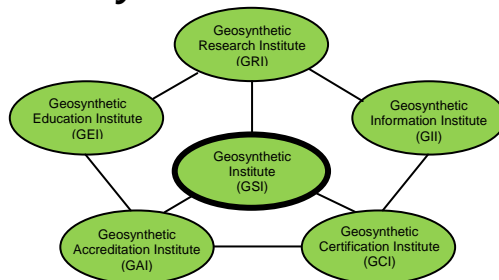


# The GSI Newsletter/Report

## Geosynthetic Institute



Vol. 27, No. 4

December, 2013

This quarterly newsletter, now in its 27<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).

*Happy Holidays and a Healthy  
and Prosperous New Year*

## Activities of GSI's Directors and Officers

1. Regarding GSI Webinars we have an agreement with Geosynthetic (through their affiliate Minerva) to record and market a group of twelve. This parallels our agreement with the American Society of Civil Engineers to do the same with twelve different ones. As such, anyone can have access at any time and location. ASCE calls them "On-Demand Videos". Incidentally, 1.5 professional development hours (PDH's) are associated with each of them.
2. We have been quite active with preparing new test methods, specifications and practices. There are six of them in the review process.
3. Requests-for-Proposals (RFP's) are out for GSI Fellows for the 2014-'15 academic year. They have been sent to nine magazines and Jamie Koerner will send a copy to all of you. If you know of students who fit the requirements do forward the RFP's to them accordingly.
4. Elections for the GSI Board of Directors are in progress for government agencies, resin/additive producers and one (of two) international members.
5. The present BoD is as follows, along with their respective term ending years. Don't hesitate to contact any them or the GSI officers.

### Term Ends 2013 (currently being balloted)

- 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)

### Term Ends 2014

- Mark Sieracke - Weaver Boos (Consultants and Testing Labs)  
e-mail: [msieracke@weaverboos.com](mailto:msieracke@weaverboos.com)
- Boyd Ramsey - GSE (Geomembranes and GCLs)  
email: [bramsey@qseworld.com](mailto:bramsey@qseworld.com)
- Wayne Hsieh - NPUST and GSI-Taiwan (International-2)  
e-mail: [cwh@mail.npust.edu.tw](mailto:cwh@mail.npust.edu.tw)

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- Upcoming GSI Events
- GSI's Member Organizations

## Term Ends 2015

- John Workman - Waste Management Inc. (Owners and Operators)  
e-mail: [jworkman@wm.com](mailto:jworkman@wm.com)
- Mark Wayne – Tensar Earth Technology (Geotextiles and Geogrids)  
e-mail: [mwayne@tensarcorp.com](mailto:mwayne@tensarcorp.com)
- Sam Allen – TRI Environmental Inc. (At-Large)  
e-mail: [Sallen@tri-env.com](mailto:Sallen@tri-env.com)

## **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, Professor of Civil Engineering at Drexel University 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 email <[grace.hsuan@coe.drexel.edu](mailto:grace.hsuan@coe.drexel.edu)> or phone at (610) 522-8440.

**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 17<sup>th</sup>-year and has resulted in an extremely authoritative set of real-life data which is being used by many in their geomembrane lifetime predictions.
- 2. Flow Behavior of Innovative Leachate Collection and Removal Systems (LCRS's)** – Several new geocomposite drainage systems are being compared to traditional geonet composites. The project is just now beginning and will be a multi-year effort.
- 3. Flow Behavior of Fully Degraded Waste\*** - This is a field project on investigating 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 presentation was given at the 2012 Global Waste Conference in Phoenix... a paper will follow.
- 4. Field Exposed Lifetime of Geogrids Used at the Facing of 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 is presently investigating two different geogrid's 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 #8 below.
- 5. Field Behavior of CSPE-R Geomembranes** – Scrim reinforced chlorosulphonated polyethylene geomembranes have a long and quite successful use under the trade name Hypalon®. The resin producer, DuPont ceased production in the U.S. and this void has been taken up by several international companies. As such, we have recently been evaluating its field behavior and have just issued a GRI Specification as GRI-GM28 ([www.geosynthetic-institute.org/specs.htm](http://www.geosynthetic-institute.org/specs.htm)).
- 6. Laboratory Exposed Lifetime 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 70,000 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.
- 7. Laboratory 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 dedicated UV-fluorescent devices and the results are very impressive.

The study is being conducted for CARPI Tech, a GSI member organization. (Note that the exposure and lifetime prediction of North American produced PVC GMs has been concluded).

8. **Laboratory Exposed Lifetime of Geogrids** - The UV-fluorescent exposure of two different polypropylene biaxial geogrids which are used at the exposed faces of welded wire mesh MSE structures is ongoing. The various geogrids are now up to 40,000 light hours and data is being generated and sent to the respective manufacturers; Tensar and TenCate. 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.
9. **Laboratory Exposed Lifetime of TRM Fibers** - We are also using UV-fluorescent exposure of four different turf reinforcement mat fibers to assess their lifetime capabilities. They have been incubated at 60°C, 70°C and 80°C. A final report to the manufacturer has just been produced.
10. **Laboratory Exposed Lifetime of Geotextiles** - We have 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. This study of other exposed geotextile lifetimes has been extended to include a lightweight needle-punched nonwoven. Its lifetime, as expected, is much shorter. The third geotextile is a woven slit film and it is almost finished. A woven monofilament GT will conclude the series. Results will appear in about six months in a GSI Report.
11. **Retaining Wall Failure Evaluations\*** - We presently have GSI Reports 38, 39, and 40 addressing mechanical stabilized earth (MSE) walls using geosynthetic reinforcement which document 82-failures. Our data base grew to 141, then 171, and now (thanks to Rick Valentine) 224. *Readers, we have a very serious situation in this regard!* 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 a field inspectors certification program; see the certification section of this Newsletter/Report. We have just recently presented the findings at two geotechnical conferences; one in Williamsburg and the other in Hershey. A paper has just been published by the Journal of Geotextiles and Geomembranes. Copies are available.
12. **pH Between Masonry Block Wall Units\*** - George Koerner has been measuring the pH between three types of masonry blocks for over six years to monitor the values. Concern here is over PET geogrids which are known to be sensitive to high alkalinity environments. Indeed, the values started high, but over time are now down to eight and lower. George Koerner has a paper in this regard.
13. **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 using the ReSSA Code and are now available to members and associate members as GRI Report #41. The latest failure in this regard is in Easton, Pennsylvania. It is under investigation presently.
14. **Slow Pressurization of HDPE Geomembranes in Axi-Symmetric Testing\*** - The ASTM D5716 method of testing geomembranes in a 3-D axis-symmetric mode uses a pressure rate of 6.9 kPa/min (1.0 psi/min). While such a rate is reasonable for most geomembrane types, it is questionable for HDPE which is semi-crystalline and cannot readily stress relax. To investigate slower rates we have initiated a new project with rates as low as 6.9 kPa/month (1.0 psi/month)! The last test, just now begun, is at a rate of 6.9 kPa/six months (1.0 psi/six months) and it will take about five years to conclude.
15. **CaCO<sub>3</sub> in Bentonites 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 has a paper in progress.
16. **Shrinkage of GCLs Under Wet/Dry Cycling** - George Koerner has been evaluating shrinkage of various GCLs in boxes on the overhead roof of GSI. The study is on behalf of one of our members.
17. **Temperature Behavior Under Different Geosynthetic Layers** - Since exposed lifetime of geosynthetics is influenced by sunlight the lifetime of layers directly beneath the uppermost one (heat only, but no sunlight) is of interest. George Koerner has set up such a scenario on behalf of one of our members.
18. **Generic Specifications** - A major continuing effort is ongoing with respect to the development and maintenance of GRI's generic geosynthetic specifications. The current status of these specifications is as follows:  
  
Completed, Available 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  
GM28 – CSPE-R Geomembranes  
GT10 – Geotextile Tubes  
GT12 – Geotextile Cushions  
GT13 – Geotextile Separators  
GCL3 – Geosynthetic Clay Liners  
GS15 – Geocells

#### Working Within Focus Group

GTXX – Turf Reinforcement Mats (tabled)  
GMXX – Coated Slit Film Geotextiles

#### 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.

**19. Other GRI Standards** - There are several GRI Standards in various forms of preparation. These include the following:

- A practice on field seaming inspection emphasizing the electrical leak location system (ELLS).
- Three standards on GCL joining so as to prevent/monitor panel separation.
- A specification on coated geotextile membranes.
- A practice explaining the use of MARV for geotextiles

## **Progress within GII (Information)**

Our GSI Home Page is accessed as follows:

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

It has been 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             | • Product Certification |
| • Prospectus                      | • Newsletter/Reports    |
| • Associate Membership (Agencies) | • Internet Courses      |
| • Members by Focus Groups         | • GSI Members Links     |
| • GSI Publications                | • GSI Member Meetings   |
| • GRI Specs, Guides, White Papers | • Courses at GSI        |
| • Laboratory Accreditation        | • Insp. Cert. Programs  |

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 available. This includes:

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

The Keywords Section contains about 35,000 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 (for the concept please read the writeup on pg. 11-12 in this Newsletter/Report); the following being the most recent.

- #26 - Need for Justification of Quality Management Systems for Successful GS Performance
- #27 - The Intimate Contact Issues of Field Placed Geomembranes With Respect to Wave (or Wrinkle) Management
- #28 - Cold Temperature and Freeze-Thaw Cycling of Geomembranes and Their Seams

Jamie's most recent survey is a retrospective review of the 136 faculty which participated in the Educate-the-Educators week-long courses at Auburn University from 1994-1998. Do ask for a copy if interested.

## **Progress within GEI (Education)**

#### Free CD

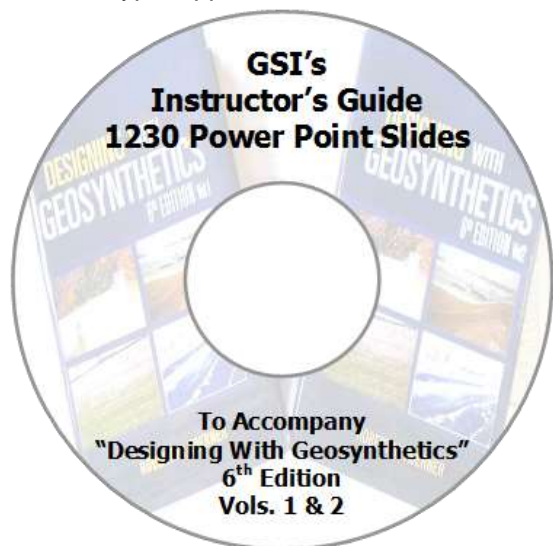
We sent a broadcast e-mail to everyone stating that many power point presentations were available and would be sent upon request. Many persons replied asking for all of them. Therefore, we put all 63 presentations on a CD which was sent to all GSI contact persons. That said, we have many copies still 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**

The 6<sup>th</sup> Edition of Designing With Geosynthetics continues to sell well in all three of its formats; hardback, softback and e-book... the latter is really cheap; i.e., \$3.50 for each volume! The two volume set can be purchased through GSI, Xlibris, Amazon and Barnes and Noble. A special link is available on the cover page of our website. To date and after six quarters (1.5 years) since publication we have sold the following units. All proceeds go to GSI.

Volume 1 (GS, GT, GG and GN)	
hardback	417
softback	423
e-book	259
Volume 2 (GM, GCL, GF and GC)	
hardback	392
softback	436
e-book	237

Our most recent activity in this regard is to develop a power point presentation for the entire 914-page book. This is what it looks like and it does indeed contain 1230 nonencrypted ppt slides.



Call or e-mail if you want a copy. It is free to all, but we need your postal address.

## **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:

- #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 re-scheduled the following two courses here at GSI. They are as follows.

- #1 March 13, 2014  
QA/QC of Geosynthetics in Waste Containment Systems  
(Optional Exam Follows)
- #2 March 14, 2013  
Construction Inspection of MSE Walls, Berms and Slopes  
(Optional Exam Follows)

Each course carries with it 8 PDH's. All are held at GSI so demonstrations by George enliven and illustrate the respective lectures. GSI is approximately 4.5 miles from Philadelphia 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))

## **Webinars**

**(Second Wednesday of Every Month)**

**11:30 AM – 1:00 PM (Eastern Time Zone)**

**Registration at**

**[www.geosynthetic-institute.org/webinar.htm](http://www.geosynthetic-institute.org/webinar.htm)**

**1.5 Professional Development Hours; Cost \$250**

- W8 – January 8, 2014 “Lifetime Prediction of Exposed and Nonexposed Geosynthetics”
- W9 – February 12, 2014 “Landfill Failures”
- W10 – March 12, 2014 “Landfill Bioreactors”
- W11 – April 9, 2014 “Lateral and Vertical Expansions”
- W12 – May 14, 2014 “Beneficial Uses of Closed Landfills”
- W1 – June 11, 2014 “MSE Wall Failures Data Base”
- W2 – July 9, 2014 “MSE Wall Back Drainage Design”
- W3 – August 13, 2014 “MSE Wall Remediation”
- W4 – September 10, 2014 “MSE Wall Inspection”
- W5 – October 8, 2014 “GSs in Hydraulic Applications”
- W6 – November 12, 2014 “GSs in Heap Leach Mining”
- W7 – December 10, 2014 “GSs in Agriculture”

Note: These webinars are recorded and are available “on-demand” anytime and anyplace

## More Webinars

11:30 AM – 1:00 PM (Eastern Time Zone)  
 Registration at [www.asce.org/webinars](http://www.asce.org/webinars)  
 1.5 Professional Development Hours; Cost \$400

- ASCE 1 – January 14, 2014 “Geomembranes for Surface Impoundments”  
 2 – February 26, 2014 “Geosynthetic in Paved and Unpaved Roads”  
 3 – March 19, 2014 “Geosynthetic Reinforced MSE Walls”

## 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 their immediate future)
- Students must be recommended by their advisor or department head.

The fellowships can be renewed for a 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. Please note Item #3 on “Activities of GSI’s Directors and Officers” in this Newsletter/Report.

## GSI Fellowship Status for 2012-‘13 Academic Year

### Class 4 (a) – 2<sup>nd</sup> Year Funding at \$5,000 per student

No.	Name	University	Advisor	Topic
3-11	Felix Jacobs	RWTU-Aachen, Germany	Martin Ziegler	Geogrid Reinforced Soil in Biaxial Compression Tests
4-11	Mahmound Khachan	Syracuse University	Shobha Bhatia	Dewatering Performance of Geotextile Tubes

### Class 5 (a) – 1<sup>st</sup> Year Funding at \$10,000 per student

No.	Name	University	Advisor	Topic
1-12	Chuangi Wang	University of Memphis	David Arellano	Properties of Recycled Expanded Polystyrene
2-12	Xunchang Fei	University of Michigan	Dimitrois Zekkos	Biodegradation of Geotextiles
3-12	Jitendra K. Thakur	University of Kansas	Jie Han	Recycled Asphalt Used in Geocells

Note that proposals for the new class (our sixth year of the program) for the A.Y. 2013-'14 are presently being reviewed by the GSI Board of Directors.

## 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 ASTM, ISO or GRI test methods. 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 236 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of December, 2013, 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.

- <sup>1A</sup> - TRI/Environmental Inc. (135 tests)  
 Jarrett Nalson -- (512) 263-2101  
[Sallen@tri-env.com](mailto:Sallen@tri-env.com)
- <sup>3A</sup> - Golder Associates (45 tests)  
 David Alexander -- (770) 492-8280  
[dalexander@golder.com](mailto:dalexander@golder.com)
- <sup>4C</sup> - Geosynthetic Institute (116 tests)  
 George Koerner -- (610) 522-8440  
[gkoerner@dca.net](mailto:gkoerner@dca.net)

- 8<sup>B</sup> - Propex Operating Co., Ringgold (18 tests)  
Todd Nichols -- (800) 258-3121  
[todd.nichols@propexglobal.com](mailto:todd.nichols@propexglobal.com)
- 9<sup>B</sup> - Lumitec (16 tests)  
Rebecca Kurek -- (770) 869-1700  
[rpage@lumiteco.com](mailto:rpage@lumiteco.com)
- 13<sup>A</sup> - TRI Env. Inc. (97 tests)  
Cora Queja -- (714) 520-9631  
[cqueja@tri-env.com](mailto:cqueja@tri-env.com)
- 14<sup>A</sup> - Geotechnics (49 tests)  
J. P. Kline -- (412) 823-7600  
[JPkline@geotechnics.net](mailto:JPkline@geotechnics.net)
- 20<sup>A</sup> - GeoTesting Express, MA (47 tests)  
Gary Torosian -- (978) 635-0424  
[gtt@geotesting.com](mailto:gtt@geotesting.com)
- 22<sup>B</sup> - CETCO Hoffman Estates (13 tests)  
Barbara Gebka -- (847) 851-1500  
[jim.olsta@cetco.com](mailto:jim.olsta@cetco.com)
- 24<sup>B</sup> - 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 (12 tests)  
Beth Wilbanks -- (706) 693-2226  
[b.wilbanks@tencate.com](mailto:b.wilbanks@tencate.com)
- 26<sup>B</sup> - Agru America Inc. (20 tests)  
Grant Palmer -- (843) 546-0600  
[gp@agruamerica.com](mailto:gp@agruamerica.com)
- 29<sup>E</sup> - FITI Testing and Research Institute (68 tests)  
Hong-Kwan Kim -- 82-2-3299-8071  
[hoganKim@fiti.re.kr](mailto:hoganKim@fiti.re.kr)
- 31<sup>D</sup> - NYS Dept. of Transportation (9 tests)  
Tom Burnett -- (518) 457-4704  
[tburnett@dot.state.ny.us](mailto:tburnett@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 Environmental Richey Road (36 tests)  
Rich Schaefer -- (281) 230-6890  
[r.schaefer@gseworld.com](mailto:r.schaefer@gseworld.com)
- 37<sup>B</sup> - GSE Environmental Chile (19 tests)  
Mauricio Ossa -- 56-2 6010153  
[Mossa@gseworld.com](mailto:Mossa@gseworld.com)
- 38<sup>C</sup> - Sageos/CTT Group (103 tests)  
Eric Blond -- (450) 771-4608  
[eb blond@GCTTG.com](mailto:eb blond@GCTTG.com)
- 40<sup>B</sup> - GSE Environmental (14 tests)  
Bruce Pressley -- (843) 382-4603  
[bpressley@gseworld.com](mailto:bpressley@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) (61 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 (22 tests)  
George DeStafano -- (407) 855-3860  
[gdestafano@ardaman.com](mailto:gdestafano@ardaman.com)
- 44<sup>B</sup> - PGI and Fiber Web, Inc. (9 tests)  
Kim Thomas -- (615) 847-7155  
[Kim.Thomas@fiberweb.com](mailto:Kim.Thomas@fiberweb.com)
- 45<sup>B</sup> - Ten Cate Geosynthetics Malaysia SDN Bhd. (23 tests)  
Gan Wee Hunn -- (603) 519 28576  
[wh.gan@tencate.com](mailto:wh.gan@tencate.com)
- 46<sup>B</sup> - TAG Environmental Inc. (13 tests)  
Colin Murphy -- (705) 725-1938  
[colin\\_murphy@tagenv.com](mailto:colin_murphy@tagenv.com)
- 47<sup>B</sup> - GSE Syntec (10 tests)  
Andrew Barker -- (410) 327-1070  
[abarker@synteccorp.com](mailto:abarker@synteccorp.com)
- 49<sup>B</sup> - Engepol Geosinteticos (14 tests)  
Carolina Polomino -- (55) 51 3303-3916  
[carolina@engepol.com](mailto:carolina@engepol.com)
- 50<sup>B</sup> - ADS, Inc. Hamilton (7 tests)  
Terry McElfresh -- (513) 896-2065  
[terry.mcelfresh@ads-pipe.com](mailto:terry.mcelfresh@ads-pipe.com)
- 51<sup>B</sup> - Solmax International Inc. (22 tests)  
Simon Gilbert St. Pierre -- (450) 929-1234  
[simonGSP@solmax.com](mailto:simonGSP@solmax.com)
- 53<sup>B</sup> - Polytex Inquique (19 tests)  
Christian Valdebenito -- 011 56 57 42 90 00  
[cvaldebenito@polytex.cl](mailto:cvaldebenito@polytex.cl)
- 54<sup>B</sup> - ADS, Inc. Finley (10 tests)  
David Gonso -- (419) 424-8377  
[davegonso@ads-pipe.com](mailto:davegonso@ads-pipe.com)
- 55<sup>B</sup> - Atarfil Geomembranes (19 tests)  
Gabriel Martin Sevilla -- 34 958 439 200  
[gmartin@atarfil.com](mailto:gmartin@atarfil.com)
- 56<sup>B</sup> - Polytex Santiago (13 tests)  
Christian Valdebenito -- 56-2-627-2054  
[cvaldebenito@polytex.cl](mailto:cvaldebenito@polytex.cl)
- 57<sup>B</sup> - Ten Cate Cornelia (13 tests)  
Melissa Medlin -- (706) 778-9794  
[m.medlin@tencate.com](mailto:m.medlin@tencate.com)
- 58<sup>B</sup> - Propex Operating Co. Hazelhurst (16 tests)  
Tim Smith -- (229) 686-5511  
[Tim.Smith@propexglobal.com](mailto:Tim.Smith@propexglobal.com)  
[SimpsonJanie@firestone.com](mailto:SimpsonJanie@firestone.com)
- 60<sup>B</sup> - Polytex Lima (12 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)  
Teoh Pei Ching -- (450) 929-1234  
[pcteoh@solmax.com](mailto:pcteoh@solmax.com)
- 63<sup>A</sup> - TRI Environmental, Inc.; DDRF (5 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  
[ca@agruamerica.com](mailto:ca@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  
[asad@rowadplastic.com](mailto:asad@rowadplastic.com)
- 67<sup>A</sup> - MicroBac Hauser Division (10 tests)  
Heather Smalley -- (720) 406-4806  
[heather.smalley@microbac.com](mailto:heather.smalley@microbac.com)
- 68<sup>B</sup> - Glen Raven Technical Fabrics LLC (4 tests)  
Richard Greeson -- (336) 229-5576  
[rgreeson@glenraven.com](mailto:rgreeson@glenraven.com)
- 69<sup>B</sup> - GSE Environmental (12 tests)  
Siriporn Chayaporenlernt -- 6638-636638  
[Siripornc@gseworld.com](mailto:Siripornc@gseworld.com)
- 70<sup>A</sup> - RSA Geo Lab LLC (48 tests)  
Raza Ahmed -- (908) 964-0786  
[geolab13@yahoo.com](mailto:geolab13@yahoo.com)
- 71<sup>B</sup> - Plásticos Agrícolas y Geomembranas S.A.C. (15 tests)  
Jhoana Carolina Diaz Martinez -- 073-511814-511829  
[calidad@pqa.peru.com](mailto:calidad@pqa.peru.com)
- 72<sup>B</sup> - Tensar Corp. GA (5 tests)  
Mignon Kittler (770) 968-3255  
[mkittler@tensarcorp.com](mailto:mkittler@tensarcorp.com)
- 73<sup>B</sup> - Gai Loi JSE (9 tests)  
Paul Wong 84-650-362-5825  
[paul905677@gmail.com](mailto:paul905677@gmail.com)
- 74<sup>B</sup> - Agru America Inc.  
Mark Locklear (843) 221-4412  
[ml@agruamerica.com](mailto:ml@agruamerica.com)
- 75<sup>B</sup> - GeoMatrix S.A.S.  
Javier Diaz Cipagauta (571) 424-9999  
[jdiaz@geomatrix.com.co](mailto:jdiaz@geomatrix.com.co)
- 76<sup>B</sup> - Tehmco (Chile)  
Patricia Rojas Perez (562) 589-2800  
[projas@tehmco.cl](mailto:projas@tehmco.cl)

- 77<sup>B</sup> - PQA Mexico  
Cesar Augusto Arcila (669) 954-8202  
[calidadmexico@pga.com.co](mailto:calidadmexico@pga.com.co)
- 78<sup>B</sup> - Intertape Polymer Group (IPG)  
Boris Gourichon (902) 895-1686 ext. 1147  
[BGourich@itape.com](mailto:BGourich@itape.com)

<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).

The GAI-LAP proficiency test program would not function without samples to test. In this regard we like to thank the following organizations for their generous contribution of geosynthetics to this cause.

- ACF Environmental
- Propex Inc.
- TenCate Inc.
- GSE Lining Technology Inc.
- CETCO Inc.
- ADS Inc.
- NAUE

*George R. Koerner*

## Activities within GCI (Certification)

GSI presently has two separate inspector certification programs. One (began in 2006) is focused on QA/QC of field inspection of waste containment geosynthetics and compacted clay liners. The other (began 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 eighth year has been recommended, 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 – 2013

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	34	5 (15%)	28	3 (11%)	3 (9%)
2013	32	4 (12%)	30	1 (3%)	1
<b>TOTAL (to date)</b>	<b>533</b>	<b>75 (14%)</b>	<b>491</b>	<b>60 (12%)</b>	<b>34 (5%)</b>

The 5-year renewal period for those having taken the exam in 2009 is at present and about 60% have renewed accordingly. This is felt to be encouraging from our perspective.

Note that a GSI course on this topic will be offered on March 13, 2014 with the exam following directly.

## 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 course on November 29, 2012 was presented. There are now sixteen persons certified by GCI for the inspection of MSE Walls, Berms and Slopes.

This one-day course and subsequent 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.

Note that a GSI course on this topic will be offered on March 14, 2014 with the exam following directly.

## 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). It is presently in the transition of being held entirely within INHA University.

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. His active participation at conferences worldwide is very admirable. He has provided research and development in many geosynthetic subjects including geotextiles, geomembranes, geocells, additives for GCLs, recycled plastics for formulations, etc.

**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.

\*Both of these affiliated institutes are currently under re-organization. Details will be forthcoming.

## Items of Interest

### 1. A Major “Plug” for Distance Learning

“Lord knows there’s a lot of bad news in the world today to get you down, but there is one big thing happening that leaves me incredibly hopeful about the future, and that is the budding revolution in global online higher education. Nothing has more potential to lift more people out of poverty-by providing them an affordable education to get a job or improve in the job they have. Nothing has more potential to unlock a billion more brains to solve the world’s biggest problems. And nothing has more potential to enable us to reimagine higher education than the massive open online course, or MOOC, platforms that are being developed by the likes of Stanford and the Massachusetts Institute of Technology and companies like Coursera and Udacity.”

*Thomas L. Friedman*  
*“Revolution Hits the Universities”*  
*The New York Times – January 26, 2013*

### 2. Construction Industry Accounts for 37% U.S. Workplace Deaths

“According to the U.S. Department of Labor, the construction industry now accounts for the most U.S. workplace deaths thanks to a 5% increase in 2012.

With 775 fatal injuries in 2012, private construction rose to the top of all U.S. industries in the number of workplace deaths, according to preliminary data from the Bureau of Labor Statistics.

Deaths in the construction industry were up 5 percent from 2011, the first increase after five consecutive years of declines.

In 2011, construction was second to transportation and warehousing in fatal injuries. In 2012, transportation and warehousing fell behind construction with 677 deaths.”

(ref. *Foundation Drilling, Sept./Oct., 2013*)

### 3. House Passes Bill to Authorize State Permitting Programs for Coal Ash Facilities

“The recent passage of the House of legislation authorizing states to set up permitting programs for regulating the disposal of coal ash has sparked debate over whether the federal government or state governments should oversee facilities used to store the material, which is produced when power plants burn coal.

Introduced in early June by Representative David McKinley (R-West Virginia), the Coal Residuals Reuse and Management Act of 2013 (H.R. 2218) was passed by the House on July 25 by a vote of 265 to 155. The bill would amend the Resource Conservation and Recovery Act to authorize states to establish permitting programs for the management and disposal of ash, which is also referred to as coal combustion residuals. If not beneficially reused in wallboard, concrete, or other products, coal ash is typically stored in surface impoundments owned by electric utilities or disposed of in landfills. Under the bill, states choosing to establish permitting programs would be required to notify the U. S. Environmental Protection Agency (EPA) of their intent to do so. If a state opted not to set up a permitting program, the EPA would be required to implement the program for that state.

Within 36 months of the law’s enactment, states instituting permitting programs would be required to certify their compliance with certain requirements, some of which mandate the involvement of engineers. For example, state permitting programs would require that an independent registered professional perform the study.”

(ref. *Civil Engineering, October, 2013*)

### 4. Russia Invests in Highways

“Russia’s strong economic performance is leading to high levels of investment in the country’s infrastructure, with highways being one of the key sectors prioritized for development by the government.

Speaking at the opening of the new Western High-Speed Diameter toll road in St. Petersburg in August, President Vladimir Putin said: *A decision has been made to allocate EUR450 billion (USD 13.6 billion) from the National Welfare Fund to important infrastructural projects, plus we will increase private investment.*

Demand for better and safer roads is being driven by rising levels of car ownership and the urgent need to increase the efficiency of freight movements. By 2020, some 7,400 km of federal highways and 6,700 km of regional and municipal roads are to be built or reconstructed, with federal financing. As a result, the authorities and agencies responsible for the development and operation of Russia’s highways are seeking innovative solutions and applying best international practice to meet the many challenges they face.”

The second Exprotraffic exhibition will take place at Moscow’s VVC All-Russian Exhibition Centre from 14 to 16 May 2014.

## GSI’s Changing Landscape

Since its founding in 1986 as the Geosynthetic Research Institute (GRI) within Drexel University, the associated research activity gradually transitioned from federally funded projects (mainly via the U.S. Environmental, Transportation and Defense agencies) to consortium suggested projects that were of major interest to the members and their clients. This transition brought about the enlarged mandate from GRI to the Geosynthetic Institute (GSI) in 1991 with subinstitutes for research, education, information, accreditation and certification. It also necessitated our move in 1997 from Drexel’s campus to our present location in Folsom, Pennsylvania, very close to the Philadelphia International Airport. This location was fortunate since yet another change occurred in the nature of our membership. From essentially all U.S. based members we presently have a worldwide membership as follows:

• North America primarily	=	27 (45%)
• European primarily	=	10 (17%)
• South America primarily	=	5 (8%)
• Asian primarily	=	5 (8%)
• Africa primarily	=	2 (4%)
• International	=	11 (18%)
TOTAL	=	60 (100%)

(Note that there are an additional 18 state agency *associate members* which are all U.S. based that are not included in the above total.) This geographic membership change came about naturally (without any overt advertising) and followed the growth of geosynthetics from its North American and European roots to a worldwide technology. The implications of such worldwide activity, however, requires the very desirable normalization of the many segments of the technology. Some commentary on these individual segments follow.

Regarding geosynthetics manufacturing, the international growth appears *to us* to be almost seamless insofar as proper MQC/MQA is concerned. The various products are formulated, produced, and transported in a similar manner depending on the scope and diversity of the manufacturer. Regarding geosynthetic installation, best practices should be common across different countries but there is considerable “catch-up” for emerging countries that are just becoming accustomed to geosynthetics. Regarding geosynthetic regulations, the patterns set by the US-EPA and German-BAM have clearly set the tone for waste containment. However, other applications in transportation, geotechnics, hydraulics, mining, agriculture and aquaculture are largely unregulated except for niche markets like shale gas and coal combustion residuals. In this same regard, the issue of having prescribed regulations (rather than generalized performance regulations or none at all) is somewhat dicey and remains for a future discussion as to the pros-and-cons. Regarding geosynthetic design there is indeed worldwide uniformity. This is largely due to the borderless publication of books, journals, conference proceedings and now distance learning over the internet. Regarding geosynthetic testing the “big-two” (ASTM and ISO) have considerable work-to-do so as to normalize their respective activities. This refers not only to individual standards (test methods, practices or guides) but even to terminology. Regarding private and public owners dealing with geosynthetics, the landscape is extremely uneven. Waste containment facility owners are very aware of the nuances of geosynthetics, while many highway agencies and essentially all private developers still appear to struggle with even the fundamental basics. In the newer emerging areas of geosynthetics just mentioned, owners are only beginning with their exposure and knowledge of geosynthetics, e.g., they all seem to begin with asking “how long will the geosynthetic last?”

It is this last group, i.e., the private and public owners which can and should be involved with geosynthetics. In this regard, GSI sees itself making a major effort in providing to them geosynthetics knowledge and proper use. GSI publications will be forthcoming in “not-so-prestigious” publications such as owners trade magazines, owners newsletters, case histories to owners, webinars to owners, etc. In so doing we hope to be able to present to them all segments of the geosynthetics technology and also to do so in a fair and unbiased manner.

*Bob & George Koerner*

## Upcoming GSI Events

### GSI Webinars

(2<sup>nd</sup> Wednesday of Every Month – see following website)

Contact: [www.geosynthetic-institute.org/webinar.htm](http://www.geosynthetic-institute.org/webinar.htm)

### ASCE Webinars

(see following website)

Contact: [www.asce.org/webinars](http://www.asce.org/webinars)

### GSI Courses in Folsom, PA

#1 March 13, 2014

QA/QC of Geosynthetics in Waste Containment Systems

(Optional Exam Follows)

#2 March 14, 2014

Construction Inspection of MSE

Walls, Berms and Slopes

(Optional Exam Follows)

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

- January 28-30, 2014  
ASTM Committee D35 on Geosynthetics  
Hyatt Regency Houston  
Contact: [www.astm.org](http://www.astm.org)
- April 23-25, 2014  
Central PA-ASCE  
Hershey, PA  
Contact: [robert.koerner@coe.drexel.edu](mailto:robert.koerner@coe.drexel.edu)
- July 2014  
ASCE Shale Conference  
Pittsburgh, PA  
Contact: [www.asce.org/conferences](http://www.asce.org/conferences)
- September 21-25, 2014  
10<sup>th</sup> Intl. Geosynthetics Conf.  
Berlin, Germany  
Contact: [www.geosyntheticssociety.org](http://www.geosyntheticssociety.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. **Our newest members are ThermaGreen with Tim Walter/Blu Alexander/Ken vander Velden, Maccaferri with Massimo Ciarla and Pietro Rimoldi, and Jones and Wagener (Pty) Ltd. with Anton Bain, Ardaman & Assoc. with Nadim Fuleihan/Thomas S. Ingra/Jan Wildman and Tecnologia de Materiales (TDM) with José Ferreyros as contact persons. Thanks to all and welcome to GSI.**

**GSE Environmental**  
*Boyd Ramsey [BoD]/Aigen Zhao*  
**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/Tim Bauters*  
**Tensor International Corporation**  
*Mark H. Wayne [BoD]/Joseph Cavanaugh*  
**Colbond Geosynthetics**  
*Richard Goodrum*  
**Geosyntec Consultants**  
*Steve Poirier*  
**LyondellBasell Industries**  
*Fabio Ceccarani/Rob Olivero*  
**TenCate Geosynthetics**  
*John Henderson/Chris Lawson*  
**CETCO**  
*Chris Athanassopoulos/James T. Olsta*  
**Huesker, Inc.**  
*Steven Lothspeich/Dimiter Alexiew*  
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*Kent von Maubeuge [BoD]*  
**Propex**  
*Andy Burran/Judith Mulcay*  
**Polymer Group Inc.**  
*Brian H. Whitaker*  
**NTH Consultants, Ltd.**  
*Rick Burns*  
**TRI/Environmental Inc.**  
*Sam R. Allen [BoD]/Joel Sprague*  
**U. S. Army Corps of Engineers**  
*David L. Jaros [BoD]*  
**Chevron Phillips Co.**  
*Lili Cui [BoD]*  
**URS Corp.**  
*John Volk/Ron Hager*  
**Solmax Géosynthétiques**  
*Robert Denis/Guy Elie/Daniel Tan Su Ming*  
**Envirosource Technologies, Inc.**  
*Douglas E. Roberts*  
**CARPI, Inc.**  
*Alberto M. Scuero/John A. Wilkes*  
**Civil & Environmental Consultants, Inc.**  
*Tony Eith/Daniel Tolmer*  
**Agri America, Inc.**  
*Paul W. Barker/Markus Haager/Nathan Ivy*  
**Firestone Specialty Products**  
*Bill Tippins/Christa K. Petzke*  
**FITI (GSI-Korea)**  
*Jeonhyo Kim/H.-Y. Jeon*  
**Waste Management Inc.**  
*Greg Cekander/John Workman [BoD]*  
**NPUST (GSI-Taiwan)**  
*Chiwan Wayne Hsieh [BoD]*

**GeoComp/GeoTesting Express**  
*W. Allen Marr/Richard P. Stulgis*  
**GEI Consultants**  
*Michael A. Yako*  
**GSE Chile, S.A.**  
*Mauricio Ossa*  
**Atarfil, S. L.**  
*Mario Garcia Girones/Emilio Carreras Torres*  
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**GSE Europe**  
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**Intertape Polymer Group**  
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*Pascal Saunier*  
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*Edgar Chow*  
**In-Line Plastics/GeoProducts**  
*Mark Williams/Marlyn Waltner*  
**Bombay Textile Research Institute**  
*A. N. Desai*  
**Watershed Geosynthetics LLC**  
*Michael Ayers*  
**ThermaGreen**  
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**Maccaferri**  
*Massimo Ciarla/Pietro Rimoldi*  
**Jones & Wagener (Pty) Ltd.**  
*Anton Bain*  
**Ardaman & Assoc.**  
*Nadim Fuleihan/Thomas S. Ingra/Jan Wildman*  
**Tecnologia de Materials (TDM)**  
*José Ferreyros*

## **ASSOCIATE MEMBERS**

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*Anne Germain*

**Nebraska Department of Environmental Quality**

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

*Robert J. Phaneuf*

**Maine Department of Environmental Protection**

*David E. Burns*

**New York State Department of Transportation**

*Robert Burnett/James Curtis*

**California Water Resource Control Board**

*Leslie Graves/Nadine Langley*

**New Jersey Dept. of Environmental Protection**

*Michael J. Burlingame*

**Pennsylvania Dept. of Environmental Protection**

*Steve Socash*

**Florida Dept. of Environmental Protection**

*Richard B. Tedder*

**U.S. Bureau of Reclamation**

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**Michigan Dept. of Environmental Quality**

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**Florida Dept. of Transportation**

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**National Design, Construction & Soil Mechanics Center**

*Stephen D. Reinsch*

**Virginia Dept. of Environmental Quality**

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*Paul Emond*

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**Oak Ridge National Laboratory**

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

*Amit Shyam*

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- The GSI Centers-of-Excellence
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- "Commentary on Geosynthetics Performance Testing"
- GSI's Member Organizations