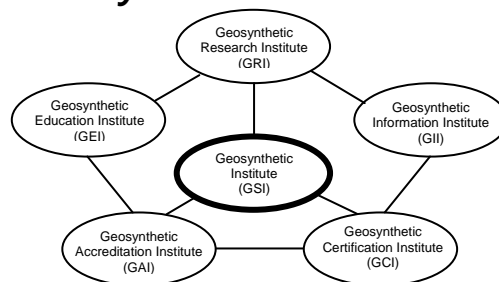


# The GSI Newsletter/Report

## Geosynthetic Institute



Vol. 26, No. 2

June, 2012

This quarterly newsletter, now in its 26<sup>th</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 George R. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at [gkoerner@dca.net](mailto:gkoerner@dca.net) or [mvashley@verizon.net](mailto:mvashley@verizon.net).

## Activities of GSI's Directors

1. Director George Koerner participated in a GMA government liaison group meeting in Washington, DC which appeared to be very productive.
2. Dr. Lili Cui of Chevron Phillips Chemical Co. has been elected to fill the vacancy of Dr. Rex Bobsein. Incidentally, Rex was recently sent a plaque in testimony to his long service as the GSI Board of Directors contact person for the Resin/Additive Group.
3. We are providing six ASCE webinars (each twice per year) with another two in the review process... see [www.asce.org/webinars](http://www.asce.org/webinars) for information.
4. The GRI-25 conference organization set for Long Beach, California in April, 2013 is presently finalized. The theme is "25-Year Retrospectives on the Geosynthetic Industry and Glimpses Into the Future".
5. Both George and Bob are doing many in-house presentations for member organizations. In this regard all of the ASCE Webinars are available plus about 100 others. If you want a list, please advise and we can work something out in this regard.
6. The GSI Endowment Committee (Jerry Neyer of NTH, Jim Olsta of CETCO, John Basista of MSSB and Bob Koerner) will deliberate during a teleconference call on June 26, 2012.
7. The present BOD is as follows, along with their respective term ending years.

### Term Ends 2012

- Tony Eith (Chairman) - Waste Management Inc. (Owners and Operators)  
e-mail: [aeith@wm.com](mailto:aeith@wm.com)
- Boyd Ramsey - GSE Lining Technology, Inc. (Geotextiles and Geogrids)  
e-mail: [bramsey@gseworld.com](mailto:bramsey@gseworld.com)
- Sam Allen - TRI/Environmental, Inc. (At-Large)  
e-mail: [Sallen@tri-env.com](mailto:Sallen@tri-env.com)

### Term Ends 2013

- David Jaros - Corps of Engineers (Government Agencies)  
e-mail: [dave.l.jaros@usace.army.mil](mailto:dave.l.jaros@usace.army.mil)
- Lili Cui – Chevron Phillips Co. (Resin/Additive)  
e-mail: [cuil@cpchem.com](mailto:cuil@cpchem.com)
- Kent von Maubeuge - NAUE GmbH & Co. KG (International-1)  
e-mail: [kvmaubeuge@naue.com](mailto:kvmaubeuge@naue.com)

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- Upcoming GSI Events
- GSI's Member Organizations

## Term Ends 2014

- Mark Sieracke - Weaver Boos (Consultants and Testing Labs)  
e-mail: [msieracke@weaverboos.com](mailto:msieracke@weaverboos.com)
- Tim Rafter - CETCO (Geomembranes and GCLs)  
email: [tim.rafter@cetco.com](mailto:tim.rafter@cetco.com)
- Wayne Hsieh - NPUST and GSI-Taiwan (International-2)  
e-mail: [cwh@mail.npust.edu.tw](mailto:cwh@mail.npust.edu.tw)

## **Overview of GRI Projects (Research)**

Each issue of our Newsletter/Report provides a brief glimpse and update of current GRI research projects. It will be noted that most projects are of a very long duration; one being up to 50-years! (In this regard short projects are given to design firms or testing laboratories that are GSI Members). 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) 5228440 or e-mail at [grace.hsuan@coe.drexel.edu](mailto:grace.hsuan@coe.drexel.edu).

**Important Notice:** Use of GSI/GRI generated data and information is for member organization use assuming that the information is not taken out of the context of which it was developed. When used for formal publications such as proposals, regulatory permits, brochures and advertisements we would appreciate seeing a draft copy for possible comments. Thank you for your cooperation in this regard.

- 1. In-Situ Temperature Monitoring of Liner and Cover Geomembranes in Dry and Wet Landfills\*** - 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 extended into its 15<sup>th</sup>-year and has resulted in an extremely authoritative set of real-life data.
- 2. Bioreactor (aka, Wet) Landfill Behavior and Properties\*** - One of the landfill cells mentioned in Item #1 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 wasteData is being collected on a quarterly basis. The timeline of the project calls for monitoring up to 10 years. This activity has been extended to an adjacent landfill to see how reproducible the data is with a slightly different waste mass.
- 3. 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 materials consist of both natural soils and geosynthetic drains. The experimental setup has been dismantled and a paper will be given at the 2012 Global Waste Conference in Phoenix.
- 4. Lifetime of Exposed Facing Geogrids Used at Landfill Berms** - The facing of mechanically stabilized earth landfill berms (and other walls and slopes as well) is often using a wrap-around configuration leaving the geogrid exposed to the atmosphere. A new project being conducted by George Koerner for Waste Management is presently investigating different grid behavior over time. A 50-year time frame is envisioned. The long-term behavior will eventually be compared to UV laboratory exposed data as noted in Item #7 below.
- 5. UV Exposure of Geomembranes\*** - GSI is using three UV-fluorescent devices to estimate the projected exposed lifetime of many different types of geomembranes. Presently being incubated are HDPE, LLDPE, fPP, PVC (N.A.), and EPDM. Exposure times of 50,000 light hours are now realized at 70°C and a replicate set of samples are being incubated at 60°C. Some will take at least 70,000 light hours (≈ ten years). The third sequence at 80°C was started on 1/1/2010. Ongoing data is being reported to manufacturers and resin producers. GRI Report #42 is available on the 70°C data using a correlation coefficient to estimate field lifetime of the various geomembranes.
- 6. Exposed Lifetime of PVC (European) Geomembranes** - Of late, we have been attempting to distinguish between PVC geomembranes manufactured in North America versus Europe. Of course, the difference is in the type of plasticizers and other additives used in the formulations. In this regard we have been evaluating various European formulations for four years using three additional UV-fluorescent devices and the results are very impressive. The study is being conducted for CARPI Tech, a GSI member organization.
- 7. UV Exposure of Geogrids** - The UV-fluorescent exposure of two different biaxial geogrids which are used at the exposed faces of welded wire mesh MSE structures is ongoing. The various geogrids are now up to 35,000 light hours and

data is being generated and sent to the respective manufacturers. Replicate samples are now being incubated at 60°C for eventual use in Arrhenius Modeling and lifetime prediction. The last set at 80°C has just begun incubation.

8. **UV Exposure of TRM Fibers** - We are also using UV-fluorescent exposure of four different turf reinforcement mat fibers to assess their lifetime capabilities. They are presently being incubated at 60°C, 70°C and 80°C. Communication between the manufacturer Propex is ongoing.
9. **UV Exposure of Geotextiles** - We have just completed a UV study on a heat-bonded nonwoven PP geotextile used for three dimensional cell structures which are exposed to the atmosphere. The results for the particular geotextile and its specific formulation at 20°C (68°F) average field temperature are 4.9 years for halflife of breaking strength and 4.1 years for halflife of breaking elongation.
10. **Lifetime of Geomembrane Tapes** - There are several adhesive sided geomembrane tapes used to repair exposed geomembranes. Two different types are being evaluated in our QUV exposure devices.
11. **Field Behavior of fPP and fPP-R Geomembranes** - We continue to receive and evaluate field samples of flexible polypropylene geomembranes (mainly scrim reinforced). They are regularly added to our database in this regard. The most recent was for potable water storage and had a service lifetime of 10-years. Using our correlation factor of 1200 light hours in D7238 at 70°C being equivalent to one-year in a hot climate, this is equivalent to a laboratory exposure in the weathering device of 12,000 light hours. Our GRI-GM18 specification calls for 20,000 light hours for an acceptable formulation which is essentially a factor-of-safety of 1.67.
12. **Retaining Wall Failure Evaluation** - We presently have GRI Reports 38, 39, and 40 addressing mechanical stabilized earth (MSE) walls using geosynthetic reinforcement which document 82-failures. Our data base has now increased to 154 failures and continues to grow! The failures are either excessive deformation or collapses. We have presented one-day courses on this topic along with inspector training and development insofar as an inspectors certification program; see the certification section of this Newsletter/Report. We have just recently presented the findings at the two geotechnical conferences.
13. **pH Between Masonry Block Wall Units\*** - George Koerner has been measuring the pH between three types of masonry blocks over six years to monitor the values. Concern here is over PET geogrids which are known to be

sensitive to high alkalinity environments. The values started high, but over time are now down to eight and lower. George Koerner has a paper in this regard.\*

14. **Landfill Failure Analysis** - Since our originally reported paper on ten landfill failures in a 2000 publication, we have accumulated ten more. All 20-failures have been analyzed by Dr. Connie Wong using the ReSSA Code and are now available to members and associate members as GRI Report #41.
15. **Puncture Behavior of Nontraditional Protection GSs** - A member organization asked about the protection afforded to a geomembrane by geonet composites and GCL's. As a result, we have just concluded a laboratory study using three different probes against various GMs protected by geotextiles, GCs and GCLs. The resulting paper has been accepted by ASTM's Journal of Geotechnical Testing.
16. **CaCO<sub>3</sub> in Bentonite Contained Within GCL's** - It is possible that the amount of calcium carbonate contained within the bentonite of different GCL's is indicative of their hydraulic performance. George Koerner has evaluated 15-bentonites and will report the data at the ASTM D35 Committee meeting next week.
17. **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 and EPDM-R Geomembranes  
GM22 – Exposed Temporary Covers  
GM25 – LLDPE-R Geomembranes  
GM19 – Geomembrane Seams  
GT10 – Geotextile Tubes  
GT12 – Geotextile Cushions  
GT13 – Geotextile Separators  
GCL3 – Geosynthetic Clay Liners

Working Within Focus Group

GTXX – Turf Reinforcement Mats (tabled)

Delayed or Off in the Distance

GGXX – Bidirectional Geogrids  
GGXX – Unidirectional Geogrids  
GNXX – Geonet Drainage Composites  
GCXX – Other Drainage Geocomposites  
GSXX – High Strength Reinforcement Geotextiles

The complete set of 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. There is a brief tutorial

accompanying each specification. They will be updated shortly. Copies of the above listed draft specification tables are also available to members and associate members.

18. **Other GRI Standards** - There are several GRI Standards in various forms of preparation. These include a test method to extract plasticizers from PVC geomembrane formulations, a GCL overlap permeability and a group of test methods being prepared for both Milliken and ThermaGreen Companies for their respective new products.

## Progress within GII (Information)

Our GSI Home Page (which has a revised opening format) is accessed as follows:

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

It has been completely revised and is being maintained 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
- Laboratory Accreditation
- Product Certification
- Newsletter/Reports
- Internet Courses
- Geosynthetics Links
- GSI Member Meetings
- Courses at GSI
- Insp. Cert. Program

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. Please note that original passwords have recently been changed. 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 available. 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 30,000 citations which is the majority 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 daily activities.

In addition to the information provided in our home page as just mentioned, Jamie Koerner (Special

Projects Coordinator) is performing various surveys of pertinent topics in geosynthetics.

Most of these have been turned into GRI White Papers; the following being the most recent.

- #15 - Allowable S.I. Leakage Rates
- #16 - Conformance Testing Requirements
- #17 - Post Closure Care of MSW Landfills
- #18 - UMT and LLRW Disposal Sites in USA
- #19 - Monitoring Movements of MSE Structures
- #20 - GS Opportunities with Shale Gas Extraction
- #21 - State Regulatory Departments Involved in Shale Gas Permitting
- #22 - Selected GS Opportunities with Energy Production and Transmission

Jamie's current survey is to evaluate the state regulatory status of the use and design of large engineering berms at landfill sites.

## Progress within GEI (Education)

### Free CD

We sent a broadcast e-mail to everyone stating that many power point presentations were available and would be sent upon request. Many 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.

### 6<sup>th</sup> Edition of Designing With Geosynthetics

After the first 3-months of availability of the new book we find the following sales activity:

Hardback (\$35.00 each volume)

Volume 1 – 139

Volume 2 – 140

Softback (\$24.00 each volume)

Volume 1 – 77

Volume 2 – 64

e-Book (\$3.74 each volume)

Volume 1 – 35

Volume 2 – 54

The two volume set can be purchased through GSI, Xlibris, Amazon and Barnes and Noble. A special link is available on the opening page of our website.

### GRI Reports

To date, we have 42 GRI Reports available to members and associate members. These reports vary in length from 30 to 200 pages and beginning with Report #25 they are on the password protected section

of our home page. Prior to that date only the abstract is available online. All of them, however, are available in hard copy. The most recent reports are as follows:

- #38 – A Data Base and Analysis of Geosynthetic Reinforced Wall Failures
- #39 – Methods of Stabilizing Excessively Deformed MSE Walls
- #40 – On the Prevention of Failures of Geosynthetic Reinforced MSE Walls and Recommendations Going Forward
- #41 – Analysis and Critique of Twenty Large Solid Waste Landfill Failures
- #42 – Lifetime Prediction of Laboratory UV Exposed Geomembranes Based on a Correlation Factor (due January 2, 2012)

### Courses

We have just scheduled the following set of courses:

- #1 MSE Wall Failures and Their Remediation  
November 28, 2012 and March 13, 2013
- #2 Construction Inspection of MSE Walls, Berms and Slopes  
November 29, 2012 and March 14, 2013  
(Optional Exam Follows)
- #3 Design and Testing of Geosynthetics in Waste Containment Systems  
December 5, 2012 and March 20, 2013
- #4 QA/QC of Geosynthetics in Waste Containment Systems  
December 6, 2012 and March 21, 2013  
(Optional Exam Follows)

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:  
\$350/person for each one-day course (up to one month prior to course)  
\$400/person thereafter  
\$250/person – GSI Members  
Contact: Marilyn Ashley ([mvashley@verizon.net](mailto:mvashley@verizon.net))

### GSI Fellowships

As in the past, GSI has been awarding graduate fellowships for students performing geosynthetics research. There were nine new proposals this academic year. These proposals were then reviewed by the GSI Board of Directors along with Bob and George Koerner.

The presently established criteria are as follows:

- Students must be working on a geosynthetics topic which furthers the technology in a proactive manner.

- Students must have completed their candidacy requirements leading to a doctoral degree. (Comment, we hope that some of them will “go academic” and teach and/or research geosynthetics in the immediate future)
- Students must be recommended by their advisor or department head.
- The fellowships can be renewed for total of three-years depending upon acceptable annual reports.
- Funding for each student is \$10,000 the first year and \$5000 for the second and third years.

The following table identifies the successful recipients, their university, advisor and topic. We congratulate the students and wish them success in their endeavors. If any readers wish to add congratulations or to find greater detail as to specific projects and students please contact us accordingly.

### **GSI Fellowship Status for 2011-'12 Academic Year**

#### **Class 2 (c) – 3<sup>rd</sup> year funding**

No.	Name	University	Advisor	Topic
4-09	Majid Khabbazian	U. of Delaware	Victor Kaliakin	GS basal reinforcement

#### **Class 3 (b) – 2<sup>nd</sup> year funding**

No.	Name	University	Advisor	Topic
1-10	Tanay Karademir	Georgia Tech	David Frost	Temperature effects on shear strength
2-10	Jing Ni	U. of Wollongong, Australia	Buddhima Indraratna	PVD's in railroad stabilization
3-10	Carmen Franks	U. of Maryland	Ahmet Aydilek	GT filters for stormwater runoff

#### **Class 4 (a) – 1<sup>st</sup> year funding**

No.	Name	University	Advisor	Topic
1-11	Ryan Corey	U. of Kansas	Jie Han	GS protection of buried pipelines
2-11	G. Hossein Roodi	U. of Texas at Austin	Jorge Zornberg	Pavement lifetime using field data
3-11	Felix Jacobs	RWTHU-Aachen, Germany	Martin Ziegler	Geogrid reinforced soil behavior
4-11	Mahmound Khachan	Syracuse University	Shobha Bhatia	Defloculants for geotextile tubes

**It is important to note that Jamie has just sent our requests-for-proposals for GSI Fellowships for the 2012-2013 academic year to various magazines and newsletters. Do “talk-it-up” in this regard with your favorite university and academic colleagues.**



## Activities within GAI (Accreditation)

The Geosynthetic Accreditation Institute's (GAI) current mission is focused on a Laboratory Accreditation Program (LAP) for 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 as an ISO 17011 enterprise. In short, this means that the GSI lab does not conduct outside commercial testing.

It should also be made clear 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 ASTM, ISO or GRI 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. Presently, there are 223 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of June, 2012, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel, telephone numbers and e-mails are also listed.

- 1<sup>A</sup> - TRI/Environmental Inc. (118 tests)  
Sam Allen -- (512) 263-2101  
[Sallen@tri-env.com](mailto:Sallen@tri-env.com)
- 3<sup>A</sup> - Golder Associates (45 tests)  
David Alexander -- (770) 492-8280  
[dalexander@golder.com](mailto:dalexander@golder.com)
- 4<sup>C</sup> - Geosynthetic Institute (116 tests)  
George Koerner -- (610) 522-8440  
[gkoerner@dca.net](mailto:gkoerner@dca.net)
- 8<sup>B</sup> - Propex, Ringgold (19 tests)  
Todd Nichols -- (800) 258-3121  
[todd.nichols@propexinc.com](mailto:todd.nichols@propexinc.com)
- 9<sup>B</sup> - Lumite (10 tests)  
Rebecca Kurek -- (770) 869-1700  
[rkurek@lumite.com](mailto:rkurek@lumite.com)
- 13<sup>A</sup> - Precision Laboratories, CA (95 tests)  
Cora Queja -- (714) 520-9631  
[cqueja@precisionlabs.net](mailto:cqueja@precisionlabs.net)
- 14<sup>A</sup> - Geotechnics (57 tests)  
J. P. Kline -- (412) 823-7600  
[JPkline@geotechnics.net](mailto:JPkline@geotechnics.net)
- 20<sup>A</sup> - GeoTesting Express, MA (46 tests)  
Gary Torosian -- (978) 635-0424  
[gtorosian@geotest.com](mailto:gtorosian@geotest.com)
- 22<sup>B</sup> - CETCO Hoffman Estates (13 tests)  
Jim Olsta -- (847) 392-5800  
[jim.olsta@cetco.com](mailto:jim.olsta@cetco.com)
- 23<sup>B</sup> - CETCO Cartersville (10 tests)  
Chris Cunningham -- (706) 337-5316

- 24<sup>B</sup> - [chris.cunningham@cetco.com](mailto:chris.cunningham@cetco.com)  
CETCO Lovell (10 tests)  
Roger Wilkerson -- (307) 548-6521  
[roger.wilkerson@cetco.com](mailto:roger.wilkerson@cetco.com)
- 25<sup>B</sup> - Ten Cate, Pendergrass (11 tests)  
Beth Wilbanks -- (706) 693-2226  
[beth\\_wilbanks@rtcusa.net](mailto:beth_wilbanks@rtcusa.net)
- 26<sup>B</sup> - Agru America Inc. (17 tests)  
Grant Palmer -- (843) 546-0600  
[gpalmer@agruamerica.com](mailto:gpalmer@agruamerica.com)
- 29<sup>E</sup> - FITI Testing and Research Institute (86 tests)  
Dong-Whan Kim -- 82-2-3299-8071  
[HKKim@fiti.com.re.kr](mailto:HKKim@fiti.com.re.kr)
- 31<sup>D</sup> - NYS Dept. of Transportation (9 tests)  
John Remmers -- (518) 457-4104  
[Jremmers@dot.state.ny.us](mailto:Jremmers@dot.state.ny.us)
- 32<sup>A</sup> - Geo-Logic Inc. (6 tests)  
Ken Criley -- (530) 272-2448  
[criley@geologic.com](mailto:criley@geologic.com)
- 34<sup>B</sup> - GSE Richey Road (34 tests)  
Jane Allen -- (281) 230-6726  
[Jallen@gseworld.com](mailto:Jallen@gseworld.com)
- 37<sup>B</sup> - GSE Chile (21 tests)  
Mauricio Ossa -- 56-2 6010153  
[Mossa@gseworld.com](mailto:Mossa@gseworld.com)
- 38<sup>C</sup> - Sageos/CTT Group (91 tests)  
Eric Blond -- (450) 771-4608  
[eblond@groupecttgroup.com](mailto:eblond@groupecttgroup.com)
- 40<sup>B</sup> - GSE Lining Technology Inc. (17 tests)  
Vicki Parrott -- (843) 382-4603  
[Vparrott@gseworld.com](mailto:Vparrott@gseworld.com)
- 41<sup>A</sup> - SGI Testing Service, LLC (19 tests)  
Zehong Yuan -- (770) 931-8222  
[ZYuan@interactionspecialists.com](mailto:ZYuan@interactionspecialists.com)
- 42<sup>C</sup> - NPUST (GSI-Taiwan) (69 tests)  
Chiwan Wayne Hsieh -- 011-886-8-7740468  
[CWH@mail.npust.edu.tw](mailto:CWH@mail.npust.edu.tw)
- 43<sup>A</sup> - Ardaman & Associates (18 tests)  
George DeStafano -- (407) 855-3860  
[gdestafano@ardaman.com](mailto:gdestafano@ardaman.com)
- 44<sup>B</sup> - Fiber Web, Inc. (9 tests)  
Kim Cox -- (615) 847-7575  
[k.mcclain@fiberweb.com](mailto:k.mcclain@fiberweb.com)
- 45<sup>B</sup> - Ten Cate Malaysia SDN Bhd. (23 tests)  
C. P. Ng -- (603) 519 28568  
[cpng@tencate.com](mailto:cpng@tencate.com)
- 46<sup>B</sup> - TAG Environmental Inc. (13 tests)  
Colin Murphy -- (705) 725-1938  
[cmurphy@gseworld.com](mailto:cmurphy@gseworld.com)
- 47<sup>B</sup> - Syntec LLC (9 tests)  
Jeffrey Hicks -- (410) 327-1070  
[jhicks@synteccorp.com](mailto:jhicks@synteccorp.com)
- 49<sup>B</sup> - Engepol Geossinteticos (19 tests)  
Carolina Polomino -- (55) 11-4166 3001  
[Carolina@nortene.com.br](mailto:Carolina@nortene.com.br)
- 50<sup>B</sup> - ADS, Inc. Hamilton (7 tests)  
Terry McElfresh -- (513) 896-2065  
[mcelfresh@ads-pipe.com](mailto:mcelfresh@ads-pipe.com)
- 51<sup>B</sup> - Solmax International Inc. (20 tests)  
Simon Gilbert St. Pierre -- (450) 929-1234  
[simonGSP@solmax.com](mailto:simonGSP@solmax.com)
- 53<sup>B</sup> - Polytex Inquique (13 tests)  
Cristian Valdebenito -- 011 56 57 42 90 00  
[cvaldebenito@polytex.cl](mailto:cvaldebenito@polytex.cl)
- 54<sup>B</sup> - ADS, Inc. Finley (9 tests)  
David Gonso -- (419) 424-8377  
[davegonso@ads-pipe.com](mailto:davegonso@ads-pipe.com)
- 55<sup>B</sup> - Atarfil Geomembranes (20 tests)  
Iganacio Garcia Arroyo -- 34 958 439 278  
[larroyo@atarfil.com](mailto:larroyo@atarfil.com)
- 56<sup>B</sup> - Polytex Santiago (11 tests)  
Jamie Morales -- 56-2-627-2054  
[Jmorales@polytex.cl](mailto:Jmorales@polytex.cl)
- 57<sup>B</sup> - Ten Cate Cornelia (15 tests)  
Melissa Medlin -- (706) 778-9794  
[mmedlin@tencase.com](mailto:mmedlin@tencase.com)

- 58<sup>B</sup> - Propex Nashville (9 tests)  
Tim Smith -- (229) 686-5511  
[TimSmith@propexinc.com](mailto:TimSmith@propexinc.com)
- 59<sup>B</sup> - Firestone (9 Tests)  
Janie Simpson -- (864) 439-5641  
[SimpsonJanie@firestonebp.com](mailto:SimpsonJanie@firestonebp.com)
- 60<sup>B</sup> - Polytex Lima (11 tests)  
Elias Jurufe -- 51 16169393  
[Ejarufe@polytex.cl](mailto:Ejarufe@polytex.cl)
- 61<sup>B</sup> - Raven Industries (17 tests)  
Justin Norberg -- (605) 335-0288  
[Justin.Norberg@ravenind.com](mailto:Justin.Norberg@ravenind.com)
- 62<sup>B</sup> - Solmax International Asia (14 tests)  
Marie Andre Fortin -- (450) 929-1234  
[MarieAF@solmax.com](mailto:MarieAF@solmax.com)
- 63<sup>A</sup> - TRI Environmental, Inc.; DDRF (4 tests)  
Joel Sprague -- (864) 242-2220  
[JSprague@tri-env.com](mailto:JSprague@tri-env.com)
- 64<sup>B</sup> - Agru America (NV) (14 tests)  
Chris Adams -- (775) 835-8282  
[cadams@agruamerica.com](mailto:cadams@agruamerica.com)
- 65<sup>C</sup> - Bombay Textile Rsearch Assoc. (BTRA) (24 tests)  
Riyaz Shaikh  
(0) 022-25003551  
[btra@vsnl.com](mailto:btra@vsnl.com)
- 66<sup>B</sup> - Rowad International Geosynthetics Co. Ltd (14 tests)  
Asad Ullah Khan -- +966-3-812-1360  
[usad@rowadplastic.com](mailto:usad@rowadplastic.com)
- 67<sup>A</sup> - MicroBac Hauser Division (8 tests)  
Steve Ferry -- (720) 406-4806  
[steveferry@microbac.com](mailto:steveferry@microbac.com)
- 68<sup>B</sup> - Glen Raven Technical Fabrics LLC (3 tests)  
Edmund Gant -- (336) 229-5576  
[dseagraves@glenraven.com](mailto:dseagraves@glenraven.com)
- 69<sup>B</sup> - GSE Lining Technology Co. Ltd. (12 tests)  
Siriporn Chayaporenlerit -- 6638-636638  
[siripornc@gseworld.com](mailto:siripornc@gseworld.com)
- 70<sup>A</sup> - RSA Geo Lab LLC (48 tests)  
Raza Ahmed -- (908) 964-0786  
[www.rsaglobal.com](http://www.rsaglobal.com)
- 71<sup>B</sup> - Plásticos Agrícolas y Geomembranas S.A.C. (14 tests)  
Cesar Augusto -- 6370 (20 110811)  
[asistentecalidad1@pqa.com.co](mailto:asistentecalidad1@pqa.com.co)

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

If you desire more information on the GAI-LAP, its test methods, and the associated laboratories, a directory is published annually in December of each year. It is available on GSI's home page at <http://www.geosynthetic-institute.org> (Accreditation).

*George R. Koerner*

## Activities within GCI (Certification)

GSI now has two separate inspector certification programs. One (begun in 2006) is focused on QA/QC of field inspection of waste containment geosynthetics and compacted clay liners. The other (begun on Dec. 1, 2011) is focused on MSE Wall, Berm and Slope field inspection. See our website at [www.geosynthetic-institute.org](http://www.geosynthetic-institute.org) under "certification" for a description and information on both of them. They are both similar in that a perspective candidate must...

- Be recommended by a professional engineer who knows, and can attest to, at least six months of acceptable experience performing CQA activities with either geosynthetic liner or cover systems or MSE walls, berms, or slopes using geosynthetic reinforcement.
- Submit a completed application and be approved by the Geosynthetic Certification Institute to take the exam.
- Must successfully pass a written examination (70% of the questions is the passing grade) proctored by GCI or a GCI designated organization and graded by the Geosynthetic Certification Institute to become a certified inspector.
- Must pay a one-time fee which covers a five-year period upon completion of the above items. The fee is \$500 for five-years of certification.

### Program #1 - Inspection of Liner Systems for Waste Containment Facilities

This program now in its sixth year has been received, and in some cases required, by solid waste owners, state regulators, and design consultants for proper QCA in field installation of both geosynthetic materials and compacted clay liners. The statistics to date are as follows.

#### Inspector Certification Test Results 2006 – 2012

Year	Geosynthetic Materials		Compacted Clay Liners		Commentary No. of people failing both exams
	No. of people taking exam	No. of people failing exam	No. of people taking exam	No. of people failing exam	
2006	141	5 (3%)	128	12 (9%)	2 (1.5%)
2007	82	11 (13%)	73	12 (16%)	7 (8.5%)
2008	95	25 (26%)	89	20 (22%)	13 (14%)
2009	36	7 (19%)	36	2 (5%)	2 (6%)
2010	59	12 (20%)	54	7 (13%)	5 (8%)
2011	54	6 (11%)	53	3 (6%)	1 (2%)
2012	4	0	4	0	0
<b>TOTAL (to date)</b>	<b>471</b>	<b>66 (14%)</b>	<b>437</b>	<b>55 (12.5%)</b>	<b>30 (6%)</b>

The 5-year renewal period for those having taken the exam in 2006 is at present and about 60% have renewed accordingly. This is felt to be encouraging from our perspective.

### Program #2 - Inspection of MSE Walls, Berms and Slopes

The official launch of the program was on December 1, 2011 with a course and the examination afterward. More recently a somewhat revised second course on June 14, 2012 was well received. As a result there are now twelve persons certified by GCI for the inspection of MSE Walls, Berms and Slopes.

This one-day course and an examination were developed by GSI and reviewed by a steering committee consisting of the following individuals:

- Kent von Maubeuge – NAUE Group
- Mohammed Karim – Virginia DEQ
- Bob Sabanas – NTH Consultants
- John Conturo and Maria Tanase – AECOM, Inc.
- John Lostumbo – TenCate Geosynthetics
- Mike Yako – GEI Consultants
- Steve Poirier – Geosyntec Consultants
- Willie Liew – Tensar International
- Doug Clark – CEC Consultants
- Dick Stulgis – Geocomp, Inc.
- Frank Adams, Paul Whitty, Rafael Ospina – Golder Associates
- Daniel Alzamora - FHWA
- Sam Allen – TRI Environmental Inc.
- Greg Cekander – Waste Management Inc.
- Greg Fedak – CETCO Contracting Services

Our thanks go to them in this regard.

While a field inspector cannot require proper design or instruct a contractor how to build the wall, flaws can be identified for possible design modification or mitigation action. Furthermore, and at minimum, construction practices can be observed and corrected if inadequate or improper. Please contact George Koerner at [gkoerner@dca.net](mailto:gkoerner@dca.net) or Jamie Koerner at [jrkoerner@verizon.net](mailto:jrkoerner@verizon.net) for questions or additional information.

## 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 Dean of the R & D Office. 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 59 geosynthetic test methods. Dr. Hsieh has 10-students working on geosynthetic-related projects and is extremely active nationally and internationally. GSI Taiwan has hosted three very successful internal conferences to date and has also held a much broader one, namely, GSI-Asia in Taichung, Taiwan.

## Items of Interest

### 1. Biggest Time Wasters at Work

ADSC's magazine *Foundation Drilling* has many quirky articles. This one states the obvious... "It is impossible to make time, save time, or find time. Each of us are gifted with the exact same number of minutes to use each day: 1440, to be exact. The only way to reach our goals is to use the time we are allotted differently, or to not waste the time we have been given."

They then list the major time wasters...

- Surfing the Internet
- Socializing with Co-Worker
- E-mail Addiction
- Meetings
- Multitasking
- Conducting Personal Business

### 2. Self-Healing Plastics (Popular-Science Magazine)

A team from UC-San Diego realized the self-repairing process using hydrogels, which are semisolid gummy materials made up of chains of



hydrophilic polymer molecules. They found that the key to making hydrogels self-healing was to devise a means by which polymer chains that had been cut could find and latch onto one another. the researchers made that happen by creating what they call dangling side chain molecules. These extend from the main structure, giving a damaged chain something to grasp. Using computer simulations, the team found that the length of these dangling side chains is crucial to the hydrogel's ability to self-heal and that the ability is a function of length. Moreover, they found that the strength of the self-healed bond can be manipulated by the pH level of the environment.

**3. Civil Engineering Salaries (CE Magazine, March 2012)**

Title	2008	2009	2010	2011
<b>Northeast &amp; South Atlantic Region</b>				
Entry level	\$50,400	\$51,453	\$50,500	\$51,945
Project engineer	\$64,886	\$65,423	\$64,500	\$66,312
Project manager	\$81,761	\$83,448	\$86,738	\$85,964
Department manager	\$109,489	\$110,669	\$101,581	\$105,768
Principal	\$131,918	\$132,590	\$128,419	\$136,744
<b>Central Region</b>				
Entry level	\$47,810	\$47,754	\$50,170	\$50,357
Project engineer	\$63,805	\$62,764	\$63,731	\$63,000
Project manager	\$79,209	\$79,532	\$83,267	\$80,621
Department manager	\$94,789	\$94,088	\$100,000	\$97,000
Principal	\$114,750	\$116,570	\$127,250	\$120,500
<b>Mountain &amp; Pacific Region</b>				
Entry level	\$54,078	\$53,585	\$51,500	\$56,820
Project engineer	\$71,097	\$70,575	\$67,000	\$72,206
Project manager	\$88,770	\$89,246	\$87,544	\$92,000
Department manager	\$104,920	\$104,011	\$105,000	\$110,000
Principal	\$127,374	\$131,751	\$130,182	\$132,080

**Recap of GRI White Paper #22 on “Geosynthetic Opportunities Associated with Energy Production and Transmission”**

Introduction

In subdividing the many application areas of geosynthetics one usually focuses on transportation, geotechnical, geoenvironmental, hydraulics and smaller areas such as mining, agriculture, aquaculture, etc. An added and seldomly discussed application area, however, is to consider primary energy sources and then investigate the various geosynthetic opportunities in each specific source area. This particular approach is taken in this white paper stimulated largely by the present intense activity in shale gas plays.

The present worldwide energy situation is given in Figure 1 wherein the traditional source types are oil, coal, gas, hydro and nuclear representing 95% of the total. Within the recent renewables are wind power, solar energy, biomass, biofuel and geothermal sources. The projection of these individual fuel types out to 2035 is shown in Figure 2.

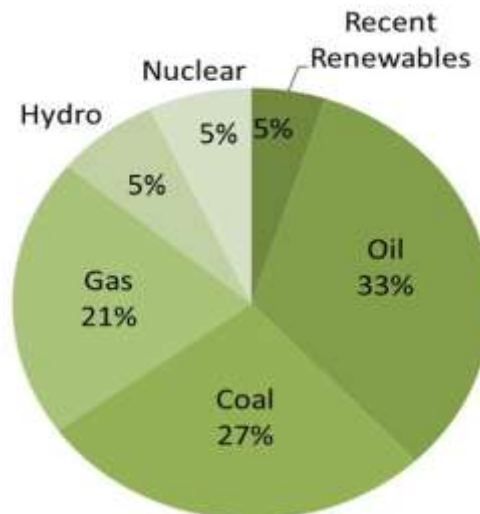


Figure 1. Energy sources in the world (compl. IEA-Wikipedia).

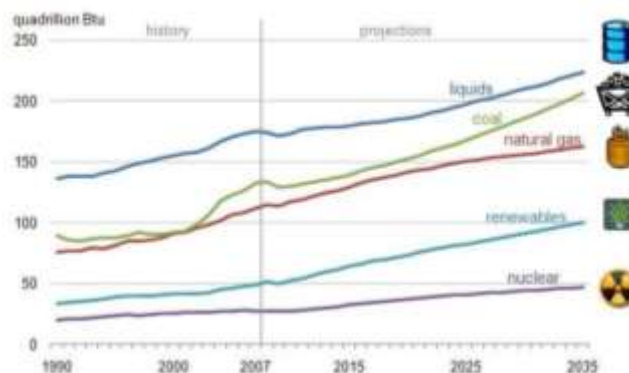


Figure 2. Worldwide primary energy use by fuel type. Source: U.S. Energy Information Administration Report #: DOE/EIA-0484 (2010)

Using this global picture as background information, this white paper addresses the major geosynthetic opportunities (present and possibly future) within the various individual energy sources.

Some commentary on each of the fuel types that are elaborated upon in the White Paper with respect to geosynthetic applications are as follows:

Regarding “oil”, major opportunities are in secondary containment of storage tanks, paved and unpaved access roads, plastic pipe and final covers for oil sands and other waste materials.

Regarding “coal”, major opportunities are in MSE walls and slopes for containment of coal combustion

residuals, mine safety nets, paved and unpaved roads and environmental contamination control.

Regarding “natural gas”, shale gas is the major focus wherein in liners for fresh water, production/frack water and well cuttings are required, working mats for the well area, MSE walls and slopes for leveling sites, plastic piping and environmental contamination controls.

Regarding “hydroelectricity”, liners for dam, canal, reservoir and tunnel waterproofing, paved and unpaved roads for access and plastic pipe are all required.

Regarding “nuclear power”, covers for low level radioactive waste and uranium mill tailings are major applications along with liners for vertical cutoff walls and to line disposal boxes.

Regarding “renewable energy”, paved and unpaved access roads are critical along with geotextile and geogrid foundation stabilization, MSE walls and slopes and environmental control systems are the major applications.

In summarizing these major applications, which are elaborated upon in the White Paper, Table 1 applies.

Table 1. Major Geosynthetic Application Areas as Applies to Various Energy Sources

Geosynthetic Application	Oil	Coal	Nat. Gas	Hydro	Nuclear	Renewals
Pond Liners			√	√		
Waterproofing liners	√		√	√		
Contamination barriers	√		√		√	
Landfill liners			√		√	
Final covers	√				√	
Paved roads	√	√	√	√	√	√
Unpaved roads	√	√	√	√	√	√
Temporary roads	√		√	√		√
Foundation support						√
MSE walls and slopes		√	√			√
Safety systems	√	√				
Drainage materials			√		√	
Protection materials		√	√			
Erosion control		√	√		√	√
Plastic pipe	√	√	√			

While there are indeed additional geosynthetic applications that can be envisioned, these are the major areas we have seen to date. In this regard, we should be championing our geosynthetic case histories, materials durability, long term performance,

benefit/cost advantages, sustainability enhancement, innovative uses and solutions. We have an outstanding chance to exchange knowledge and experiences of successful utilization of geosynthetics throughout every segment of the energy source landscape.

*Bob & George Koerner*

## Upcoming GSI Events

- ASCE Webinars  
June 25 – MSE Walls, Berms and Slopes  
July 16 – Geosynthetic Overview
- October 24-26, 2012  
26<sup>th</sup> Central PA Geotech Conf.  
Hershey, Pennsylvania  
Contact: [cbeenenga@gfnet.com](mailto:cbeenenga@gfnet.com)
- September 12, 2012  
Shale Gas and Geosynthetics  
Tyson’s Corner, VA  
Contact: [vmerida@geostructures.com](mailto:vmerida@geostructures.com)
- GSI Courses in Folsom, PA
  1. MSE Wall Failures and Remediation  
November 28, 2012 and March 13, 2013
  2. Inspection of MSE Walls, Slopes and Berms  
November 29, 2012 and March 14, 2013  
(Optional exam follows)
  3. Waste Containment Liner and Cover Design  
December 5, 2012 and March 20, 2013
  4. QA/QC of Geosynthetics  
December 6, 2012 and March 21, 2013  
(Optional exam follows)  
Contact: [mvashley@verizon.net](mailto:mvashley@verizon.net)
- October 18, 2012  
GSE Technical Seminar  
Contact: [bramsey@gseworld.com](mailto:bramsey@gseworld.com)
- March 3-6, 2013  
GeoCongress 2013  
San Diego, CA  
Contact: [www.asce.org/conferences](http://www.asce.org/conferences)
- April 2-4, 2013  
Geosynthetics 2013 and GRI-25  
Long Beach, CA  
contact: [www.ifai.com/conferences](http://www.ifai.com/conferences)

## 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. **Our newest members are ThermaGreen with Tim Walter/Blu Alexander/Ken vander Velden, Milliken & Co. with Randy Kohlman, Maccaferri with Massimo Ciarla and Pietro Rimoldi, and Jones and Wagener (Pty) Ltd. with Anton Bain as contact persons. Thanks to all and welcome to GSI.**

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*Vahe Hovsepian*

**Oak Ridge National Laboratory**

**(c/o Savannah River Remediation LLC)**

*Amit Shyam*

**IN THE NEXT ISSUE**

- Activities of the GSI Directors and Board
- Overview of GRI (Research) Projects
- Activities within GII (Information)
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- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- The GSI Centers-of-Excellence
- Items of Interest
- "The Status of Rolled Erosion Control Materials Generic Specifications"
- GSI's Member Organizations