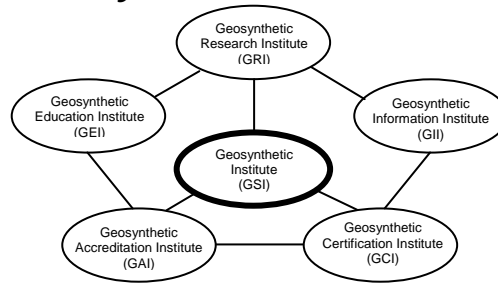


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 25, No. 4

December, 2011

This quarterly newsletter, now in its 25th year, presents the activities of GSI and its related institutes to all who are interested. It is available on the institute's home page at www.geosynthetic-institute.org. It also serves as a quarterly report to its member organizations. Details are available by contacting Robert M. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at robert.koerner@coe.drexel.edu or mvashley@verizon.net.

*Happy Holidays and a Healthy
and Prosperous New Year*

Activities of GSI's Directors and its Board of Directors

1. By unanimous agreement of GSI's nine person Board of Directors it was decided to transition George Koerner into being the new Director of GSI and Bob Koerner as Emeritus Director beginning January 1, 2012. Most sincere congratulations go to George as GSI moves forward into the future.
2. Elections for three BoD members (consultants/test labs, geomembranes/GCLs and an international member) are currently ongoing. Notices to all will be forthcoming shortly..
3. We have just successfully concluded four fall courses at GSI. They are as follows:
 - MSE wall failures and remediation
 - MSE inspectors course
 - Solid waste containment design
 - QA/QC inspectors courseBoth of the inspectors courses had certification examinations following... details will follow.
4. Advertisements as to the availability of the new MSE inspector certification program have been sent to members, agencies, private owners, etc.
5. TRI Environmental, Inc. will be offering both certification courses and will be proctoring the examinations as well.
6. The present BoD is as follows, along with their respective term ending years.

Term Ends 2011 (Elections are ongoing)

- Dick Stulgis - GeoTesting Express (Consultants and Testing Laboratories)
e-mail: rstulgis@geocomp.com
- Gary Kolbasuk - Raven Ind. (Geomembranes and GCLs)
e-mail: gary.kolbasuk@ravenind.com
- Wayne Hsieh – NPUST/GSI-Taiwan (International-2)
e-mail: cwh@mail.npust.edu.tw

Term Ends 2012

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

IN THIS ISSUE

- Activities of the GSI Directors and Board
- Overview of GRI Projects (Research)
- Activities within GII (Information)
- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliated Institutes
- Items of Interest
- Announcing the Sixth Edition of the Book "Designing With Geosynthetics"
- Upcoming GSI Events
- GSI's Member Organizations

Term Ends 2013

- David Jaros - Corps of Engineers (Government Agencies)
e-mail: dave.l.jaros@usace.army.mil
- Rex Bobsein - Chevron Phillips (Resin Producers)
e-mail: bobserl@cpchem.com
- Kent von Maubeuge - NAUE GmbH & Co. KG
(International-1)
e-mail: kvmaubeuge@naue.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. (In this regard short projects are given to design firms or testing laboratories that are GSI Members). Details and full briefings are available to member organizations at their request. Dr. Grace Hsuan, Associate Director of GRI can be contacted for additional information as can the other project managers listed in the following write-ups. **Projects marked with an asterisk have been written up as either short "in-progress" papers or complete papers.** Grace can be reached by phone at (610) 522-8440 or e-mail at <grace.hsuan@coe.drexel.edu>.

Important Notice: Use of GSI/GRI generated data and information is for member organization use assuming that the information is not taken out of the context of which it was developed. When used for formal publications such as proposals, regulatory permits, brochures and advertisements we would appreciate seeing a draft copy for possible comments. Thank you 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 15th-year and has resulted in an extremely authoritative set of real-life data.
2. **Bioreactor (aka, Wet) Landfill Behavior and Properties*** - One of the landfill cells mentioned in Item #1 is at field capacity, hence it is a true anaerobic bioreactor. Dr. George Koerner is in charge of considerable monitoring at this cell which includes the following
 - waste moisture content
 - waste temperature
 - leachate chemical analysis
 - waste gas analysis
 - perched leachate within the waste
3. **Flow Behavior of Fully Degraded Waste*** - A field project under sponsorship of GSI and Waste Management investigates the drainage of highly degraded MSW placed directly on leachate collection systems. The leachate collection materials consist of both natural soils and geosynthetic drains. The experimental setup has been dismantled and presently a paper is being prepared for the 2012 Global Waste Conference.
4. **UV Exposure of Geomembranes*** - GSI is using UV-fluorescent devices to estimate the projected exposed lifetime of many different types of geomembranes. Presently being incubated are HDPE, LLDPE, fPP, PVC (N.A.), and EPDM. Exposure times of 50,000 light hours are now realized at 70°C and a replicate set of samples are being incubated at 60°C. Some will take at least 70,000 light hours (≈ ten years). The third sequence at 80°C was started on 1/1/2010. Ongoing data is being reported to manufacturers and resin producers. GRI Report #42 will be available on the 70°C data using a correlation coefficient to estimate field lifetime of the various geomembranes.
5. **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 used in the formulations. In this regard we have been evaluating various European formulations for four years and the results are very impressive. The study is for CARPI, a GSI member organization.
6. **UV Exposure of Geogrids** - The UV-fluorescent exposure of two different biaxial geogrids which are used at the exposed faces of welded wire mesh retaining walls is ongoing. The various geogrids are now up to 35,000 light hours and data is being generated and sent to the respective manufacturers. Replicate samples are now being incubated at 60°C for eventual use in Arrhenius Modeling and lifetime prediction. The last set at 80°C has just begun incubation.
7. **UV Exposure of TRM Fibers** - We are also using UV-fluorescent exposure of four different turf reinforcement mat fibers to assess their lifetime capabilities. They are presently being incubated at 60°C, 70°C and 80°C. Communication between the manufacturer is ongoing.
8. **UV Exposure of Geotextiles** - We have just completed a UV study on a heat-bonded nonwoven PP geotextile used for three

dimensional cell structures which are exposed to the atmosphere. The results for the particular geotextile and its specific formulation at 20°C (68°F) average field temperature are 4.9 years for half-life of breaking strength and 4.1 years for half-life of breaking elongation.

9. **Field Behavior of fPP and fPP-R Geomembranes** - We continue to receive and evaluate field samples of flexible polypropylene geomembranes (mainly scrim reinforced). They are regularly added to our database in this regard. The most recent was for potable water storage and had a service lifetime of 10-years. Using our correlation factor of 1200 light hours in D7238 at 70°C being equivalent to one-year in a hot climate, this is equivalent to a laboratory exposure in the weathering device of 12,000 light hours. Our GRI-GM18 specification calls for 20,000 light hours for a acceptable formulation.
10. **Retaining Wall Failure Evaluation** - We presently have GRI Reports 38, 39, and 40 addressing mechanical stabilized earth (MSE) walls using geosynthetic reinforcement which document 82-failures. Our data base has now increased to 139 failures and continues to grow! The failures are either excessive deformation or collapses. We have presented one-day courses on this topic along with inspector training and development insofar as an inspectors certification program; see the certification section of this Newsletter/Report.
11. **pH Between Masonry Block Wall Units*** - George Koerner has been measuring the pH between three types of masonry blocks over five years to monitor the values. Concern here is over PET geogrids which can be sensitive to high alkalinity environments. The values started high, but over time are now down to eight and lower. George Koerner has a paper in this regard.*
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 by Dr. Connie Wong using the ReSSA Code and are now available to members and associate members as GRI Report #41.
13. **Generic Specifications** - A major effort is ongoing with respect to the development and maintenance of generic geosynthetic specifications. The current status of these specifications is as follows:

Completed and Regularly Updated

- GM13 – HDPE Geomembranes
- GM17 – LLDPE Geomembranes
- GM18 – fPP and fPP-R Geomembranes
- GM21 – EPDM and EPDM-R Geomembranes
- GM22 – Exposed Temporary Covers
- GM25 – LLDPE-R Geomembranes

- GM19 – Geomembrane Seams
- GT10 – Geotextile Tubes
- GT12 – Geotextile Cushions
- GT13 – Geotextile Separators
- GCL3 – Geosynthetic Clay Liners

Working Within Focus Group

- GTXX – Turf Reinforcement Mats

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.

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

Activities within GII (Information)

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

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

It has been completely revised and is being maintained through the fine efforts of Marilyn Ashley. Everyone (members and nonmembers) can access the open part, which has the following menu:

- Introduction to GSI
- Prospectus
- Associate Membership (Agencies)
- Members by Focus Groups
- GSI Publications
- GRI Specs, Guides, White Papers
- Laboratory Accreditation
- Product Certification
- Newsletter/Reports
- Internet Courses
- Geosynthetics Links
- GSI Member Meetings
- Courses at GSI
- CQA Insp. Cert. (2)

To go further one needs a members-only password. Your contact person (see the last section of this Newsletter/Report if you do not know who it is) must get a password from Marilyn Ashley. Please note that original passwords have recently been changed.

Marilyn can be reached by e-mail at mvashley@verizon.net. When you get into this section, the following information is available. This includes:

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

The Keywords Section contains about 30,000 citations of 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. To date, she has focused on the following; all of which are available. Note that we are open to suggestions to other survey-related topics. Please advise accordingly.

- State adoption of AASHTO M288 geotextile specification (GRI Report #31)
- State liner and cover regulations for solid waste disposal (GRI Report #32)
- International liner and cover regulations for solid waste disposal (GRI Report #34)
- Allowable leachate head in landfill sumps (White Paper #13)
- Allowable leakage rates for waste ponds (White Paper #15)
- Survey of LLRW and UMT at U. S. Defense establishments so as to assess the potential area for final covers (White Paper #18)
- Status of state environmental regulators with respect to conformance testing and levels of CQA at landfills and surface impoundments.
- Survey of Landfill Fires. (This effort is just beginning.)

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.

GRI Reports

To date, we have 41 GRI Reports available to members and associate members. These reports vary in length from 30 to 200 pages and beginning with Report #25 they are on the password protected section of our home page. Prior to that date only the abstract is available online. All of them, however, are available in hard copy. The most recent reports are as follows:

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

Courses

We have scheduled the following sequence of courses: (Please disregard other announcements).

- #1 Geosynthetic Reinforced Retaining Wall Failures and Their Remediation
March 13, 2012
- #2 Construction Inspection of MSE Walls, Berms and Slopes
March 14, 2012 (Optional Exam Follows)
- #3 Geosynthetics in Waste Containment Liner and Cover Design
March 20, 2012 (Optional Exam Follows)
- #4 Quality Assurance/Quality Control of Geosynthetics Installation
March 21, 2012

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

Course Registration and Fee:
\$350/person for each one-day course (up to one month prior to course)
\$400/person thereafter
\$250/person – GSI Members

Contact: Marilyn Ashley (mvashley@verizon.net)

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 consisting of the following members along with Bob and George Koerner.

- Boyd Ramsey; GSE Lining Technology
- Dave Jaros; U. S. Army Corps of Engineers
- Dick Stulgis; Geocomp Corporation
- Gary Kolbasuk; Raven Industries
- Kent von Maubeuge; NAUE Group
- Rex Bobsein; Chevron Phillips
- Sam Allen; TRI Environmental Inc.
- Tony Eith; Waste Management Inc.
- Wayne Hsieh; NPUST-GSI Taiwan

The presently established criteria are as follows:

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

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

GSI Fellowship Status for 2011-'12 Academic Year

Class 2 (c) – 3rd year funding

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

Class 3 (b) – 2nd year funding

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

Class 4 (a) – 1st year funding

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

Activities within GAI (Accreditation)

The Geosynthetic Accreditation Institute's (GAI) current mission is focused on a Laboratory Accreditation Program (LAP) for geosynthetic test methods. George Koerner is in charge of the program. The GAI-LAP was developed for accrediting geosynthetic testing laboratories on a test-by-test basis. GAI-LAP suggests that laboratories use ISO 17025 as their quality system model. In addition, the program uses the GSI lab as the reference test lab and operates as an ISO 17011 enterprise. In short, this means that the GSI lab does not conduct outside commercial testing.

It should also be made clear that GAI-LAP does not profess to offer ISO certification, nor does it “certify” laboratory results. GAI-LAP provides accreditation to laboratories showing compliance with equipment and documentation for specific standard test methods ASTM, ISO or GRI standards. In addition, GAI-LAP verifies that an effective quality system exists at accredited laboratories by way of proficiency testing.

There have been significant additions to the number of GAI-LAP tests. Presently, there are 211 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of September, 2011, 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. (118 tests)
Sam Allen -- (512) 263-2101
Sallen@tri-env.com
- 3^A - Golder Associates (45 tests)
Jonathan Ellingson -- (770) 492-8280
Jellingson@golder.com
- 4^C - Geosynthetic Institute (116 tests)
George Koerner -- (610) 522-8440
gkoerner@dca.net
- 8^B - Propex, Ringgold (19 tests)
Todd Nichols -- (800) 258-3121
todd.nichols@propexinc.com
- 9^B - Lumite (10 tests)
Rebecca Page -- (770) 869-1700

- 13^A - rpage@lumite.com
Precision Laboratories, CA (95 tests)
Cora Queja -- (714) 520-9631
cqueja@precisionlabs.net
- 14^A - Geotechnics (57 tests)
J. P. Kline -- (412) 823-7600
JPkline@geotechnics.net
- 20^A - GeoTesting Express, MA (46 tests)
Gary Torosian -- (978) 635-0424
gtorosian@geotest.com
- 22^B - CETCO Hoffman Estates (13 tests)
Jim Olsta -- (847) 392-5800
jim.olsta@cetco.com
- 23^B - CETCO Cartersville (10 tests)
Chris Cunningham -- (706) 337-5316
chris.cunningham@cetco.com
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
roger.wilkerson@cetco.com
- 25^B - Ten Cate, Pendergrass (11 tests)
Beth Wilbanks -- (706) 693-2226
beth_wilbanks@rtcusa.net
- 26^B - Agru America Inc. (17 tests)
Grant Palmer -- (843) 546-0600
gpalmer@agruamerica.com
- 29^E - FITI Testing and Research Institute (86 tests)
Dong-Whan Kim -- 82-2-3299-8071
HKKim@fiti.com.re.kr
- 31^D - NYS Dept. of Transportation (9 tests)
John Remmers -- (518) 457-4104
Jremmers@dot.state.ny.us
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
criley@vectoreng.com
- 34^B - GSE Richey Road (34 tests)
Jane Allen -- (281) 230-6726
Jallen@gseworld.com
- 37^B - GSE Chile (21 tests)
Mauricio Ossa -- 56-2 6010153
Mossa@gseworld.com
- 38^C - Sageos/CTT Group (91 tests)
Eric Blond -- (450) 771-4608
eb blond@groupecttgroup.com
- 40^B - GSE Lining Technology Inc. (17 tests)
Vicki Parrott -- (843) 382-4603
Vparrott@gseworld.com
- 41^A - SGI Testing Service, LLC (19 tests)
Zehong Yuan -- (770) 931-8222
ZYuan@interactionspecialists.com
- 42^C - NPUST (GSI-Taiwan) (69 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
CWH@mail.npust.edu.tw
- 43^A - Ardaman & Associates (18 tests)
George DeStafano -- (407) 855-3860
gdestafano@ardaman.com
- 44^B - Fiber Web, Inc. (9 tests)
Kim Cox -- (615) 847-7575
k.mclain@fiberweb.com
- 45^B - Ten Cate Malaysia SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
cpng@tencate.com
- 46^B - TAG Environmental Inc. (13 tests)
Colin Murphy -- (705) 725-1938
cmurphy@gseworld.com
- 49^B - Engepol Geossinteticos (19 tests)
Carolina Polomino -- (55) 11-4166 3001
Carolina@nortene.com.br
- 50^B - ADS, Inc. Hamilton (7 tests)
Terry McElfresh -- (513) 896-2065
mcelfresh@ads-pipe.com
- 51^B - Solmax International Inc. (20 tests)
Simon Gilbert St. Pierre -- (450) 929-1234
simonGSP@solmax.com
- 53^B - Polytex Inquique (13 tests)
Cristian Valdebenito -- 011 56 57 42 90 00
cvaldebenito@polytex.cl
- 54^B - ADS, Inc. Finley (9 tests)
David Gonso -- (419) 424-8377
davegonso@ads-pipe.com
- 55^B - Atarfil Geomembranes (20 tests)
Iganacio Garcia Arroyo -- 34 958 439 278
larroyo@atarfil.com
- 56^B - Polytex Santiago (11 tests)
Jamie Morales -- 56-2-627-2054
Jmorales@polytex.cl
- 57^B - Ten Cate Cornelia (15 tests)
Melissa Medlin -- (706) 778-9794
mmedlin@tencase.com
- 58^B - Propex Nashville (9 tests)
Tim Smith -- (229) 686-5511
TimSmith@propexinc.com
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
SimpsonJanie@firestonebp.com
- 60^B - Polytex Lima (11 tests)
Elias Jurufe -- 51 16169393
Ejarufe@polytex.cl
- 61^B - Raven Industries (17 tests)
Justin Norberg -- (605) 335-0288
Justin.Norberg@ravenind.com
- 62^B - Solmax International Asia (14 tests)
Marie Andre Fortin -- (450) 929-1234
MarieAF@solmax.com
- 63^A - TRI Environmental, Inc.; DDRF (4 tests)
Joel Sprague -- (864) 242-2220
JSprague@tri-env.com
- 64^B - Agru America (NV) (14 tests)
Chris Adams -- (775) 835-8282
cadams@agruamerica.com
- 65^C - Bombay Textile Rsearch Assoc. (BTRA) (24 tests)
Riyaz Shaikh
(0) 022-25003551
btra@vsnl.com
- 66^B - Rowad International Geosynthetics Co. Ltd (14 tests)
Asad Ullah Khan -- +966-3-812-1360
usad@rowadplastic.com
- 67^A - MicroBac Hauser Division (8 tests)
Steve Ferry -- (720) 406-4806
steveferry@microbac.com
- 68^B - Glen Raven Technical Fabrics LLC (3 tests)
Edmund Gant -- (336) 229-5576
dseagraves@glenraven.com
- 69^B - GSE Lining Technology Co. Ltd. (12 tests)
Siriporn Chayaporenkert -- 6638-636638
siripornc@gseworld.com
- 70^A - RSA Geo Lab LLC (48 tests)
Raza Ahmed -- (908) 964-0786
www.rsaglobal.com
- 71^B - Plásticos Agrícolas y Geomembranas S.A.C. (14 tests)
Cesar Augusto -- 6370 (20 110811)
asistentecalidad1@pqa.com.co

^AThird Party Independent ^CInstitute
^BManufacturers QC ^DGovernment

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

Note 1

After much effort, we are still having difficulties getting consensus on the standard atmosphere for geosynthetics laboratories. The stake holders (plastic, textile and soils groups) all wish for something different.

In the spirit of compromise, we offer the following definition of "standard atmosphere" for consideration in Atlanta at the D35 meeting on terminology. It is extremely broad and alarmingly nonrestrictive. However, it should serve as a starting point for discussion at the meeting.

Standard atmosphere, n- in geosynthetics, an atmosphere in which air is maintained at a temperature of 22 +/-3C and no relative humidity limits are maintained unless otherwise specified in test methods. However, both parameters are controlled, monitored and recorded for conditioning and testing.

We have had feedback from four labs and they are not thrilled with the prospect of having such a broad temperature window for testing. However, they have commented that it is better than the current situation of different environmental requirements for various geosynthetics. If you are interested in this topic and want to create policy for the geosynthetic industry please join us in Atlanta for a live discussion going forward.

Note 2

An *outlier* is an observation that appears to be inconsistent with the remainder of the data. Practices for dealing with outliers generally involve statistics. One identifies the probability of the questionable data falling outside the main body of data. The motivation for labeling data as an outlier can be huge particularly when one is dealing with conformance specifications.

In short, I absolutely hate the statistical practice of identifying outliers. It gives me the impression of bad quality after the fact so as to justify actions going forward. We need practices and procedures (P&P) to reduce outliers.

The two P&P's that aid in this effort the most (from my perspective) are decreasing product variability by using statistical process control and making use of the internal reference material prior to testing. The first P&P is in the hands of the geosynthetic manufacturers and my hat is off to them. Over the past 15 years we have seen material variation drastically reduced when effective SPC systems are implemented.

The second P&P focuses on the requirement that each accredited test has an IRM or gauge standard (GS) IRM. IRM's are generally stockpiled geosynthetics whereas GS's are copper wire, springs, blocks, weights, etc. used to verify the equipment and technician prior to use. This practice works great and has helped many of us avoid outliers. It reminds me of looking in the back of a text book at the answer when I could not solve a math problem. We look forward to sharing our success and failure with IRM's. Lets all try to eliminate outliers before they even occur.

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Fax: (610) 522-8441
E-mail: gkoerner@dca.net

Activities within GCI (Certification)

GSI now has two separate inspector certification programs. One (begun in 2006) is focused on QA/QC of field inspection of waste containment geosynthetics and compacted clay liners. The other (begun on Dec. 1, 2011) is focused on MSE Wall, Berm and Slope field inspection. See our website at www.geosynthetic-institute.org under "certification" for a description and information on both of them. The new program is described as follows:

Geosynthetic Institute – Inspectors Certification Program (GSI-ICP) for Mechanically Stabilized Earth (MSE) Walls, Berms and Slopes Using Geosynthetic Reinforcement

At a GSI Workshop held on April 1, 2010 representatives from about 20-member organizations suggested the need for a program to help reduce the number of MSE wall, berm and slope failures. Our current data base in this regard is presently at 139 such failures. While inadequate design and construction were the root causes of these failures (both excessive deformation and/or actual collapse), both could have been avoided, or at least mitigated, by proper construction inspection. This two-way orientation by field inspectors (notification of design anomalies and correction of contractors errors) should help stem the failures of these structures going forward.

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

- Kent von Maubeuge – NAUE Group
- Mohammed Karim – Virginia DEQ
- Bob Sabanas – NTH Consultants
- John Conturo and Maria Tanase – AECOM, Inc.
- John Lostumbo – TenCate Geosynthetics
- Mike Yako – GEI Consultants
- Steve Poirier – Geosyntec Consultants
- Willie Liew – Tensar International
- Doug Clark – CEC Consultants
- Dick Stulgis – Geocomp, Inc.
- Frank Adams, Paul Whitty, Rafael Ospina – Golder Associates

- Daniel Alzamora - FHWA
- Sam Allen – TRI Environmental Inc.
- Greg Cekander – Waste Management Inc.
- Greg Fedak – CETCO Contracting Services

Our thanks go to them in this regard.

The requirements for those wishing to be certified are as follows:

1. 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 MSE walls, berms, or slopes using geosynthetic reinforcement.
2. The candidate must submit a completed application and be approved by the Geosynthetic Certification Institute to take the exam.
3. The candidate or his/her firm 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.
4. The candidate must successfully pass a written examination (70% of the 120 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.

The official launch of the program was on December 1, 2011 with a course and the examination afterward. As a result there are now seven (7) persons certified by GCI for the inspection of MSE Walls, Berms and Slopes.

While a field inspector cannot require proper design or tell 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 or Jamie Koerner at jrkoerner@verizon.net for questions or additional information.

The GSI Affiliated Institutes

It has long been realized that the information generated within the GSI group should have a timely outlet to all countries, and in all languages. To this end, GSI has created affiliated institutes in two countries (Korea and Taiwan), and potentially others in the future. These affiliated institutes are full members of GSI and are empowered to translate and use all available information so as to create similar institutes and activities in their respective countries.

GSI-Korea was formed on February 9, 1998 as a collaborative effort between FITI Testing and Research

Institute (a quasi-government organization) and INHA University (through its Geosynthetics Research Laboratory).

FITI is a 30-year old testing organization located in Seoul focusing on interlaboratory proficiency; environmental protection; safety and flammability; hazardous substances; in-house quality control; consumer protection; complaint analysis; quality marking; procurement; household and industrial applications; and materials approval. The geosynthetics testing group within FITI has twelve people (two with doctoral degrees) and 10 engineers. The geosynthetic laboratory is GAI-LAP accredited for 70 geosynthetic test methods. Dr. Jeonghyo Kim is the general manager within FITI's geosynthetics activities.

INHA University is located in Incheon and the geosynthetics laboratory is led by Professor Han-Yong Jeon. Dr. Jeon has 10-students working on geosynthetic-related projects and is extremely active both nationally and internationally.

GSI-Taiwan was formed on August 18, 2000 and is wholly contained within the National Pingtung University of Science and Technology in Nei Pu, Pingtung (southern Taiwan). It completely parallels GSI in that it has specific units for research, education, information, accreditation and certification. The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Dean of the R & D Office. GSI-Taiwan has an Taiwanese consortium of geogrid/geotextile manufacturers who work toward producing quality products according to the draft GRI geogrid specifications and the associated test methods. As such, GSI-Taiwan is a GAI-LAP accredited laboratory for 59 geosynthetic test methods. Dr. Hsieh has 10-students working on geosynthetic-related projects and is extremely active nationally and internationally. GSI Taiwan has hosted three very successful internal conferences to date and has also held a much broader one, namely, GSI-Asia in Taichung, Taiwan.

Items of Interest

1. Flood Management Involving Levees

According to an Associated Press report, the U.S. Corps of Engineers currently needs more than \$2 billion to repair levees, floodwalls, and river banks damaged just this year, not including recent flood damage caused by Hurricane Irene and Tropical Storm Lee. Record rainfall in the Upper Midwest this spring, combined with already full flood-protection reservoirs, led to record high water levels and levee overtopping (or intentional breaching) along the Missouri and Mississippi Rivers. Much more money is needed to upgrade

flood-protection structures across the county to withstand a 100-year or greater storm (see "Corps conundrum," CE News, June 2011, page 8).

2. Cities Working to Cover Reservoirs

An estimate cited in a paper for the American Water Works Association says there were about 750 open reservoirs containing treated drinking water. Recently, the Portland Water Bureau compiled a list including some in such cities as New York, Los Angeles, Baltimore, Seattle and Tacoma.

Plans are well along in most cities to comply with the EPA's rules, although it will take years to finish the work. In Los Angeles, for example, the estimate is 2022. In New York, city officials have asked the Obama administration for a waiver to allow the billion-gallon Hillview Reservoir to remain uncovered -- or at least to delay the compliance deadline for the \$1.6 billion project.

Phila. Inquirer July 10, 2011

3. Benefits of Fracking...

According to a study recently released by the New York State Department of Environmental Conservation, described as the draft of a "generic environmental impact statement," they anticipate that as many as 40,000 new gas wells will be drilled into New York's portion of the Marcellus Formation in the next three decades. While those operations are expected to create as many as 24,800 jobs, the state will incur "significant negative fiscal impacts" as a result of the work. Additional enforcement officers will be needed to ensure that drilling is conducted safely, and additional permitting staff will be needed to review well plans. More crews also will be needed to repair roads damaged by the heavy truck activity that the work will entail.

(ref. Civil Engineering, Nov. 2011)

GSI Note: The 2012 Sagamore Conference will have a special session on shale gas extraction at its annual conference <www.nyfederation.org>.

Announcing the 6th Edition of the Book "Designing With Geosynthetics"

Thirty-years ago while contemplating "Designing With Geosynthetics" I never dreamed that there would be a sixth-edition and yet here we are but not without some major changes. Back then, I had experience with writing textbooks for all of the major technical book publications (John Wiley and Sons, McGraw-Hill and Prentice-Hall) and decided on the latter which today is Pearson Publishing Co. It was a good experience since their editors were fully familiar with technical books containing figures, tables, example problems, S.I. units, equations, Greek symbols, etc., etc. The

typed manuscripts always came out in book published form looking fantastic. They also had a sales department which visited all colleges and universities greatly aiding in the adoption process.

As with many cutting-edge technical areas (geosynthetics being no exception) new information and products required revisions and successive editions followed with the status of all previous editions being as follows:

Edition	Published	Pages	Sales
First	1986	424	3197
Second	1990	652	2645
Third	1994	783	4686
Fourth	1998	761	5460
Fifth	2005	796	3500

Two years ago, however, I was informed by the book publisher that sales were insufficient for a sixth edition. This was a surprise since plans were already underway! Since the price was \$150 per copy, however, I rationalized that a different publisher might even be an advantage.

After searching for on-line electronic and self-publishing outlets, I decided on the Xlibris Company which appears to specialize in biographies and autobiographies and, as such, is very low-cost in that it prints its book orders on-demand.

The new sixth edition manuscript was sent to the publisher on April 5, 2011 with the hope that it would be ready for the Fall academic year. However, surprises were immediate. One was that Xlibris' books are smaller in size than a standard engineering textbook and would require two separate volumes. As it has come to be, there are four chapters in each volume, i.e.,

Vol. 1 - Geosynthetics, Geotextiles, Geogrids and Geonets

Vol. 2 - Geomembranes, Geosynthetic Clay Liners, Geofoam and Geocomposites

Another surprise is that their editors were completely unfamiliar with analytical and technical presentations. Each volume has been proofread five-times and the end result is yet to be seen. I certainly hope for the best in this regard. One issue, however, is that the book prices are very low!

Hardbound: Vol. 1 and Vol. 2 \approx \$34.00

Softbound: Vol. 1 and Vol. 2 \approx \$24.00

As with all previous editions there are homework problems at the end of each chapter and a solutions manual is available for those interested, e.g., faculty teaching a geosynthetics course. I would estimate that 20% is new from the previous edition particularly the inclusion of failure situations (and their avoidance),

sustainability information, new products and recent references.

Regarding adoption, faculty will have to work through the publisher directly, while individuals can order through the general on-line book sellers. When the book becomes available (hopefully) in January 2012 we will make attempts for wider distribution through organizations and societies. It is hoped that the success of previous editions extends into this sixth edition as well.

Bob Koerner

Upcoming GSI Events

- ASCE Webinars by RMK
Dec. 16, 2011 – Veneer Stability Design
Jan. 10, 2012 – Geosynthetics Used in Hydraulic Structures
Jan. 25, 2012 – MSE Walls
Feb. 8, 2012 – Overview of Geosynthetics
Contact: <https://asce.org/listwebinar>
- February 22-23, 2012
19th National Dam Safety Program
Emmitsburg, Maryland
Contact: mvashley@verizon.net
- GSI Courses
Geosynthetic Reinforced Retaining Wall Failures and Their Remediation
March 13, 2012

Construction Inspection of MSE Walls, Berms and Slopes
March 14, 2012 (Optional exam follows)

Geosynthetics in Waste Containment Liner and Cover Design
March 20, 2012

Quality Assurance/Quality Control of Geosynthetics Installation
March 21, 2012 (Optional exam follows)
Contact: mvashley@verizon.net
- NY Federation of Solid Wastes
May 21-23, 2012
Sagamore, New York
Contact: www.nyfederation.org
- 26th Central PA Geotech Conf.
October 24-26, 2012
Hershey, Pennsylvania
Contact: cbeenenga@gfnet.com

GSI's Member Organizations

We sincerely thank all of our sponsoring organizations. Without them, GSI simply could neither happen nor exist. The current GSI member organizations and their contact members are listed below. **Our newest**

members are ThermaGreen with Tim Walter/Blu Alexander/Ken vander Velden, Milliken & Co. with Randy Kohlman and Maccaferri with Massimo Ciarla and Pietro Rimoldi as contact persons. Thanks to all and welcome to GSI.

GSE Lining Technology, Inc.

Boyd Ramsey [BoD]

AECOM

Kevin McKeon/Ken Bergschultz/John Trast

U.S. Environmental Protection Agency

David A. Carson

E. I. DuPont de Nemours & Co., Inc.

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Oak Ridge National Laboratory

(c/o Savannah River Remediation LLC)

Amit Shyam

IN THE NEXT ISSUE

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