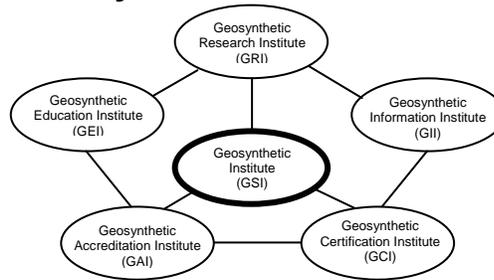


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 21, No. 2

June 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. Per our Board of Directors agreement we have now copyrighted all of GRI's Specifications, Guides, and Practices, but not Test Methods. It is the intention that test methods should eventually be adopted by ASTM and/or ISO.
2. We are now in the process of trademarking our various institutes under the "umbrella" of GSI.
3. The draft White Paper on MARV and its use is still being discussed and George Koerner will address it with those involved at ASTM at the end of June in Norfolk, VA.
4. A new Center-of-Excellence on the topic of "Geosynthetics in Agriculture" is being developed. Details will come when the agreement is concluded.
5. The Inspector Certification Program and Laboratory Accreditation Program will both be reviewed at the next BoD teleconference call later this month.
6. 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.

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)

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.

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)

Elections for those whose term ends in 2007 will be this Fall.

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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 either short "in-progress" papers or complete 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 Summer 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 up to 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 wasteData 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. A paper will be presented by George at the GeoAmericas Conference in March, 2008. If you have additional sites to add, please contact George at (610) 522-8440.

9. **UV Exposure of Geomembranes*** - GSI is using 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 four 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 GSI members and associate members 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 168 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of June, 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
- 6^A - GeoSystems Consultants (27)
Craig Calabria -- (215) 654-9600
- 8^B - Propex, Ringgold (19 tests)
Toni Ruppert -- (800) 258-3121
- 9^B - Propex, 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)
J. P. Kline -- (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, Pendergrass (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 - Ten Cate Malaysia SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
- 46^B - Bentofix Technologies (13 tests)
Colin Murphy -- (705) 725-1938
- 47^A - Precision Laboratories, TX (13 tests)
Ron Belanger -- (866) 522-0843
- 48^B - Tenax Corporation (9 tests)
Andrew Barker -- (410) 522-7000
- 49^B - Engopol 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
- 55^B - Atarfil Geomembranes (21 tests)
Isabel Merida Fernandez -- 34 958 439 278
- 56^B - Polytex Santiago (11 Tests)
Jamie Morales -- 56-2-627-2054
- 57^B - Ten Cate Cornelia (11 Tests)
Melissa Medlin -- (706) 778-9794
- 58^B - Propex Nashville (9 Tests)
Tim Smith -- (229) 686-5511
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641

^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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Folsom, PA 19033-1208
Telephone: (610) 522-8440
Fax: (610) 522-8441
E-mail: gkoerner@dca.net

Note: GAI-LAP Annual Meeting, Wednesday, June 27, 2007, Norfolk, VA in conjunction with ASTM.

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. Since its inception about 190 have passed the geosynthetics part and 170 have passed the CCL part. The examination has just had a 20% change in questions so as to keep it current and have an entirely new test in 5-years since recertification will be required after that time period. (The next issue of this Newsletter/Report will have complete details).

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 (CPReS) 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.
- (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 and he defends his dissertation in June, 2007.
- (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 UV fluorescent device.
3. In both CPReS 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. The United Nations environmental protection program oversees Small Island Developing States (SIDS) of which there are approximately 2000 Islands. These 2000 Islands are grouped in one of the following seven regions:

- Arctic Region
- Atlantic Region (Includes the Caribbean Islands)
- Baltic Region
- Indian Region
- Mediterranean Region
- Pacific Region
- Southern Region (Antarctic Islands)

Wastes are disposed of in various ways, such as in landfills or by means of composting, incineration, open burning or indiscriminate

dumping on open land or in rivers and coastal waters. There are very few sanitary landfills in Small Island Developing States. Poorly managed landfill sites -- particularly open dumping sites, which are still common -- seriously threaten environmental safety and increase health hazards. In addition, open dumping and illegal landfills are a common urban eyesore and reduce property values. Solid materials, surface run-off and leachate from wastes can have devastating effects on freshwater and marine ecosystems.

(This is a part of a GRI Report on Worldwide Landfill liner and cover systems due to members this summer)

2. In 1980, the federal government created the Superfund program to clean up abandoned waste sites. Within Superfund, the U.S. EPA held a pivotal position.

Firms could work with the agency to clean up their sites -- saving themselves money and gaining some control over the process. Or they could let the EPA perform its own top-of-the-line cleanup -- and risk paying for everything. It was a huge impetus for companies to come to interact.

The fund was replenished by a tax levied on industries tied to pollution. In 1995, with the Superfund at \$3.8 billion, the tax expired. Today the Superfund competes for money with every agency in the federal budget. It also gets money recovered from polluters. Revenue from both has declined.

In 1999, according to the Center for Public Integrity, the EPA collected \$320 million from polluters. Last year, it got \$60 million. Federal appropriations were \$1.25 billion, down \$180 million from 1995.

(ref., "Philadelphia Inquirer, May 28, 2007)

3. The finally-enacted SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) commits \$39.9 billion a year to highway construction. This is a significant increase to the 2006 level of \$35.6 billion. The bill to replace and extend the prior transportation enabling legislation which expired in 2004, was scheduled for completion and passage in 2005. In order to keep the program moving a series of Enabling Resolutions were passed while the bill itself was stalled in committee and in Congress for years. The prior Congress cleared only two of the eleven appropriation bills for 2007.

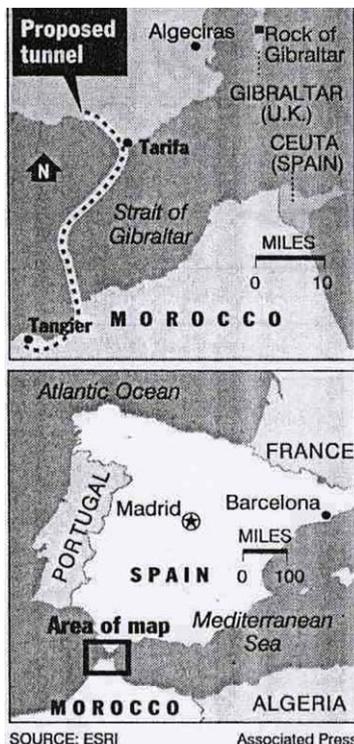
(ref., Foundation Drilling, Mar./April, 2007)

4. **European Union to Allow Only Metric Products** Beginning in 2010, the European Union (EU) will prohibit the use of products that feature units of measurements that are not metric. The directive prohibits the use of product labels, packaging, advertising, catalogs, technical manuals, and user instructions featuring systems of measurement other than the metric system. Given the dictates of the U.S. Fair Packaging and Labeling Act, firms

that operate both in the United States and in Europe may be forced to create two different product packages, one featuring both metric units and units of the U. S. Customary System and the other featuring only metric units.
(U. S. Department of Commerce)

5. Tunnel to Africa

A proposed high-speed rail tunnel to connect Europe and Africa would cost more than \$13 billion and take 20 years to complete. If it progresses it promises to be an awesome technical challenge. Perhaps even more challenging will be the political and social issues.



(ref. Philadelphia Inquirer, April 29, 2007)

Background and Most Recent GRI Standards

In the 1980's, while supervising graduate research students in their geosynthetic theses topics, the issue of writing generic and standardized procedures arose in this (quite new at the time) geosynthetic's field. Rob Swan generated our first formalized test methods with what became GRI-GG1, "Geogrid Rib Tensile Strength" (now ASTM D6637) and GRI-GG2, "Individual Geogrid Junction Strength". Through the subsequent years many more standards were promulgated by students and mainly by Drs. George Koerner and Grace Hsuan. A good percentage of

these standards (29%) were subsequently adopted in whole or part by ASTM.

We made the decision to group our GRI standards by geosynthetic type rather than application area and continue to do so. Please note that we continue to use the GRI (Geosynthetic Research Institute) designation since all of our standards have in-house research and development testing involved in their development. The following table lists our current standards which include specifications, guides, practices, and test methods.

Current Number of GRI Standards

Geosynthetic (GS) Type	GRI Adopted	ASTM Adopted	GRI Remaining
geotextile (GT)	15	5	10
geogrid (GG)	11	3	8
geonet (GN)	1	1	0
geomembrane (GM)	24	6	18
geosynthetic clay liner (GCL)	5	2	3
geocomposite (GC)	10	1	9
geosynthetic (general) (GS)	10	4	6
Total	76	22	54

The specifications, guides, and practices are registered under U.S. copyright and are also available free via the GSI Home Page <www.geosynthetic-institute.org>. It is the latest version that is always on-line. The test methods are available at a nominal price. The entire collection of 54 GRI Standards are available for \$100 plus shipping and handling. Commentary on some of the newer standards follows:

Geotextile tubes for erosion control, dewatering, and now decontamination of polluted river and harbor sediments are a growing application area. We have available the modification of Jack Fowler's original concept of a "hanging bag" test for assessing if a given fabric type is suitable for a given dredged soil type. It is available as the GRI-GT14 test method.

Biaxial geogrids are used for roadway and airfield stabilization and one potential test method to assess their performance is the "torsional rigidity" test when subjected to in-plane rotation. It is a modification of Dr. Tom Kinney's original test and is available as the GRI-GG9 test method.

"Temporary landfill covers" are being used to prevent or retard landfill gases from release into the atmosphere. Cost-wise, however, a thick permanent geomembrane is not warranted for a relatively short 5-10 year lifetime. Thus a specification for lightly reinforced polyethylene geomembranes is available. It is GRI-GM22 and addressed properties for three different thicknesses.

GCL testing is known to be difficult insofar as gripping the upper and lower geotextile surfaces in a large direct shear box. Borrowing from Dr. Pat Fox's research, we have used his "end platens" in our GRI-GCL4 test method. It is presently available with photos and graphic details. Another new GCL standard is a practice for taking "undisturbed field samples" for subsequent hydraulic conductivity testing. Developed by Dr. George Koerner, it is designated as GRI-GCL5.

In the geocomposite area we have two recent test methods both directed toward "geosynthetic (geofoam) gravel". They were developed by George Koerner. One test method is focused on mechanical deformation behavior, the other on hydraulic behavior. They are designated GRI-GC9 and GRI-GC10, respectively. They are currently being considered by ASTM for possible adoption.

Needless to say, as time progresses please look for new standards to be developed by GRI in all geosynthetic areas. It is exciting for us to be key players in the important process advancing the industry through standardization.

Bob Koerner

Upcoming Events

- June 13-14, 2007
Liner Integrity Short Course
by TRI Environmental, Inc.
Latham, New York
Contact: <mhunter@tri-env.com>
- June 27-29, 2007
ASTM D35 on Geosynthetics
Norfolk, Virginia
Contact: <csierke@asmt.org>
- October 1-5, 2007
Sardinia Landfill Conference
Cagliari, Italy
Contact: <info@sardiniasymposium.it>
- November 14-16, 2007
IS Kyushu '07
Earth Reinforcement Conference
Contact: <junotani@gpo.kumamoto.u.ac.jp>
- December 10, 2007
Landfill Design Course
December 11, 2007
QC/QA of Geosynthetics Course
December 12, 2007
GS and CCL Exams
Above are at GSI, Folsom, Pennsylvania
Contact: <mvashley@verizon.net>
- 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>
- June 17-20, 2008
Geosynthetics Asia 2008
Shanghai, China
Contact: <ccigs@4acq-2008sh.com>
- September 7-10, 2008
Global Waste Mgmt. Symposium
Cooper Mountain, CO
Contact: <www.wastesymposium.com>
- September 7-10, 2008
EuroGeo 4
Edinburgh, Scotland
Contact: <eurogeo4@eurogeo4.org>

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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 organizations are the Massachusetts Department of Environmental Protection and Aquatan (Pty) Ltd. of South Africa. A sincere thanks to both of them and welcome!

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