. "Many members of the key [congressional] committees are supportive of this. They realize it's a good program. It's good government. And we're very confident that it will pass. (ref: Civil Engineering, Nov. 2005)

4. Sage Advice From Karl Terzaghi

The following is excerpted from an article that appeared in the May/June 2006 issue of Geo-Strata magazine, the official publication of the ASCE's Geo-Institute.

Karl Terzaghi had this in mind when he gave his students at Harvard a set of rules for which he called the game of engineering. The rules are full of wisdom:

1. Engineering is a noble sport which calls for good sportsmanship. Occasional blundering is part of the game. Let it be your ambition to be the first one to discover and announce your blunders. If somebody else get ahead of you, take it with a smile and thank him for his interest. Once you begin to feel tempted to deny your blunders in the face of reasonable evidence, you have ceased to be a good sport. You are already a crack or a grouch.

2. The worst habit you can possibly acquire is to become uncritical towards your own concepts and at the same time skeptical towards those of others. Once you arrive at that state, you are in the grip of senility, regardless of your age.

3. When you commit one of your ideas to print, emphasize every controversial aspect of your thesis which you can perceive. Thus, you win the respect of your readers and are kept aware of the possibilities for further improvement. A departure from this rule is the safest way to wreck your reputation and to paralyze your mental activities.

4. Very few people are either so dumb or so dishonest that you could not learn anything from them.

Engineering is indeed a noble sport, and the legacy of good engineers is a better physical world for those who follow them. You are well started on a career that can leave such a legacy and, as you pursue that career, I give you my very best wishes.

(*ref. Foundation Drilling, August, 2006*)

P.S. If you care to hear a power point presentation on Karl Terzaghi during my next visit please advise accordingly. *Bob K.*

GRI-20 Conference: A Retrospective

All previous GRI Conferences have focused on either a single or double theme. As such, they are meant to be a tutorial on (i) advancing an established area in geosynthetics, or (ii) trying to make inroads into a new and/or emerging area. GRI-20 was of the latter type and it is clearly the more difficult. This is due to the inherent lack of speakers in an entirely new area, or hesitancy of speakers to divulge information which is not yet available or legally protected. Both of these limitations were felt to be somewhat working insofar as GRI-20 was concerned on the topic of "Use of Geosynthetics to Combat and/or Mitigate Acts of Terrorism or Natural Disasters". Yet, the conference did generate nineteen (19) papers (of which we are greatly appreciative of) and this retrospective presents an overview of the activity. The venue was a one-day offering embedded within the Geosynthetics 2007 Conference held in Washington, DC on January 18, 2007. It was coincident with the NAGS/GMA activities and the combined events were arranged for by IFAI.

Tom Stephens of TC Nicolon opened the conference with a paper on emergency sealing of levee breaks using short, sand-filled, geotextile tubes dumped from trucks into the breaks. Richard Reid of South Dakota State University followed by describing soil-filled blast resistant barrier walls which is an ongoing technology used by the military. Rich has considerable experience in this regard. Jorge Zornberg of University of Texas at Austin presented research on fiber reinforced soil and its resistance to blasts. Dov Leshchinsky of the University of Delaware then presented shaking table results of reinforced modular block walls. These four papers nicely set the tone of

the conference in addressing the dual themes of terrorism and natural disasters.

Joe Martin of Drexel University described research in using nonwoven fabrics to intercept biological agents at potable water intakes, and then Elizabeth Peggs described government efforts at illegal entry fencing locations. Rich Reid of South Dakota State University gave a second paper on the use of fabrics as camouflage, and this was followed by Ralph Baker's use of a net to evacuate people from building rooftops. This is a patented (and very interesting) product of the Baker Safety Equipment Co.

A series of four papers on fiber optics variations for in-situ monitoring of geosynthetics was presented after lunch. Mahmoud El-Sherif of Drexel/Photonics Labs gave the tutorial on the subject, followed by Sibel Pamukcu of Lehigh University on Brillouin Time Domain Reflectometry (BOTDR) to obtain and analyze signals. Bruce Lacina of TC Nicolon presented their patented monitoring system and gave examples of field use to measure geosynthetic strains. Lastly in this group, Grace Hsuan of Drexel University presented a number of hypothetical scenarios of using fiber optics to detect intentional or accidental breaches in floating reservoir covers.

The final seven papers covered a wide range of topics; all of which were tightly connected to the conference theme. Rich Weggel of Drexel University proposed a geogrid enclosure of floating megabags to ocean transport potable water to emergency locations. Joe Mullin of Drexel University proposed a new wrapping system of exposed oil and gas transmission pipelines using nonwoven fabrics infilled with shear-thickening fluids. Steve Gale of Gale-Tech Engineering described his geosynthetic-based barriers for building security against truck bombs. Sam Allen of TRI/Environmental Inc. presented research on retrofitting buildings using polyurea liners. Ian Peggs of I-Corp Intl. described geosynthetic use in airport engineered materials arresting systems (EMAS). George Koerner of GSI gave a pot-pourri of emergency repair methods for damaged roadways and airports, and Craig Calabria of GeoSystems Consultants closed the conference with a futuristic look at RF Shredded Buildings and related advanced topics.

Many wonderful ideas were embedded in the 19-orally presented papers and the conference organizers thank all involved. Special thanks to Elizabeth Peggs, Lara Costa and Chris Kelsey of Geosynthetica for arranging a Technology Café at lunch where each speaker had a designated table at which those interested in his/her paper could ask advanced questions. The proceedings of the GRI-20 Conference are available in CD-form from IFAI's Bookstore. Contract: www.bookstore.ifai.com and click on "GRI-20 Proceedings."

Bob Koerner

Upcoming Events

- March 29-30, 2007
TRI/Environmental Courses
Ontario, CA
Contact: <Sallen@tri-env.com>
- April 10, 2007
GS Design of Waste Containment Systems
Folsom, PA
Contact: <mvashley@verizon.net>
- April 11, 2007
QC/QA of Geosynthetics
Folsom, PA
Contact: <mvashley@verizon.net>
- May 6-9, 2007
Solid Waste Assoc. of North America
Sagamore, NY
Contact: <www.nyfederation.org>
- June 27-29, 2007
ASTM D35 on Geosynthetics
Norfolk, Virginia
Contact: <csierke@asmt.org> 15th
- January 29-31, 2008
ASTM D35 on Geosynthetics
Tampa, Florida
Contact: <csierke@asmt.org>
- March 2-5, 2008
GeoAmericas
Cancun, Mexico
Contact: <jmrutledge@ifai.com>
- September 7-10, 2008
Global Waste Mgmt. Symposium
Cooper Mountain, CO
Contact: <www.wastesymposium.com>

GSI's Member Organizations

We sincerely thank all of our sponsoring organizations. Without them, GSI simply could neither happen nor exist. The current GSI member organizations and their contact members are listed below. The newest member organization is the Massachusetts Department of Environmental Protection. A sincere thanks to them and welcome!

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