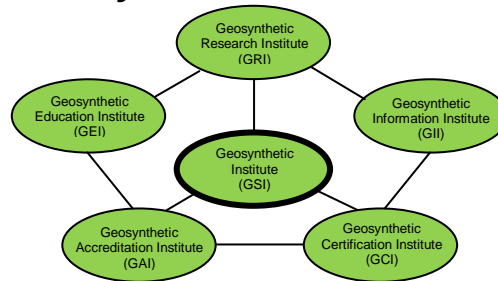


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 30, No. 2

June, 2016

This quarterly newsletter, now in its 30th year, presents the activities of GSI and its related institutes to all who are interested. It is available on the institute's home page at www.geosynthetic-institute.org. It also serves as a quarterly report to its member organizations. Details are available by contacting George R. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at gkoerner@dca.net or mvashley@verizon.net.

Activities of GSI's Directors and Officers

1. GeoAmericas '16 in Miami, Florida lived up to its expectations and then some. We presented five lectures and a short course as well as our Annual Meeting and BoD Meeting.
2. Notes of the Annual Meeting are in the password protected section of our website.
3. The book is out! That is "Geotextiles From Design to Applications" published by The Textile Institute via Elsevier/Woodhead. It contains 26-chapters by worldwide experts who did an excellent job knitting together all aspects of geotextiles. The editor (Bob Koerner) thanks all of them individually and collectively. The 617-page book is available by the publisher as well as Amazon and Barnes and Noble.
4. The GeoInstitute of ASCE is honoring Dr. Dave Daniel and Dr. Bob Koerner via two separate, but back-to-back, Symposia on August 15, 2016 in connection with its GeoEnvironmental Conference in Chicago, Illinois... see <http://www.geoenvironmentconference.org/program/>
5. GSI Webinars and Courses are ongoing on a regular basis and each successive one is advertised on our home page. They carry 1.5 to 8.0 professional development hours and have had many positive reviews. A complete list is given on Page 5 herein.
6. Our experience with on-line webinars and courses has been so successful that we have just completed putting the entire Designing-With-Geosynthetics textbook on-line. This is indeed distance learning and is meant to address the

article in this Newsletter/Report entitled "We're Losing the Battle".

7. Upon reading this article please get ready for a new GSI certification program titled "Geosynthetic Designer Certification"... more later...
8. There have been 11-proposals submitted for GSI Fellowship awards for the 2016-'17 academic year. They have just been sent to our Board of Director members for their review and subsequent funding.
9. The nine person GSI Board of Directors is presently as follows:

Term Ends 2016

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

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- The GSI Affiliated Institutes
- "We're Losing the Battle"
- GSI's Member Organizations

Term Ends 2017

- A. N. Desai – BTRA & GSI-India (Agencies)
e-mail: btra@vsnl.com
- Edgard Chow – Kuraray (Resin Producers)
e-mail: edgard.chow@kuraray.com
- Kent von Maubeuge - NAUE GmbH & Co. KG
(International-1)
e-mail: kvmaubeuge@naue.com

Term Ends 2018

- Tony Eith - CEC Consultants , Inc.
(Consultants and Testing Labs)
e-mail: teith@cecinc.com
- Nathan Ivy - AGRU America Inc.
(Geomembranes and GCL's)
e-mail: nivy@agruamerica.com
- Moreno Scotto - Maccaferri
(International - 2)
e-mail: moreno.scotto@gmail.com

Overview of GRI Projects (Research)

The following projects are all funded by GSI membership dues unless specifically noted. Most are long-term projects for which we are well positioned to accomplish. *Those projects marked with an asterisk have written papers available; please ask and we will send them accordingly.* Contact George Koerner (gkoerner@dca.net), Grace Hsuan (g.hsuan@coe.drexel.edu) or Bob Koerner (robert.koerner@coe.drexel.edu) for details and/or discussions.

- 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 multiple thermocouples for long term measurements in both wet and dry municipal solid waste landfills in Pennsylvania. The project has been extended into its 19th-year and has resulted in an extremely authoritative set of real-life data which is being used by many researchers 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 in its second year and will be a multi-year effort. It is likely that a Standard Guide will be developed on this topic.
- 3. 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 project being conducted by George Koerner is presently

investigating two different geogrids 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.

- 4. Laboratory Exposed Lifetime of Geomembranes*** - GSI is using three UV-fluorescent devices to estimate the projected exposed lifetime of six different types of geomembranes. They are HDPE, LLDPE, fPP, EPDM, PVC (N.A.) and PVC (Euro.). They are being incubated at 60, 70, and 80°C until half-life or strength and elongation are measured. The goal is lifetime prediction. Some will take at least 90,000 light hours (\approx 12.3 years). GRI Report #44 is available on results to date and a webinar is also available. The information was made available to the public in April 2016 and will be the topic of our Keynote Lecture and will likely be republished in the International Geosynthetics Journal. (In this regard it should be noted that we have withheld the information for well over a year which has been our custom.)
- 5. HDPE Geomembrane Lifetime as a Function of Thickness** - This often encountered question is being evaluated by exposure at 80°C in a QUV weathering device per ASTM D7238. Formulations are exactly the same and only the sample thicknesses vary. These thicknesses are 2.76, 2.44, 1.58, 1.08, 0.77 and 0.48 mm. Parameters being evaluated in this decade long study are change in thickness and presence of crazing or cracking. Time will tell!
- 6. Laboratory Exposed Lifetime of PVC (European) Geomembranes** - We have been evaluating five different 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. This also allows us to distinguish between PVC geomembranes manufactured in North America versus Europe. The differences are in the type of plasticizers used in the formulations as well as thickness.
- 7. Laboratory Exposed Lifetime of TRM Filaments** - We are also using UV-fluorescent exposure of four different turf reinforcement mat filaments to assess their lifetime capabilities. They have been incubated at 60°C, 70°C and 80°C. A final report to the manufacturer (Propex) has been submitted.
- 8. Laboratory Exposed Lifetime of Geotextiles** - A similar UV study as with geomembranes (Items 5, 6 and 7), geogrids (Item 8) and TRM filaments (Item 9) has been conducted on various geotextiles. Woven monofilaments, woven slit films, nonwoven heat bonded and needle punched types are included. In the latter are four different weights of needle punched nonwovens. All data and laboratory and field

lifetime predictions are included in GRI Report #44. The results have just been published in Chapter 10 of the new Geotextile book mentioned earlier.

9. **Laboratory Exposed Geotextile Yarns** - A new effort on behalf of a member organization (TenCate) is evaluating polypropylene yarns with and without long-term antioxidants. It will be interesting to observe differences in behavior insofar as long-term strength and elongation. As with all of our long-term exposure research, incubation is using UV-fluorescent devices per ASTM D7238.
10. **Retaining Wall Failure Evaluations*** - 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 grown to 141, then 171, and now 283! *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 was published by the Journal of Geotextiles and Geomembranes in October, 2013 and the publisher (Elsevier) reports that 900 requests have been made to date. It was voted as being the best paper of 2013 by the journal. This was the topic of a GSI course and lecture presented at GeoAmericas in April, 2016.
11. **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 very high alkalinity environments. Indeed, the values started high, but over time are now down to eight and lower. George has a paper in this regard.
12. **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 presently in litigation.
13. **Slow Pressurization of HDPE Geomembranes in Axi-Symmetric Testing*** - The ASTM D5716 method of testing geomembranes in a 3-D axisymmetric mode uses a pressure rate of 6.9 kPa/min (1.0 psi/min). While such a rate is appropriate for most geomembrane types, it is very fast for HDPE which is semi-crystalline and cannot readily stress relax so as to

accommodate the applied pressure. To investigate slower rates we have initiated a 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. A preliminary paper was presented at Geosynthetics '15 in Portland.

14. **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 Watershed Inc., a GSI member.
15. **Forensic Analysis of Field Exposed GMs** - We have three ongoing analyses of GMs retrieved from the field after years of service. One is from a surface impoundment (comp. of EPI), another from a canal (comp. of BuRec) and the third from a hazardous liquid pond which is in litigation.
16. **Generic Specifications** - A major continuing effort is ongoing with respect to the development and updating of GRI's generic geosynthetic specifications. The current status of these specifications is as follows:

Completed and Available on our Website

GM13 – HDPE Geomembranes
GM17 – LLDPE Geomembranes
GM18 – fPP and fPP-R Geomembranes
GM19 – Geomembrane Seams
GM21 – EPDM and EPDM-R Geomembranes
GM22 – Scrim Reinforced PE Barriers (New)
GM25 – LLDPE-R Geomembranes
GM28 – CSPE-R Geomembranes
GM30 – Coated Tape PE Barriers (New)
GT10 – Geotextile Tubes
GT12 – Geotextile Cushions
GT13 – Geotextile Separators
GCL3 – Geosynthetic Clay Liners
GC14 – Turf Reinforcement Mats (New)
GS15 – Geocells

Working; Available Upon Request

GGXX – Bidirectional Geogrids (active)
GGXX – Unidirectional Geogrids (active)
GNXX – Geonet Drainage Composites (active)

The complete set of formalized specifications are available to everyone (members and nonmembers) on the open section of our Home Page. Please download and use them accordingly. There is a brief tutorial accompanying each specification. Also note that this is where the latest modification will always be available. Of note is that GM22 and GCL 3 have been upgraded for stiffness and hydraulic conductivity, respectively.

17. 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 guide as to recommended testing of drainage geocomposites.
- A practice explaining the use of MARV for geotextiles
- A transverse rib bending test for homogeneous geogrids

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. 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. The GeoAmericas' 16 papers were recently added. 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) performs various surveys on pertinent topics in geosynthetics. If you have topics in need of the current status please advise accordingly.

Progress within GEI (Education)

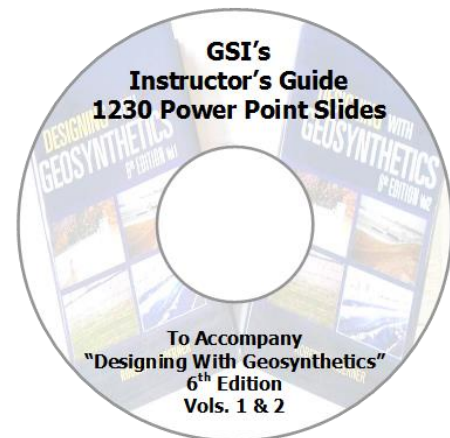
Free CD

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 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.

6th Edition of Designing With Geosynthetics

The 6th 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. All proceeds go to GSI.

Additionally, we have developed 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 45 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. Our most recent report is:

- #45 - A Review of 3000 Geosynthetic Q&As on the GMA Techline Since Its Inception in 2004. In it are the 100 “most difficult” questions asked and answered since the Techline’s inception in 2004.

Courses

Due to lack of attendance for day-long courses at GSI we have not scheduled further in-house dates. That said, our two certification courses are available on-line via a series of six, ninety-minute, interconnected webinars. Contact Jamie Koerner at jrkoerner@verizon.net if you want information and details.

GSI Webinars (90 minutes long)

**(Second Wednesday of Every Month)
11:30 AM – 1:00 PM (Eastern Time Zone)
Registration at**

www.geosynthetic-institute.org/webinar.htm

1.5 Professional Development Hours

Nonmembers Cost - \$250; Members Cost - \$200

Commentary on Webinars: Never in Bob K’s long career has he “reached out” to so many people than when giving these GSI and ASCE webinars. For the single cost of \$250 or \$200 a feed is delivered over Adobe Connect to the requested site. This can be anywhere, e.g., office, conference room, auditorium or even sent to additional offices and sites. For example, NY-DEC had the feed going into their Albany auditorium and then into the 13-regions of New York State. Clearly, hundreds of participants were involved. For one ASCE webinar there were 62-sites! We are now abandoning our in-house, one-day, courses (which have been given for the past 30-years) and delivering them in six segments over three days each morning and afternoon. *Readers; on-line distance learning, aka, webinars, is the way to communicate information to masses of people in an inexpensive and time efficient manner. Indeed, the future of learning is here!*

- GSI 1 - “MSE Wall Failures Data Base”
- GSI 2 - “MSE Wall Back Drainage Design”
- GSI 3 - “MSE Wall Remediation”
- GSI 4 - “MSE Wall Inspection”
- GSI 5 - “Geosynthetics In Hydraulic Applications”
- GSI 6 - “Geosynthetics in Heap Leach Mining”
- GSI 7 - “Geosynthetics in Agriculture”
- GSI 8 - “Geosynthetics Applications in the Private Sector”
- GSI 9 - “Behavior and Analysis of Twenty Solid Waste (Landfill) Failures”
- GSI 10 - “Wet (Bioreactor) Landfills for Rapid Degradation of MSW Organics”

- GSI 11 - “Lateral and Vertical Expansions Over Old and Existing Landfills”
- GSI 12 - “Landfill Covers: Past, Present, Emerging”
- GSI 13 - “Beneficial Used of Abandoned and/or Closed Landfills”
- GSI 14 - “Lifetime Predictions of Covered and Exposed Geosynthetics”
- GSI 15 - “In-Situ Stabilization of Soil Slopes Using Nailed (or Anchored) Geosynthetics”
- GSI 16 - “Sand Drains-to-Wick Drains-to-Sand Columns”
- GSI 17 - “Geosynthetics in Erosion Control”
- GSI 18 - “Pond Liner Design and Performance”

GSI Fellowships

A major change over previous years has been quite successful this year. We now offer fellowships for masters and doctoral students. Also the stipend is \$5000 for a single year, rather than three multiple years. This change resulted in 22-proposals which were reviewed and graded by the GSI-BoD and ourselves. Twelve were accepted and are listed below. If a specific proposal is of interest please contact Jamie Koerner at jrkoerner@verizon.net.

	Name	School	Advisor	Topic
1	Beauragar, Melissa	University of Colorado	Jonathan Wu	Protocol for Selecting Wall Facing for GS Reinforced Structures
2	Bester, Karl James	University of Cape Town	Kelvin Legge	Test Methods for GT Filters used in Waterway Engineering
3	Bredacs, Marton	Montan University	Gerald Pinter	Aging Mechanisms and LT Assessment of PE Tunnel Liner
4	Gutierrez, Angel	Arizona State University	Edward Kavazanjian	Evaluation of GM Seam Strain Concentration Factors
5	Huang, Muji	NPUST	Wayne Hsieh	RECP Soil Protection Properties due to Variables in Channel Flow
6	Huang, Grace	Virginia Tech	George Filz	GS Contribution to Stability of Column- Supported Embankments
7	Javadi, Sadra	University of Louisville	Qian Zhao	Advection and Sorption of Organic Containment in GCL with Organobentonite
8	Jiang, Yan	University of Kansas	Jie Han	Evaluating Performance of Hybrid GRE Walls
9	Kiffle, Zeru	Syracuse University	Shobha Bhatia	Finite Element Model of GT Tubes Stacking in Dewatering Projects
10	Sievering, Roland	RWTH Aachen University	Martin Ziegler	Interaction Modeling in Finite Element Simulation of GG Reinforced Soil
11	Xu, Lei	Columbia University	Hoe Ling	Centrifuge modeling of wire mesh facing GS reinforced Soil Retaining Wall
12	Zadeh, Shahin Ghazi	Colorado State	Chris Bareither	Evaluation of Long Term Internal Shear of GCLs in Mining Applications

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. *It should be emphasized 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 245 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of December, 2015, 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^A - TRI/Environmental Inc. (155 tests)
Jarrett Nelson -- (512) 263-2101
jnelson@tri-env.com
- 3^A - Golder Associates (43 tests)
Henry Mock -- (770) 492-8280
Henry_Mock@golder.com
- 4^C - Geosynthetic Institute (109 tests)
George Koerner -- (610) 522-8440
gkoerner@dca.net
- 8^B - Propex Operating Co., Ringgold (11 tests)
Todd Nichols -- 438-553-3757
todd.nichols@propexglobal.com
- 9^B - Lumite (17 tests)
Benjamin Bell -- (770) 869-1187
bbell@lumiteco.com
- 13^A - TRI Env. Inc. (Precision Labs) (86 tests)
Cora Queja -- (714) 520-9631
cqueja@tri-env.com
- 14^A - Geotechnics (51 tests)
J. P. Kline -- (412) 823-7600
JPkline@geotechnics.net
- 20^A - GeoTesting Express, MA (59 tests)
Gary Torosian -- (978) 635-0424
gtt@geotesting.com
- 22^B - CETCO Hoffman Estates (13 tests)
Barbara Gebka -- (847) 851-1500
barbara.gebka@cetco.com
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
roger.wilkerson@cetco.com
- 25^B - Ten Cate, Pendergrass (13 tests)
Melissa Medlin -- (706) 693-2226
m.medlin@tencate.com
- 26^B - Agru America Inc. (27 tests)
Maria Coffey -- (843) 546-0600
mcoffey@agruamerica.com
- 29^E - FITI Testing and Research Institute (80 tests)
Dong Whan Kim -- 82-2-3299-8071

- 31^D - dwKim@fitiglobal.com
NYS Dept. of Transportation (9 tests)
Tom Burnett -- (518) 457-4704
tburnett@dot.ny.gov
- 32^A - Geo-Logic Inc. (6 tests)
Ken Criley -- (530) 272-2448
kcriley@geo-logic.com
- 34^B - GSE Environmental Richey Road (30 tests)
Mauricio Ossa
mossa@gseworld.com
- 38^C - Sageos/CTT Group (122 tests)
Eric Blond -- (450) 771-4608
eblond@GCTTG.com
- 40^B - GSE Environmental (13 tests)
Mary Thompson -- (843) 382-4603
mthompson@gseworld.com
- 41^A - SGI Testing Service, LLC (18 tests)
Zehong Yuan -- (770) 931-8222
ZYuan@interactionspecialists.com
- 42^C - NPUST (GSI-Taiwan) (71 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
CWH@mail.npust.edu.tw
- 43^A - Ardaman & Associates (22 tests)
George DeStafano -- (407) 855-3860
gdestafano@ardaman.com
- 44^B - PGI and Fiber Web, Inc. (9 tests)
Mitchell Clendenin -- (615) 847-7155
Mitchell.Clendenin@avintiv.com
- 45^B - Ten Cate Geosynthetics Malaysia SDN Bhd. (24 tests)
Boon Kean Tan -- (603) 519 28576
b.k.tan@tencate.com
- 46^B - TAG Environmental Inc. (13 tests)
Colin Murphy -- (705) 725-1938
colin_murphy@tagenv.com
- 49^B - Engepol Geossinteticos (15 tests)
Patricia Ferreira -- (55) 51 3303-3901
patricia@engepol.com
- 50^B - ADS, Inc. Hamilton (7 tests)
Terry McElfresh -- (513) 896-2065
terry.mcelfresh@ads-pipe.com
- 51^B - Solmax International Inc. (22 tests)
Simon Gilbert St. Pierre -- (450) 929-1234
simonGSP@solmax.com
- 53^B - Polytex Autofagasta (19 tests)
Ximena Parra Pizarro -- 011 55-2883308
xparra@polytex.cl
- 55^B - Atarfil Geomembranes (21 tests)
Gabriel Martin Sevilla -- 34 958 439 200
gmartin@atarfil.com
- 56^B - Polytex Santiago (13 tests)
Marta Tenorio F. Jeff -- 011 56-2-677-1000
MTenorio@polytex.cl
- 57^B - Ten Cate Cornelia (22 tests)
Melissa Medlin -- (706) 778-9794
m.medlin@tencate.com
- 58^B - Propex Operating Co. Hazelhurst (16 tests)
Victoria Shoupe -- (912) 375-5406
Victoria.Shoupe@propexglobal.com
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
SimpsonJanie@firestonebp.com
- 60^B - Polytex Lima (14 tests)
Roberto Diaz Palacios -- 51 16169393
rdiaz@polytex.cl
- 61^B - Raven Industries (18 tests)
Clint Boerhave -- (605) 335-0288
Clint.Boerhave@ravenind.com
- 62^B - Solmax International Asia (14 tests)
Pei Ching Teoh -- (450) 929-1234
pcteoh@solmax.com
- 63^A - TRI Environmental, Inc.; DDRF (4 tests)
Jay Sprague -- (864) 346-3107
Jesprague@tri-env.com
- 64^B - Agru America (NV) (14 tests)
Ryan Steele -- (775) 835-8282
RSteele@AgruAmerica.com

- 65^C - Bombay Textile Research Assoc. (BTRA) (23 tests)
Riyaz Shaikh
(0) 022-25003551
bttra@vsnl.com
- 66^B - Rowad International Geosynthetics Co. Ltd (14 tests)
Mohammad Usman Ansari -- +966-3-812-1360
mu.ansari@tasnee.com
- 68^B - Glen Raven Technical Fabrics LLC (4 tests)
Richard Greeson -- (336) 229-5576
rgreeson@glenraven.com
- 69^B - GSE Environmental (13 tests)
Siriporn Chayaporenler -- 6638-636638
Siripornc@gseworld.com
- 70^A - RSA Geo Lab LLC (47 tests)
Rasheed Ahmed -- (908) 964-0786
geolab13@yahoo.com
- 71^B - Plasticos Agricolas y Geomembranas S.A.C. (21 tests)
Manuel Constantino Olivares Espinoza --
073-511814-511829
calidad@pqaperu.com
- 72^B - Tensar Corp. GA (4 tests)
Lynn Cassidy (770) 968-3255
lcassidy@tensarcorp.com
- 73^B - Gai Loi JSE (10 tests)
Paul Wong 84-650-362-5825
paul905677@gmail.com
- 74^B - Agru America Inc. (9 tests)
Mark Locklear (843) 221-4121
mlocklear@AgruAmerica.com
- 75^B - GeoMatrix S.A.S. (24 tests)
Javier Diaz Cipagauta (571) 424-9999
jdiaz@geomatrix.com.co
- 76^B - Tehmco (Chile) (15 tests)
Patricia Rojas Perez (562) 580-2852
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- 78^B - PQA Mexico (14 tests)
Cesar Augusto Arcila (669) 954-8202
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- 79^A - TRI Geosynthetic Testing and Services (32 tests)
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- 80^B - Texel (Canada) (8 tests)
André Parent (418) 387-4801
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- 81^B - GSE Germany (18 tests)
Evelyn Kroeger 49-40-767420
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- 82^B - CARNO ATC (1 test)
Mary Lynn Smith (770)-427-9456
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- 83^B - GSE Egypt (13 tests)
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- 84 - Interwrap India (14 tests)
Ashutosh Dixit - 1-778-945-2888
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- 85 - PAG Tacna (11 tests)
Manuel Constantino Olivares Espinoza --
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- 86 - BOSTD China (29 tests)
Zheng Hong - 86-532-8780-6919
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- 87 - Willacoochee Industrial (18 tests)
Jason Booth - 912-534-5757
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^AThird Party Independent ^CInstitute
^BManufacturers QC ^DGovernment

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

Activities within GCI (Certification)

GSI presently 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 in 2011) is focused on MSE Wall, Berm and Slope field inspection. See our website at 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 – 2015

Year	Geosynthetic Materials		Compacted Clay Liners	
	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%)
2007	82	11 (13%)	73	12 (16%)
2008	95	25 (26%)	89	20 (22%)
2009	36	7 (19%)	36	2 (5%)
2010	59	12 (20%)	54	7 (13%)
2011	54	6 (11%)	53	3 (6%)
2012	34	5 (15%)	28	3 (11%)
2013	32	4 (12%)	30	1 (3%)
2014	45	1 (3%)	42	3 (7%)
2015	56	6 (11%)	51	6 (12%)
2016	16	2 (12%)	17	1 (6%)
TOTAL (to date)	650	84 (13%)	601	70 (12%)

The 5-year renewal periods for those having taken the exam before 2010 is ongoing and about 60% have renewed accordingly. This is felt to be encouraging from our perspective.

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

While a field inspector cannot require proper design or direct a contractor how to build a 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.

The official launch of this inspection 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. Next year, the corresponding course for this certification program will now be transferred into a series of six presentations over a three-day period. Contact Jamie Koerner at jrkoerner@verizon.net for details and arrangements.

The status of the program is shown in the following table.

Inspector Certification Test Results
MSE Walls and Berms
(2011-2015)

Year	Course Location	MSE Wall And Berms	
		No. of People Taking the Exam	No. of People Failing the Exam
2011	GSI Course	7	0
2012	GSI Course	6	0
2013	GSI Course	2	0
2014	GSI Course	3	0
2015	GSI Course	4	0
2016	GSI Course	2	0
TOTAL		24	0

The on-line courses for preparation of both of these certification programs is available in a series of six-90 minute webinars. Contact Jamie Koerner at jrkoerner@verizon.net for details and arrangements.

Program #3 - Geosynthetic Designer Certification

With the just-released availability of an on-line, on-demand, course covering the entirety of the 6th Edition of Designing With Geosynthetics textbook (914 pages) and its availability as hardback, softback and e-book we will shortly initiate a “geosynthetic designer certification”. It will require an applicant to be a professional engineer, have 6-months geosynthetic design experience, be recommended by his/her supervisor and pay the administration fee for a 5-year period. Also, it will require passing ($\geq 70\%$) of a 150-question multiple choice examination. Some details remain to be sorted-out but the program should be

initiated by September 2016. Please contact us accordingly.

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 three countries (Korea, Taiwan and India), 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 improved 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.

GSI-India under the direction of Dr. A. N. Desai has been formed in 2015. The hosting organization is the Bombay Textile Research Association (BTRA) which is world known for its excellence in textile R & D and is currently branching out into all forms of geosynthetics.

We are delighted in this regard and, as a side-note, Dr. Desai has just been elected to GSI's Board of Directors. (See associated writeup on the "Global Geosynthetics Summit" in the December, 2014 Newsletter/ Report).

Items of Interest

Please note that this section will no longer be carried in these quarterly GSI Newsletter/Reports. This is due primarily to limit the length of the reports which have grown considerably over time.

We're Losing the Battle!

The above title is not about military, political or social issues; however, it is about the knowledge base of graduating students and other new employees entering the field of geosynthetics. In both situations, i.e., graduating students and other new employees, entry level men and women have little or no idea of the plethora of available geosynthetic materials or of the myriad applications they serve. To give an idea of the available talent pool, the following annual statistics are available from the American Society of Engineering Education (ASEE) for the USA and Wikipedia for worldwide data.

Category	USA	Worldwide (except USA)
Colleges/Universities with Engineering Programs	1,723	7,000 (est.)
All Engineering Bachelor Degrees	83,001	1,000,000 (est.)
Civil Engineering	12,157	150,000 (est.)
All Engineering Masters Degrees	46,940	50,000 (est.)
Civil Engineering	4,739	15,000 (est.)
All Engineering Doctoral Degrees	9,582	15,000 (est.)
Civil Engineering	747	2,000 (est.)

As will be seen later, only a miniscule few of these graduates have been exposed to geosynthetics. This, of course, leaves the onus of geosynthetics education to the agency, owner, consultant, testing lab, manufacturer, representative, inspector, contractor or installer to the employer! Indeed it is challenging and expensive (for both the employer and individual) once a new individual enters geosynthetics employment as his/her profession.

Let's first address the geosynthetic implementation status at the college/university level. Looking at the many disciplines comprising the geosynthetics field, the logical entry discipline for formal training is civil engineering. This does not mean that other

engineering disciplines (such as chemical, materials, mechanical, electrical, environmental, etc.) cannot be involved, it's just that a dedicated course in geosynthetics is not likely in any other than a civil engineering program. Even further, students in disciplines other than engineering (such as chemistry, business, law, economics, marketing, etc.) are also not likely to have any exposure to geosynthetics. *But, why are colleges/universities with civil engineering programs not teaching geosynthetics?* The reasons are many and they include the following;

- university administrative pressures to reduce overall course credits for graduation,
- university administrative pressure to have more social and liberal courses within engineering curricula,
- departmental administrative pressures to have fewer specialized technical courses,
- departmental faculty competition with many other specialized technical courses,
- departmental costs (and space) involved in setting up a geosynthetics laboratory, and/or
- departmental requirements of insufficient student enrollment for a geosynthetic course so as to justify a faculty member's teaching commitment.

To be sure, efforts to encourage geosynthetic education at the college/university level have been made, and most notable in this regard are the "Educate-the-Educators" programs. For five consecutive summers, from 1994 to 1998, a one-week course on geosynthetics was given at Auburn University under the guidance of Prof. David Elton. There were a total of 136 participants and in a survey made by GSI in 2012 (14 to 18 years later), 18 of the participants (13%) had given a geosynthetic course. A second survey made through the United States Universities Council on Geotechnical Education and Research (USUCGER) found that 24 college/universities taught a stand-alone geosynthetics course in 2014. The above said, there are many existing courses being taught regularly which include some aspects of geosynthetics. For example, the following applies in this regard.

- Geomembranes and Geosynthetic Clay Liners for liners in landfill related courses.
- Geogrids and geotextiles for walls, slopes and filters in geotechnical related courses.
- Geotextiles (and other geosynthetics) for highway pavement courses.
- Geopipe (and other geosynthetics) for liquid distribution in hydraulics related courses.

However, such existing civil engineering courses hardly do justice to explain the complete geosynthetics technology, much less make a graduating student see the field in a holistic sense.

Toward the end of having available a complete course in geosynthetics, we have decided to put the entire textbook "Designing With Geosynthetics" in a distance-learning, on-demand, format. The existing textbook, made for teaching a full nine-month academic year's coursework, is being transitioned into power point slides, each with voice-over by yours truly. It directly follows the 914-page textbook section-by-section and page-by-page. The total package consists of the following:

GSI's New On-Line, Distance Learning Course
 "Designing With Geosynthetics (DwG)"
 by
 Bob Koerner

Chapter Number	Topic	DwG Book Sections Covered	Number of Slides	Presentation Time (min.)
1	Geosynthetics	all	121	60
2a	Geotextiles	2.1 to 2.4	119	90
2b	Geotextiles	2.5 to 2.6	122	85
2c	Geotextiles	2.7	65	70
2d	Geotextiles	2.8 to 2.11	126	85
3	Geogrids	all	112	85
4	Geonets	all	72	60
5a	Geomembranes	5.1 to 5.2	92	65
5b	Geomembranes	5.3 to 5.5	115	70
5c	Geomembranes	5.6	100	80
5d	Geomembranes	5.7 to 5.13	152	90
6a	GCLs	all	89	70
6b	GCLs	new topics	72	55
7	Geofoam	all	67	40
8	Geocomposites	all	116	80
TOTALS			1540	1085 ~ 18 hours

The delivery platform for the above is Adobe Connect, which we have been using for webinar presentations for several years. It works remarkably well. Due to the massive amount of content, the user will have open accessibility to the complete 1540 slide course for 30-days upon receiving payment. The charge to GSI members is \$1000, whereas for nonmembers it is \$3000. Of course, more than one employee can utilize the content during the 30-day period.

We hope you give your new employees, and others as well, the opportunity to learn about all types of geosynthetics through this on-line course. It's ready to go and if you have questions and/or comments please contact us accordingly.

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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 Altakomol Alhadith Cont. Co. of Saudi Arabia with Carlos Lasserre; INOVA Geosynthetics/AERO Aggregates with Archie Filshill; Sotrafa Agrualura y Geosinteticos of Spain with Jose Miguel Munoz Gomez; Kaytech Fabrics Co. of South Africa with Garth James; Interwrap Inc. with Clive Mills/Martin Vido, Borouge Pte. Ltd. of Singapore with Julia Putih and Intermas Group of Spain with Rubén Palacios contact members. Thanks to all and welcome to GSI!!!

GSE Environmental
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 David A. Carson

Chemours Technology
 John L. Guglielmetti

Federal Highway Administration
 Silas Nichols/Daniel Alzamora

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 Randy Moynihan

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 John Volk/Ron Hager/John Bove

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INHA (GSI-Korea)
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IN THE NEXT ISSUE

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- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- The GSI Centers-of-Excellence
- Items of Interest
- Retrospective of GeoAmericas '16
- GSI's Member Organizations