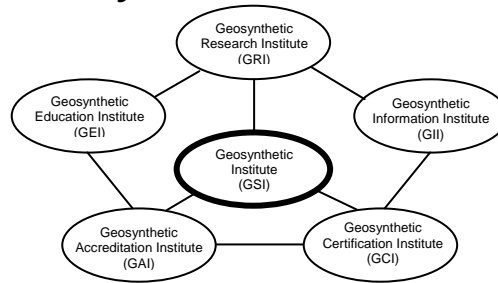


# The GSI Newsletter/Report

## Geosynthetic Institute



Vol. 23, No. 1

March, 2009

This quarterly newsletter, now in its 23<sup>rd</sup> 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](http://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](mailto:robert.koerner@coe.drexel.edu) or [mvashley@verizon.net](mailto:mvashley@verizon.net).

## Activities of GSI Board of Directors Meeting on February 27, 2009

1. Allow state and federal agencies to participate in, and vote in, the "Regulator Group".
2. Solicit approval of GSI Bylaws modification so as to allow a membership category of "Sole Proprietors", i.e., individual consultants.
3. Continue on pace with the GSI Fellows program (Five more students will be added this year).
4. GAI-LAP Steering Committee will be surveyed insofar as an increase in fees for participation. (It is currently \$2000 per year).
5. Approved GSI-Taiwan to have a GSI-Asia Conference in Taiwan on the theme of "Geosynthetics in Infrastructure".
6. Initiate "webinars" using our existing power point presentations with a host organization yet to be determined.
7. Investigate more frequent meetings of the BoD and Focus Groups using a low-cost method like SKYPE, or other. Tony Eith will investigate the situation for us.
8. Couple with ASTM for a durability workshop in San Antonio, Texas in late January 2010. This will be the location of our next Annual and BoD Meetings.
9. Couple with ASCE, GMA and NAGS for GeoFrontiers in early 2011. This will be the location of our GRI-23 Conference with Annual and BOD Meeting as well.

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](http://www.geosynthetic-institute.org). It is in the open section under the heading "Newsletter/Report". Please share it with your friends and colleagues.

10. Tony Eith of Waste Management Inc. was unanimously selected to remain as Chairman of the GSI Board of Directors.

Your Board of Directors is as follows:

### 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)

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#### Term Ends 2010

David Jaros - Corps of Engineers (Government Agencies)

Paul Oliveira - Firestone bp Inc. (Resin Producers)

Kent von Maubeuge - NAUE GmbH & Co. KG

(International)

#### Term Ends 2011

Dick Stulgis - GeoTesting Express (Consultants and Testing Laboratories) - Re-elected this year

Gary Kolbasuk - Raven (Geomembranes and GCLs) - Re-elected this year

Wayne Hsieh - GSI-Taiwan (International) - Newly-elected this year

Sincere thanks go to Mark Sieracke of Weaver-Boos Consultants for his service on the BoD and to the institute in this manner.

## 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\*** - In addition to Grace Hsuan's ongoing evaluations of HDPE geomembranes, she 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 for inclusion in generic specifications.
- 2. 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.
- 3. 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. The project has been updated

into its 14<sup>th</sup>-year and has been presented at the Global Waste Conference in September, 2008.

- 4. Bioreactor (aka, Wet) Landfill Behavior and Properties\*** - One of the landfill cells mentioned in Item 3 is at field capacity, hence it is a true anaerobic bioreactor. Dr. George Koerner is in charge of considerable monitoring at this cell 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. It was also presented at the Global Waste Conference in September.

- 5. 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 third year and is at a landfill in the Philadelphia area. We gave our third paper on the topic at the Global Waste Conference in September.
- 6. Hydrostatic Creep Puncture of Geomembranes\*** - This ten-year creep puncture project has just been dismantled and an analysis of the findings has been concluded. A short version is available as GSI White Paper #14 on our website and a complete paper has been submitted to the Journal of Geotextiles and Geomembranes for review and possible publication. Contact us if you are interested in the draft paper.
- 7. 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 will be for 20<sup>+</sup> years. The target sites are paved highways, driveways, parking lots, etc., where control sections without geotextiles are also available for comparison purposes. This database is national 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.

- 8. UV Exposure of Geomembranes\*** - GSI is using UV-fluorescent devices to evaluate the projected exposed lifetime of many different types of geomembranes. Presently being incubated are HDPE, LLDPE, 5 fPPs, PVC, EPDM, PE-R and LLDPE-R. Exposure times of 40,000 light hours are being approached.
- 9. UV Exposure of Geogrids** - The UV-fluorescent exposure of four different biaxial geogrids which are used at the exposed surfaces of welded wire mesh retaining walls is ongoing. The geogrids are now up to 18,000 light hours and data is being generated and sent to the respective manufacturers.
- 10. UV Exposure of TRM Fibers** - We are also using UV-fluorescent exposure of several turf reinforcement mat fibers to assess their lifetime capabilities. Contact Bob Koerner if you have materials for inclusion into this effort.
- 11. UV Exposure of Repair Tape** - We have found that a particular type of polyethylene repair tape has been successfully used to repair an exposed geomembrane at a Delaware landfill. After five-years it appears very durable. Original samples are being evaluated in one of our fluorescent tube weatherometers per ASTM D7238 at 70°C.
- 12. Geomembrane Chalking** - With the reinstatement of the flexible polypropylene geomembrane specification, i.e., GRI-GM18, we are in need of a test method to assess the degree of geomembrane caulking. This type of degradation has been experienced on several exposed geomembrane sites and on laboratory weatherometer samples while being incubated.
- 13. Generic Specifications** - A major effort is ongoing with respect to the development and maintenance of generic geosynthetic specifications. The current status of these specifications is as follows:

Completed and Regularly Updated

- GM13 – HDPE Geomembranes
- GM17 – LLDPE Geomembranes
- GM18 – fPP and fPP-R Geomembranes
- GM21 – EPDM Geomembranes
- GM22 – Exposed Temporary Covers
- GM19 – Geomembrane Seams
- GT10 – Geotextile Tubes

- GT12 – Geotextile Cushions (ASTM & ISO)
- GT13 – Geotextile Separators (ASTM & ISO)
- GCL3 – Geosynthetic Clay Liners

Working Within Focus Groups

- GCXX – TRMs for Erosion Control
- GTXX – High Strength Reinforcement Geotextiles
- GMXX – LLDPE-R Geomembranes

Delayed or Off in the Distance

- GGXX – Bidirectional Geogrids
- GGXX – Unidirectional Geogrids
- GNXX – Geonet Drainage Composites
- GXX – Drainage Geocomposites

The complete 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.

## 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             | • Laboratory Accreditation      |
| • Prospectus                      | • Answers to Your Questions     |
| • Associate Membership (Agencies) | • Newsletter/Reports            |
| • GSI Publications                | • Geosynthetics Links           |
| • GRI Specs, Guides, White Papers | • GSI Annual Meeting            |
| • GSI Fellowships and Projects    | • GSI Focus Group Meeting       |
| • Contact Us                      | • GSI Short Courses             |
|                                   | • Inspector Certification Exams |

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](mailto:mvashley@verizon.net). When you get into this section, the following information is presented. This includes:

- GRI Test Methods
- GRI Reports
- 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 25,000 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 of the website that we (and others we are told) use the most in our various activities.

## Progress within GEI (Education)

### Free CD

We sent a broadcast e-mail to everyone on February 25, 2008 stating that many power point presentations were available and would be sent upon request. About 20 persons replied asking for all of them. Therefore, we put all 63 presentations on a CD which was sent to all GSI contact persons. That said, we have many copies still available so do ask and we will mail it to you immediately. Topic areas are all types of geosynthetics, plus walls/slopes, landfills, specifications, and miscellaneous. We also have a new report on landfill berms (Report #35) available on CD.

### Courses

We have scheduled the following sequence of courses:

- April 13, 2009  
*Infrastructure Development Using Geosynthetics;  
Public Sector Projects*
- April 14, 2009  
*Infrastructure Development Using Geosynthetics;  
Private Sector Projects*
- June 10, 2009  
*QC/QA Using Geosynthetics*

The above courses will be held at:  
Geosynthetic Institute  
475 Kedron Avenue  
Folsom, PA 19033  
(approx. 4.5 miles from Phila. International Airport)

Course Registration and Fee:  
\$275/person for each one-day course (up to one month prior to course)  
\$325/person thereafter  
\$175/person – GSI Members

Contact: Marilyn Ashley ([mvashley@verizon.net](mailto:mvashley@verizon.net))

## 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. In addition, the program uses the GSI lab as the reference test lab and operates it as an ISO 17011 enterprise. In short, this means that the GSI lab does not conduct outside conformance testing for a fee.

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. In addition, 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 180 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of December, 2008, 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<sup>A</sup> - TRI/Environmental Inc. (118 tests)  
Sam Allen -- (512) 263-2101
- 3<sup>A</sup> - Golder Associates (44 tests)  
Henry Mock -- (770) 492-8280
- 4<sup>C</sup> - Geosynthetic Institute (116 tests)  
George Koerner -- (610) 522-8440
- 8<sup>B</sup> - Propex, Ringgold (19 tests)  
Todd Nichols -- (800) 258-3121
- 9<sup>B</sup> - Lumite (10 tests)  
Rebecca Page -- (770) 869-1700
- 11<sup>A</sup> - STS Consultants Ltd. (13 tests)  
Bill Quinn -- (847) 279-2500
- 13<sup>A</sup> - Precision Laboratories, CA (95 tests)  
Ron Belanger -- (714) 520-9631
- 14<sup>A</sup> - Geotechnics (61 tests)  
J. P. Kline -- (412) 823-7600
- 19<sup>A</sup> - HTS Inc. (42 tests)  
Larry McMichael -- (713) 692-8373
- 20<sup>A</sup> - GeoTesting Express, MA (46 tests)  
Gary Torosian -- (978) 635-0424
- 22<sup>B</sup> - CETCO Hoffman Estates (13 tests)  
Jim Olsta -- (847) 392-5800
- 23<sup>B</sup> - CETCO Cartersville (10 tests)  
Sid Weiser -- (706) 337-5316
- 24<sup>B</sup> - CETCO Lovell (10 tests)  
Roger Wilkerson -- (307) 548-6521
- 25<sup>B</sup> - Ten Cate, Pendergrass (11 tests)  
Beth Wilbanks -- (706) 693-2226

- 26<sup>B</sup> - Agru America Inc. (17 tests)  
Grant Palmer -- (843) 546-0600
- 29<sup>C</sup> - FITI Testing & Research Institute (70 tests)  
Moon-Hyun Jeong -- (011-82-2-960-8034)
- 31<sup>D</sup> - NYS Dept. of Transportation (9 tests)  
John Remmers -- (518) 457-4704
- 32<sup>A</sup> - Vector Engineering (6 tests)  
Ken Criley -- (530) 272-2448
- 34<sup>B</sup> - GSE Richey Road (28 tests)  
Jane Allen -- (281) 230-6726
- 37<sup>B</sup> - GSE Chile (21 tests)  
Mauricio Ossa -- 56-2 6010153
- 38<sup>C</sup> - Sageos/CTT Group (82 tests)  
Eric Blond -- (450) 771-4608
- 40<sup>B</sup> - GSE Lining Technology Inc. (17 tests)  
Vicky Parrott -- (843) 382-4603
- 41<sup>A</sup> - SGI Testing Service, LLC (19 tests)  
Zehong Yuan -- (770) 931-8222
- 42<sup>C</sup> - NPUST (GSI-Taiwan) (49 tests)  
Chiwan Wayne Hsieh -- 011-886-8-7740468
- 43<sup>A</sup> - Ardaman & Associates (18 tests)  
George DeStafano -- (407) 855-3860
- 44<sup>B</sup> - BBA Fiber Web, Inc. (9 tests)  
Ken McLain -- (615) 847-7575
- 45<sup>B</sup> - Ten Cate Malaysia SDN Bhd. (23 tests)  
C. P. Ng -- (603) 519 28568
- 46<sup>B</sup> - Bentofix Technologies (13 tests)  
Colin Murphy -- (705) 725-1938
- 47<sup>A</sup> - Precision Laboratories, TX (13 tests)  
Mike Bishop -- (866) 522-0843
- 48<sup>B</sup> - Tenax Corporation (9 tests)  
Andrew Barker -- (410) 522-7000
- 49<sup>B</sup> - Engepol Geossinteticos (20 tests)  
George Nastas -- (55) 11-4166 3001
- 50<sup>B</sup> - ADS, Inc. Hamilton (7 tests)  
Terry McElfresh -- (513) 896-2065
- 51<sup>B</sup> - Solmax International Inc. (17 tests)  
Guy Elie -- (450) 929-1234
- 53<sup>B</sup> - Polytex Inquique (13 tests)  
Cristian Valdebenito -- 011 56 57 42 90 00
- 54<sup>B</sup> - ADS, Inc. Finley (9 tests)  
David Gonso -- (419) 424-8377
- 55<sup>B</sup> - Atarfil Geomembranes (20 tests)  
Isabel Merida Fernandez -- 34 958 439 278
- 56<sup>B</sup> - Polytex Santiago (11 Tests)  
Jamie Morales -- 56-2-627-2054
- 57<sup>B</sup> - Ten Cate Cornelia (15 Tests)  
Melissa Medlin -- (706) 778-9794
- 58<sup>B</sup> - Propex Nashville (9 Tests)  
Tim Smith -- (229) 686-5511
- 59<sup>B</sup> - Firestone (9 Tests)  
Janie Simpson -- (864) 439-5641
- 60<sup>B</sup> - Polytex Lima (11 Tests)  
Elias Jarufe -- 51-16169393

<sup>A</sup>Third Party Independent    <sup>C</sup>Institute  
<sup>B</sup>Manufacturers QC            <sup>D</sup>Government

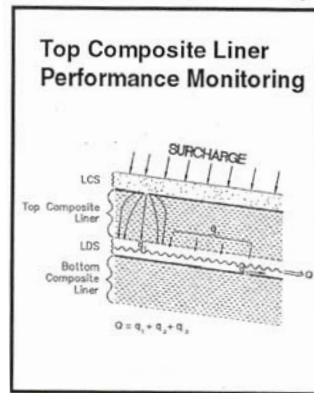
If you are interested in this program and would like a copy of the GAI-LAP directory, please advise accordingly. A directory is published annually in December, and is also kept current on GRI's Home page at <http://www.geosynthetic-institute.org>. For additional information on the GAI-LAP program contact:

George R. Koerner, Ph.D., P.E., CQA  
 Geosynthetic Institute  
 475 Kedron Avenue  
 Folsom, PA 19033-1208  
 Telephone: (610) 522-8440  
 Fax: (610) 522-8441  
 E-mail: [gkoerner@dca.net](mailto:gkoerner@dca.net)

Recently we have been asked by several GSI and GAI-LAP members where we see the testing business going forward. Since GSI is the reference test lab for the GAI-LAP (an ISO 17011 not an ISO 17025 type laboratory) we are rather immune to the seasonal variation in the testing business experienced by many third party labs. However, we are fully involved with the GS community and this is what we have heard.

- GS's are use in environmental, geotechnical, transportation and hydraulic applications. As the data below from NY DEC (Robert Phaneuf) shows, liner system: two composite liners (GM/GCL & GM/CCL) with low hydraulic heads work very well. Components of these systems are also the most tested GS's in our industry.

**How Well Are New York State's Double-Lined Landfill Designs Working ?**



**From 2005 Annual Reports**  
 (data on 34 Landfills)

**Primary LCRS Flows:**  
 Max: 10,746 gpad; Min: 262.2 gpad;  
 Mean: 1,341 gpad

**Secondary LCRS Flows:**  
 Max: 26.8 gpad; Min: 0.50 gpad;  
 Mean: 7.2 gpad

**Upper Liner System Efficiency:**  
 Max: 99.95 %; Min: 93.72 %;  
 Mean: 99.10 %



These low leakage rates are obtained by using a system's approach to the overall challenge of protecting the environment. It involves using

- Optimum materials: via HDPE via GM13
- Accredited testing laboratories via the GAI-LAP
- Best Available Installation companies and personnel via CQC-IGI
- Good and experienced Quality Assurance inspectors via GCI-ICP, and
- LIS prior to commissioning the facility

As you can see, there is testing involved with four of the five bullet items above. Furthermore, we see a host of new opportunities on the horizon. Some may consider these to be niche testing items, However, one or a combination of several might lead to profitability for a third party lab. The items are as follow;

1. The "Big Three" design tests. This is a way to service an engineering design department. The quintessential equation that defines an appropriate design is the factor of safety equation (1).

$$FS = \frac{\text{Test Property Value}}{\text{Design Required Value}} \quad (1)$$

Its partner equation, the reduction factor equation, is used whenever the test does not exactly model field condition over the life of the facility.

$$\text{Test Allow Prop.} = \frac{\text{Test Property Value}}{\text{Reduction Factors}} \quad (2)$$

The methods that are most often required on a case-by-case basis are wide width tensile, direct shear and transmissivity. One could exist by conducting these tests with their accompanying reduction factors. With the onslaught of new products and ever changing field conditions, this work is endless.

2. Accredited Field Lab. It strikes me as backwards when the shipping invoice for a project exceeds the testing charge. On a large project, one could set up an index field lab in an HVAC controlled field trailer for relatively little money. We have had several instances over the past two years where GS's were not verified prior to installation. Such tests on site such as thickness, mass per unit area, and tensile strength could save much time and effort if done quickly on site.
3. In the geomembrane business, Water Departments are getting fed up with exposed geomembranes that do not last. One is now commissioning a QUV device to expose their site specific geomembranes for 20,000 hours. If the GM does not last, the material is replaced by way of a prorated warrant. Since 2.5 years (rather than 7 to 12 years) have elapsed, the owner realizes the greater share of the rebate on the warrant.

In short, we see a great need for good quality GS's testing. The creativity and quality of the GAI-LAP labs are positioned nicely to fill these and other needs of the GS community as they arise.

The 15<sup>th</sup> annual meeting of the GAI-LAP will meet in Vancouver BC Canada on June 17<sup>th</sup> in conjunction with D35 committee week. The meeting will be on Wednesday evening at 7:00 PM. The room will be posted on the ASTM schedule of events and at the bulletin board at registration. Please plan to attend.

Regards and thank you for participating in the GAI-LAP.

*George Koerner*

## Activities within GCI (Certification)

Due in part to the active interest by many GSI members and associate members we present a tabular summary of the Inspectors Certification Program as of November, 2008. The table following gives the pass/fail statistics by year as well as insight as to the impact of taking a course before the written examination. In looking at the data it appears as though we are not "teaching-the-exam".

Year	Course Situation	Geosynthetic Materials		Compacted Clay Liners	
		No. of people taking the exam	No. of people failing the exam	No. of people taking the exam	No. of people failing the exam
2006	GSI Course	34	0	27	5 (18%)
	Other Course	59	3 (5%)	57	4 (7%)
	No Course	48	2 (4%)	44	3 (7%)
	<b>TOTAL</b>	<b>141</b>	<b>5 (3%)</b>	<b>128</b>	<b>12 (9%)</b>
2007	GSI Course	46	9 (19%)	38	6 (16%)
	Other Course	18	2 (11%)	18	3 (16%)
	No Course	18	0	17	3 (17%)
	<b>TOTAL</b>	<b>82</b>	<b>11 (13%)</b>	<b>73</b>	<b>12 (16%)</b>
2008 (to date)	GSI Course	23	6 (26%)	20	4 (25%)
	Other Course	44	11 (25%)	43	11 (25%)
	No Course	23	6 (26%)	22	5 (23%)
	<b>TOTAL</b>	<b>90</b>	<b>23 (25%)</b>	<b>85</b>	<b>20 (23%)</b>
2006- 2008 (to date)	GSI Course	103	15 (14%)	85	15 (17%)
	Other Course	121	16 (13%)	118	18 (15%)
	No Course	89	8 (9%)	83	11 (13%)
2006/08	<b>TOTAL</b>	<b>313</b>	<b>39 (12%)</b>	<b>286</b>	<b>44 (15%)</b>

## 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 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.

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. The geosynthetics testing group within FITI has twelve



people (two 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 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.

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. GSI Taiwan has hosted two very successful conferences to date and has plans for another, followed by a broader conference for Southeast Asia.

## GSI Fellowships

As mentioned our last Newsletter/Report we have awarded five GSI Fellowships in the amount of \$10,000 for research in geosynthetics.

The students are all doctoral candidates doing research in geosynthetics. From a worldwide solicitation of proposals the following five were selected. Their full proposals are on our website at [www.geosynthetic-institute.org](http://www.geosynthetic-institute.org); click on "GSI Fellowships and Projects".

University	Advisor	Student	Topic
Virginia Tech Univ.	George Filz	Michael McGuire	Geosynthetically reinforced pile supported embankments
Drexel Univ.	Grace Hsuan	Connie Wong	Durability specification development for corrugated HDPE pipe
RWTH Aachen	Martin Ziegler	Axel Ruiken	Geogrid behavior when used in wall and slope applications
Univ. of Athens	Michael Sakellari	Elena Kapogianni	Geosynthetic reinforced soil slope stability under seismic conditions
Univ. of Kansas	Jie Han	Xiaoming Yang	Geocell behavior when used to reinforce aggregate bases

Their reports are due on or before June 30, 2009 and, pending appropriate progress, they can reapply for a second and even a third year. We will begin a new solicitation on July 15, 2009. In the steady state after the third year we expect to be supporting 12 to 15 students per year. Funding for this program comes from the GSI endowment.

## Items of Interest

### 1. Dam Safety in the Balance

Approximately a third of dam failures in the U.S. are caused by overtopping due to inadequate spillway designs, debris blockage of spillways, or settlement of dam crests. Foundation defects, including settlement and slope instability, account for slightly less than another third, and about another twenty percent of failures are due to piping and seepage issues. (ref. *Foundation Drilling*, November, 2008)

### 2. What's Polluting Our Rivers?

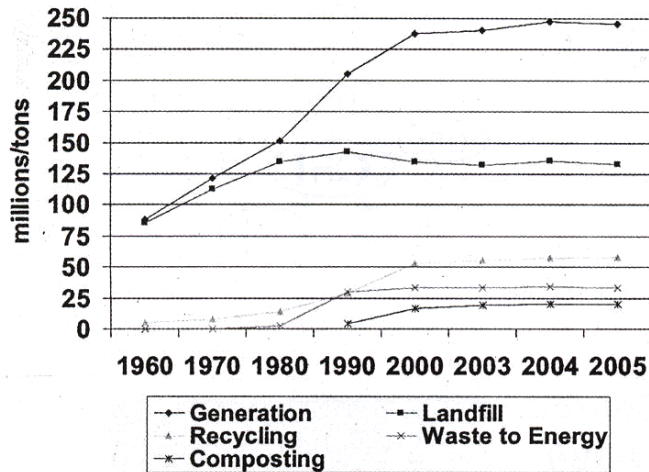
Who doesn't want cleaner lakes and rivers? Some U.S. Senators, it seems. A bill making its way through the Senate is asking that animal waste be exempt from a law that helps protect our water. But discharge from animals on large-scale farms is a major source of pollution of our nation's waterways. According to a Congressional study, 1.4 billion tons of waste is generated by animals on megafarms in more than 40 states. That's 130 times the amount of waste that the entire American population produces in a year. Not only does this pollution kill fish and aquatic life, it also seeps into our drinking water. (ref. *Parade Magazine*)

### 3. U.S. Landfill Disposal and Management Methods

The following represents the current situation in the United States regarding solid waste disposal.

Region	Annual Volume	Remaining Capacity	Years
Northeast	65	969	14.9
Southern	119	2,808	23.6
Midwest	111	1,793	16.2
Western	76	2,175	28.6
Pacific	64	1,529	23.9
Entire US	435	9,274	21.3

\*Millions of tons



(ref. MSW Management Magazine, 2009)

#### 4. ASCE Releases 2009 Report Card for America's Infrastructure

Category	Grade
Aviation	D
Bridges	C
Dams	D
Drinking Water	D-
Energy (Electric Power Grid)	D+
Hazardous Waste	D
Inland Waterways	D-
Levees	D-
Public Parks and Recreation	C-
Rail	C-
Roads	D-
Schools	D
Solid Waste	C+
Transit	D
Wastewater	D-

#### 5. Salary Survey for U. S. Civil Engineers

Median Income by Selected Major Branch of Engineering

Architectural	\$74,200
Geotechnical	\$74,870
Transportation	\$75,442
Civil	\$75,500
Structural	\$78,000
Aeronautical/aerospace	\$79,250
Environmental	\$80,000
Coastal	\$83,650
Marine	\$101,500
Nuclear	\$106,000
Mining	\$107,750
Forensic	\$107,750
Petroleum	\$119,500

(ref. Civil Engineering Magazine, July 2008)

## Recap of GRI-22 Conference in Salt Lake City

The 22<sup>nd</sup> GRI Conference took place on February 27, 2009 during the last day of a very successful Geosynthetics 2009 Conference. GRI-22 was also successful and had eighteen papers on the theme of "Its All in the Details" (geosynthetic details being critical to any long-term system's performance). Since the theme covered all possible geosynthetic topic areas, a distinct separation of papers by category was not possible. That said, some commentary on each paper follows:

Paul O'Malley of Propex (speaking for Scott Manning) presented proper installation of turf reinforcement mats to prevent soil erosion. Jim Olsta of CETCO described his company's manufacturing of GCLs so as to avoid needle fragments from occurring in the final product. Ian Peggs of I-Corp gave several instances of cracks or holes in field placed geomembranes and how to avoid them in the future. Ron Belanger of Precision Labs described details of testing textured geomembranes, namely core thickness and asperity height, and how to statistically interpret the testing results. Boyd Ramsey of GSE followed by presenting results from a new "optical scanning profilometer" showing the detailed surface of textured geomembranes with a video describing the process. GSE is presently correlating the output to conventional direct shear testing. Sam Allen of TRI then presented direct shear and transmissivity testing details from the perspective of eliminating errors by standardizing procedures and equipment.

Rick Thiel of Thiel Engineering and Vector presented many excellent drawings of geomembrane attachments to pipe penetrations and perimeter walls in a very detailed and explicit manner. Ian Peggs of I-Corp followed and corroborated many of Rick's drawings and commentary. Tim Bauters of Golder Associates described proper isolation details of the electrical leak location survey method as applied to landfill covers as well as electrode spacing and results. Don Hullings of Jones Edmunds Consultants described his method of anchoring exposed geomembrane covers to the underlying soil cover of landfills to the point that rain and winds from three recent Florida hurricanes were successfully resisted. Kevin McKeon of AECOM (formerly Earth Tech) presented many details of how to properly introduce liquids into bioreactor landfills, as well as proper gas extraction details.

Three presentations on mechanically stabilized walls (MSE) followed. John Paulson of REDI Engineering led off with many construction hints when constructing segmental retaining walls. Dimiter Alexiew of Huesker



followed with the proper construction of facing details for live (or vegetated) walls. Archie Filshill of CETCO Contracting concluded the set of three papers by emphasizing proper drainage during and after construction with concerns over the use of fine grained soils in the reinforcement zone. This set of three papers is a must-read for MSE wall designers and contractors.

George Koerner presented details of smoke detection of imperfections when nondestructively evaluating spray-applied geomembranes. A second paper by Bob Koerner of GSI was not presented due to time constraints. The topic is the joining and connection of geocomposite drainage materials and it is available on the conference CD. Hong-Yong Jeon of INHA University made a unique presentation of clay nanoparticle formulated geotextiles used in environmental applications; a completely new and innovative material was presented in this regard. Paul Oliveira of Firestone nicely concluded the conference by describing effective material specifications and pitfalls arising by poorly informed specification writers who merely "cut-and-paste" the specification together. This often produces a troublesome and inadequate document. In this regard, no one is properly served. Clearly, an adequate knowledge base is required by specification writers so as to result in a high quality product at a reasonable cost.

We at GSI would sincerely like to extend our appreciation to all of the speakers and their respective organizations. Also, we thank the 120± attendees at the GRI-22 Conference who stayed the extra, and last, day of Geosynthetics 2009 for their interest and involvement in our activity. The question and answer response to every paper was stimulating and most informative.

The conference CD is available from the IFAI Bookstore at [www.ifai.org](http://www.ifai.org). Click on "Bookstore" for details.

*Bob Koerner*

## Upcoming Events

- March 23-44, 2009  
Liner Integrity Surveys  
Austin, TX  
Contact: [www.geosyntheticstesting.com](http://www.geosyntheticstesting.com)
- March 25-26, 2009  
Construction QA/QC  
Austin, TX  
Contact: [www.geosyntheticstesting.com](http://www.geosyntheticstesting.com)

- March 31, 2009  
Interface Friction  
Austin, TX  
Contact: [www.geosyntheticstesting.com](http://www.geosyntheticstesting.com)
- April 1, 2009  
Drainage Geocomposites in Landfills  
Austin, TX  
Contact: [www.geosyntheticstesting.com](http://www.geosyntheticstesting.com)
- April 8, 2009  
Drainage Geocomposites in Landfills  
Austin, TX  
Contact: [www.geosyntheticstesting.com](http://www.geosyntheticstesting.com)
- April 13, 2009  
GSI Short Course  
GS in Infrastructure: Public Sector  
Folsom, PA  
Contact: [mvashley@verizon.net](mailto:mvashley@verizon.net)
- April 14, 2009  
GSI Short Course  
GS in Infrastructure: Private Sector  
Folsom, PA  
Contact: [mvashley@verizon.net](mailto:mvashley@verizon.net)
- June 10, 2009  
GSI Short Course  
QC/QA Using Geosynthetics  
Folsom, PA  
Contact: [mvashley@verizon.net](mailto:mvashley@verizon.net)
- June 17-19, 2009  
ASTM Committee D35  
Vancouver BC, Canada  
Contact: [csierk@astm.org](mailto:csierk@astm.org)
- June 17, 2009  
GAI-LAP Meeting @ 7:00 PM  
(with ASTM)  
Contact: [gkoerner@dca.net](mailto:gkoerner@dca.net)
- September 2-5, 2009  
GeoAfrica 2009  
Cape Town SA  
Contact: [www.geosyntheticssociety.org](http://www.geosyntheticssociety.org)
- November 10-11, 2009  
Geosynthetics in the Middle East  
Dubai, UAE  
Contact: [www.geosyntheticssociety.org](http://www.geosyntheticssociety.org)
- January 27-29, 2010  
ASTM Committee D35  
San Antonio, TX  
Contact: [csierk@astm.org](mailto:csierk@astm.org)

## 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 Philadelphia Water Department with Vahe Hovsepian as the contact person. Welcome to GSI!

**GSE Lining Technology, Inc.**  
*Boyd Ramsey [BoD]*  
**AECOM**  
*Kevin McKeon/Ken Bergschultz/John Trast*  
**U.S. Environmental Protection Agency**  
*David A. Carson*  
**E. I. DuPont de Nemours & Co., Inc.**  
*John L. Guglielmetti/David W. Timmons*  
**Federal Highway Administration**  
*Silas Nichols/Daniel Alzamora*  
**Golder Associates Inc.**  
*Mark E. Case/Jeffrey B. Fassett*  
**Tensar International Corporation**  
*Joseph Cavanaugh*  
**Poly-Flex, Inc.**  
*James Nobert/George Yazdani*  
**Colbond Geosynthetics**  
*Joseph Luna/Adrian Dobrat*  
**Geosyntec Consultants**  
*Steve Poirier*  
**Tenax, S.p.A.**  
*Aigen Zhao/Piergiorgio Recalcati*  
**LyondellBasell Industries**  
*Michael J. Balow/Fabio Ceccarani*  
**TC Nicolon USA**  
*John Henderson/Chris Lawson*  
**CETCO**  
*James T. Olsta*  
**Huesker, Inc.**  
*Steven Lothspeich/Dimitér Alexiew*  
**NAUE GmbH & Co. KG**  
*Georg Heerten/Kent von Maubeuge [BoD]*  
**Propex**  
*Scott Manning*  
**Fiberweb, Inc.**  
*Steve Bowlds/William Walmsley*  
**NTH Consultants, Ltd.**  
*James J. Parsons/Robert Sabanas*  
**TRI/Environmental Inc.**  
*Sam R. Allen [BoD]*  
**U. S. Army Corps of Engineers**  
*David L. Jaros [BoD]*  
**Chevron Phillips Co.**  
*Rex L. Bobsein*  
**URS Corp.**  
*John C. Volk*  
**Solmax Géosynthétiques**  
*Robert Denis*  
**Envirosource Technologies, Inc.**  
*Douglas E. Roberts*  
**CARPI, Inc.**  
*Alberto M. Scuero/John A. Wilkes*  
**Civil & Environmental Consultants, Inc.**  
*Chris O'Connor*

**Agri America, Inc.**  
*Paul W. Barker/Peter Riegl*  
**Firestone Specialty Products**  
*Mark Munley/Paul Oliveira [BoD]*  
**FITI (GSI-Korea)**  
*Jeonhyo Kim/H.-Y. Jeon*  
**Waste Management Inc.**  
*Anthony W. Eith [BOD]/Greg Cekander*  
**NPUST (GSI-Taiwan)**  
*Chiwan Wayne Hsieh [BoD]*  
**GeoTesting Express**  
*W. Allen Marr/Richard P. Stulgis [BoD]*  
**GEI Consultants**  
*Michael A. Yako*  
**GSE Chile, S.A.**  
*Mauricio Ossa*  
**Atarfil, S. L.**  
*Mario Garcia Girones/Emilio Torres*  
**Republic Services Inc.**  
*Clarke Lundell*  
**GSE Europe**  
*Stefan Baldauf*  
**Precision Geosynthetics Laboratories**  
*Ronald Belanger/Cora Queja*  
**CETCO Contracting Services**  
*Archie Filshill*  
**Raven Industries, Inc.**  
*Gary M. Kolbasuk [BoD]*  
**CTI and Associates, Inc.**  
*Te-Yang Soong/Steve Wintheiser*  
**Advanced Earth Sciences, Inc.**  
*Kris Khilnani/Suji Somasundaram*  
**Polytex, Inc.**  
*Jaime Morales/Elias Jarufe*  
**Carlisle Syntec, Inc.**  
*Randy Ober/Chris Taylor*  
**Ring Industrial Group**  
*Ben Berteau/Jeffrey Karl*  
**EPI, The Liner Co.**  
*Daniel S. Rohe/Mark Wolschon*  
**Vector Engineering, Inc.**  
*Vince Suryasasmitha/Richard Thiel*  
**Weaver Boos Consultants, Inc.**  
*Mark Sieracke*  
**Aquatan (Pty) Ltd.**  
*Morne Breytenbach/Piet Meyer*  
**PRS Mediterranean Ltd.**  
*Arik Nagler*  
**Jones Edmunds, Inc.**  
*Donald E. Hullings*  
**Intertape Polymer Group**  
*Dohn Berger/Trevor Arthurs*  
**The Mannik & Smith Group, Inc.**  
*John S. Browning III/Francis J. Biehl*

**ASSOCIATE MEMBERS**

**Delaware Solid Waste Authority**

*Anne Germain*

**Nebraska Department of Environmental Quality**

*Gerald Gibson*

**New York State Dept. of Environmental Conservation**

*Robert J. Phaneuf*

**Maine Department of Environmental Protection**

*David E. Burns*

**New York State Department of Transportation**

*Bob Burnett/James Curtis*

**California Water Resource Control Board**

*Leslie Graves*

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*Michael J. Burlingame*

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*Jay Swihart*

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**Environment Agency of U. K.**

*Rob Marshall*

**Florida Dept. of Transportation**

*Mario Paredes*

**National Design, Construction &  
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*Stephen D. Reinsch*

**Virginia Dept. of Environmental Quality**

*Donald Brunson*

**Massachusetts Dept. of Environmental Protection**

*Paul Emond*

**Philadelphia Water Department**

*Vahe Hovsepian*

***In The Next Issue***

- Activities of the GSI Directors and Board
- Overview of GRI (Research) Projects
- Activities within GII (Information)
- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- The GSI Centers-of-Excellence
- Items of Interest
- GMA Techline's First 1000 Q & A's
- GSI's Member Organization