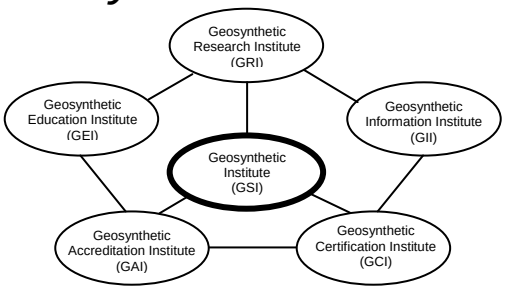
The GSI Newsletter/Report

Geosynthetic Institute



Vol. 25, No. 3 **September, 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.

25th Anniversary Year for the GSI Newsletter/Report

Activities of GSI's Directors and Board of Directors

1. On September 15, 2011 we had a "dry-run" for our new inspector certification program on MSE wall, berm and slope structures. We had ten participants who took the course and the subsequent examination. Inasmuch as they were all experts themselves, they passed the examination with grades in the 80%. Thus, both the course (with some adjustments) and the examination (also with some adjustments) are ready for "prime-time". Dates are set for December 1, 2011 and March 14, 2012. For details see the writeup under GCI in this Newsletter/Report and on the GSI website at www.geosynthetic-institute.org.
2. Accompanying the above course & exam we will have a separate and associated course on November 30, 2011 and March 13, 2012 on MSE structure failures and remediation. This topic is, of course, forcing the need for the inspector certification program.
3. Webinars are now on a cyclic schedule with four being given regularly and hosted by ASCE. The topics presently are GS overview, MSE walls, veneer stability, and waterproofing of hydraulic structures. Each are one-hour long and information and registration is on-line (www.asce.org/webinars).
4. GSI has a new employee by name Dr. Connie Wong. She was a doctoral student of Prof. Grace Hsuan at Drexel University and has her expertise in assessing and evaluating lifetime of HDPE pipe. Connie is presently assisting Bob Koerner in computed-aided forensic analyses and George Koerner in laboratory testing.
5. There will be no GRI-Conference this year, but we are already making plans for GRI-25 thereafter. The item is under discussion presently.
6. The present BoD is as follows, along with their respective term ending dates.

IN THIS ISSUE

Term Ends 2011 (Elections will be this Fall)

- 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

Term Ends 2013

- David Jaros - Corps of Engineers (Government Agencies)
  e-mail: dave.l.jaros@usace.army.mil
- Rex Bobsein - Chevron Philips (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

   Data is being collected on a monthly basis. The timeline of the project calls for monitoring up to 10 years. This activity has been extended to an adjacent landfill to see how reproducible the data is with a slightly different waste mass.
3. **Flow Behavior of Fully Degraded Waste*** - A field project under sponsorship of GSI and Waste Management investigates the drainage of highly degraded MSW placed directly on leachate collection systems. The leachate collection materials consist of both natural soils and geosynthetic drains. The experimental setup has been dismantled and is presently being evaluated… more later.
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.
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 a GSI member organization.
6. **UV Exposure of Geogrids** - The UV-fluorescent exposure of four 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 several turf reinforcement mat fibers to assess their lifetime capabilities. They are presently being incubated at 70°C and 80°C. Communication between manufacturers is ongoing.
8. **UV Exposure of Geotextiles** - We have just completed a UV study on a specific geotextile (for a member organization) used for three dimensional cell structures which are exposed to the atmosphere. The results for the particular geotextile and its specific formulation is 4.9 years for halflife of breaking strength and 4.1 years for halflife of breaking elongation, both at 20°C (68°F) average field temperature.
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 increased to 119 failures and continues to grow! The failures are either excessive deformation or collapses. We have scheduled one-day courses on this topic along with inspector training and development insofar as an inspectors certification program; see the calendar 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 are being reanalyzed by Dr. Connie Wong using the ReSSA Code and will be available shortly.
13. There are several specifications that are currently in an updating mode. These include LLDPE and LLDPE-R as well as some new specifications addressing erosion control products. We will keep all informed of progress in this regard.
14. **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 Geomembranes
    GM21 – EPDM 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 – High Strength Reinforcement Geotextiles

    Delayed or Off in the Distance
    GGXX – Bidirectional Geogrids
    GGXX – Unidirectional Geogrids
    GNXX – Geonet Drainage Composites
    GCXX – Other Drainage Geocomposites

    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.
15. **Other GRI Standards** - There are several GRI Standards in various forms of preparation. One involves spray-on geomembranes and the other vapor barriers. Contact George Koerner for the status of these efforts.

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 presented. This includes:

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

The Keywords Section contains about 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.

- 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 40 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:

- #36 – Inadequate Performance of Geotextile Filters Under Different and Challenging Field Conditions
- #37 – Geosynthetic Supported Base Reinforcement Over Deep Foundations
- #38 – A Data Base and Analysis of Geosynthetic Reinforced Wall Failures
- #39 – Methods of Stabilizing Excessively Deformed MSE Walls
- #40 – On the Preventon of Failures of Geosynthetic Reinforced MSE Walls and Recommendations Going Forward

Courses

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

#1 Geosynthetic Reinforced Retaining Wall Failures and Their Remediation **(NEW)**
November 30, 2011 and March 13, 2012

#2 Construction Inspection of MSE Walls, Berms and Slopes **(NEW)**
December 1, 2011 and March 14, 2012

#3 Geosynthetics in Waste Containment Liner and Cover Design
December 6, 2011 and March 20, 2012

#4 Quality Assurance/Quality Control of Geosynthetics Installation
December 7, 2011 and 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

$225/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

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 please contact us for complete addresses.

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	Deflocculants 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
rpage@lumite.com

13[A] - 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
eblond@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
Iarroyo@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@propeinc.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

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)
Erin Hensley – (720) 406-4806
ehensley@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 Chayaporenlert – 6638-636638
siripornc@gseworld.com

70[A] - RSA Geo Lab LLC (48 tests)
Raza Ahmed – (908) 964-0786
www.rsaglobal.com

71[B] - Plasticos Agricolas y Geomembranas S.A.C. (14 tests)
Cesar Augusto – 6370 (20 110811)
asistentecalidad1@pga.com.co

[A]Third Party Independent [C]Institute
[B]Manufacturers QC [D]Government

If you are interested in this program and would like a copy of the GAI-LAP directory, please advise accordingly. A directory is published annually in December 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:

I hope this message finds you well with another summer filled of happy memories. Please let this serve as a reminder that TRI will perform many future on-site audits for GAI-LAP going forward starting in 2012. Sam Allen, Richard Lacey and Joel Sprague have just spent a productive few days at GSI going through training for this task. We are looking forward to supporting them in a robust manner. As discussed in the introduction of the outsourcing, TRI will not audit third party laboratories or facilities in which a conflict of interest exists. Your feedback on this activity (as always) is greatly appreciated.

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

Activities within GCI (Certification)

GSI initiates it second Inspector Certification Program.

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 well over one hundred 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 will be on December 1, 2011 with the initial course given during the day and the examination immediately following. For those persons experienced in MSE inspection it should be mentioned that the course is not mandatory for the taking of the examination. This will be followed by an identical program on March 14, 2012. Courses and examinations will be at GSI located close to the Philadelphia International Airport. See the GSI website at www.geosynthetic-institute-org under “certification” for details and registration.

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

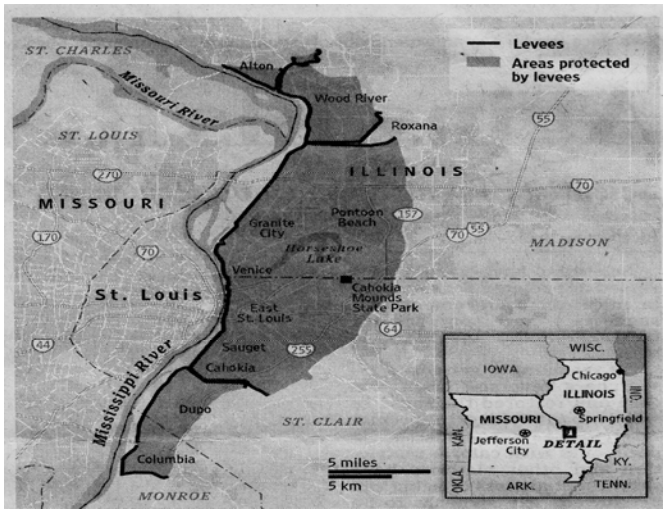
1. **Designers Beware**
   Perhaps the greatest unknown challenge to any designer is his/her uncertainty in predicting live loads caused by naturally-occurring events, e.g., floods, snow-loads, wind events, seismicity, etc. Those decisions, in turn, are influenced by climate change potential and the following table is of interest. It is authored by the National Academy of Engineering (NAE) and as-such represents a considerable body-of-knowledge.

Table 1 Information about Climate Change (manifestations of climate change in terms of extreme events that produce infrastructure risk for three time slices in the 21st century); ref. The Bridge, Fall, 2010

	Extreme Event	*Baseline (1971-2000)*	2020s	2050s	2080s
Heatwaves & Cold Events	# of days/year with maximum temperature exceeding:				
	90°F	*14*	23 to 29	29 to 45	37 to 64
	100°F	*0.4*	0.6 to 1	1 to 4	2 to 9
	# of heat waves/year	*2*	3 to 4	4 to 6	5 to 8
	Average duration (in days)	*4*	4 to 5	5	5 to 7
	# of days/year with minimum temperature below 32°F	*72*	53 to 61	45 to 54	36 to 49
Intense Precipitation & Droughts	# of days per year with rainfall exceeding:				
	1 inch	*13*	13 to 14	13 to 15	14 to 16
	2 inches	*3*	3 to 4	3 to 4	4
	4 inches	*0.3*	0.2 to 0.4	0.3 to 0.4	0.3 to 0.5
	Drought to occur, on average	*~once every 100 yrs*	~once every 100 yrs	~once every 50 to 100 yrs	~once every 8 to 100 yrs
Coastal Floods & Storms	1-in-10 yr flood to reoccur, on average	*~once every 10 yrs*	~once every 8 to 10 yrs	~once every 3 to 6 yrs	~once every 1 to 3 yrs
	Flood heights (in ft) associated with 1-in-10 yr flood	*6.3*	6.5 to 6.8	7.0 to 7.3	7.4 to 8.2
	1-in-100 yr flood to reoccur, on average	*~once every 100 yrs*	~once every 65 to 80 yrs	~once every 35 to 55 yrs	~once every 15 to 35 yrs
	Flood heights (in ft) associated with 1-in-100 yr flood	*8.6*	8.8 to 9.0	9.2 to 9.6	9.6 to 10.5
	1-in-500 yr flood to reoccur, on average	*~once every 500 yrs*	~once every 380 to 450 yrs	~once every 250 to 330 yrs	~once every 120 to 250 yrs
	Flood heights (in ft) associated with 1-in-500 yr flood	*10.7*	10.9 to 11.2	11.4 to 11.7	11.8 to 12.6

Note: This table records details about extreme events elicited from the science panel to inform evaluations of risk to critical public and private infrastructure. Source: Table 2 in Appendix C in NPCC (2010b).

2. **High Water Impact on Levees –** Indicative of previous item is the impact on levees being overtopped around the world. The following is a case-in-point along the Mississippi River. *(ref. Wall Street Journal)*



Recap of Workshop on Engineered Barrier Performance Related to Low-Level Radioactive Waste, Decommissioning and Uranium Mill Tailings Facilities

The U. S. Nuclear Regulatory Commission's Offices of Nuclear Regulatory Research (RES) and the Federal and State Materials and Environmental Management Programs (FSME) held a *Workshop on Engineered Barrier Performance Related to Low-Level Radioactive Waste, Decommissioning and Uranium Mill Tailings Facilities* on August 3-5, 2010 in Rockville, Maryland. The workshop was coordinated with several States (e.g., Texas, South Carolina, Utah, Colorado, Washington, and New York) and Federal Agencies (e.g., DOE, EPA, USGS, and DOE National Laboratories).

The workshop objectives were to facilitate communication among Federal and State regulators and contractors, and selected experts, on current engineered barrier issues and technical and regulatory experiences; discuss lessons learned and new approaches for monitoring and modeling; prepare recommendations to address maintenance of engineered barrier performance over time; identify topics for future research and the potential need to update technical guidance.

The workshop focused on engineered landfill covers and bottom liners designed to isolate waste by impeding surface water infiltration into the waste systems and/or by retarding the migration of contaminants from the waste disposal site. The technical topics included engineered barrier performance, modeling, monitoring, and regulatory experiences at low-level radioactive waste, decommissioning, and uranium mill tailings sites.

Surprisingly, this three-day workshop had little exposure to laboratory and field experiences using geosynthetics. There were thirty-two presentations and only four of them (Phaneuf, Rowe, Bachus and G. Koerner) had experience with geomembranes and related geosynthetics. Essentially, all of the others focused on soil-only covers; mainly evapo-transpirative (ET) types. As seen in the workshop proceedings (they are available from the NRC) ET covers have been extensively studied theoretically, along with some laboratory evaluations and limited field testing.
We, at GSI, have concerns over the long-term performance of soil-only final covers; see, for example, Heerten, G. and Koerner, R. M. (2008), "Cover Systems for Landfills and Brownfields," Land Contamination and Reclamation, Vol. 16, No. 4, EPP Publications Ltd., United Kingdom, pp. 343-356. The effects of total settlement and particularly differential settlement of the underlying waste with respect to ET covers is rarely addressed. Additionally, many low-level radioactive sites are in arid or semi-arid locations and desiccation cracking is clearly a challenge. In more humid locations vegetative root growth as well as animal intrusion must be considered. Sudden periods of rainfall and infiltration from side slope saturation is yet another issue of concern.

We feel, and the case was made at the Workshop, that if one desires a long-term environmentally safe and secure final cover for any type of landfill it must include a geomembrane generally with an underlying geosynthetic clay liner, i.e., a composite GM/GCL barrier system is recommended. The extensive U. S. EPA study by Bonaparte, Daniel and Koerner, "Assessment and Recommendations for Improving the Performance of Waste Containment Systems," EPA/600/R-02/099, December 2002, 1039 pgs., shows that such geosynthetic-related liner systems perform excellently. Furthermore, there are many additional papers on covers (e.g., most recently at the 9th IGS Conference there are papers by Youngblood, Case, and Yako) relating to excellent long-term performance of geosynthetic barriers in landfill covers.

As an observation, there appears to be an apparent disconnect between U. S. EPA permitted covers for hazardous and nonhazardous waste landfills (the majority of which require geosynthetic barriers) and the U. S. NRC tendencies for low level radioactive waste covers particularly in arid regions going in the direction of soil-only covers. This tendency was quite evident in the workshop. GSI has done a survey (via Jamie Koerner) on the extensiveness of the topic wherein there are 3134 acres of buried radioactive (1242) and uranium mill tailings (1892) awaiting closure at the present time. See White Paper #18 on our website at www.geosynthetic-institute.org.

George R. Koerner

Upcoming GSI Events

- ASCE Webinars by RMK
  Sept. 19, 2011 – MSE Walls
  Sept. 21, 2011 – Overview of Geosynthetics
  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
- GSI Courses
  Geosynthetic Reinforced Retaining Wall Failures and Their Remediation **(NEW)**
  November 30, 2011 and March 13, 2012

Construction Inspection of MSE Walls, Berms and Slopes **(NEW)**
December 1, 2011 and March 14, 2012

Geosynthetics in Waste Containment Liner and Cover Design
December 6, 2011 and March 20, 2012

Quality Assurance/Quality Control of Geosynthetics Installation
December 7, 2011 and March 21, 2012
Contact: mvashley@verizon.net

- Dam Safety 2011 Conference
  September 25-29, 2011
  Aberdeen, Maryland
  Contact: www.damsafety.org/conference
- NY Fed. 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 ClosureTurf, Inc. with Michael Ayers, ThermaGreen with Tim Walter/Blu Alexander/Ken vander Velden and Milliken & Co. with Randy Kohlman 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.
John L. Guglielmetti/David W. Timmons
Federal Highway Administration
Silas Nichols/Daniel Alzamora
Golder Associates Inc.
Mark E. Case/Jeffrey B. Fassett/Paul Sgriccia
Tensar International Corporation
Joseph Cavanaugh
Colbond Geosynthetics
Richard Goodrum/Adrian Dobrat
Geosyntec Consultants
Steve Poirier
Syntec Corp.
Aigen Zhao
LyondellBasell Industries
Fabio Ceccarani/Melissa Koryabina
TenCate Geosynthetics
John Henderson/Chris Lawson
CETCO
James T. Olsta/Tim Rafter
Huesker, Inc.
Steven Lothspeich/Dimiter Alexiew
NAUE GmbH & Co. KG
Kent von Maubeuge [BoD]
Propex
Steve Thaxton/Judith Mulcay
Fiberweb, Inc.
Frank Hollowell/William Walmsley/Brian H. Whitaker
NTH Consultants, Ltd.
Rick Burns/Robert Sabanas
TRI/Environmental Inc.
Sam R. Allen [BoD]
U. S. Army Corps of Engineers
David L. Jaros [BoD]
Chevron Phillips Co.
Rex L. Bobsein [BoD]
Solmax Géosynthétiques
Robert Denis
Envirosource Technologies, Inc.
Douglas E. Roberts
CARPI, Inc.
Alberto M. Scuero/John A. Wilkes
Civil & Environmental Consultants, Inc.
Daniel Tolmer/Daniel P. Duffy
Agru America, Inc.
Paul W. Barker/Peter Riegl/Dee Strong
Firestone Specialty Products
Paul E. Oliveira/Christa K. Petzke
FITI (GSI-Korea)
Jeonhyo Kim/H.-Y. Jeon
Waste Management Inc.
Anthony W. Eith [BOD]/Greg Cekander
NPUST (GSI-Taiwan)
Chiwan Wayne Hsieh [BoD]
GeoTesting Express
W. Allen Marr/Richard P. Stulgis [BoD]
GEI Consultants
Michael A. Yako
GSE Chile, S.A.
Mauricio Ossa
Atarfil, S. L.
Mario Garcia Girones/Emilio Carreras Torres
Republic Services Inc.
Joe Benco/Tony Walker
GSE Europe
Stefan Baldauf/Catrin Tarnowski
CETCO Contracting Services
Archie Filshill
Raven Industries, Inc.
Gary M. Kolbasuk [BoD]
CTI and Associates, Inc.
Te-Yang Soong/Kevin Foye
Advanced Earth Sciences, Inc.
Kris Khilnani/Suji Somasundaram
Carlisle Syntec, Inc.
Randy Ober/Krista Gonzalez/Julie Sitch

ASSOCIATE MEMBERS

Infiltrator Systems, Inc.
Ben Berteau/Brian Copus
EPI, The Liner Co.
Daniel S. Rohe/Mark Wolschon
Vector Engineering, Inc.
Monte Christie
Weaver Boos Consultants, Inc.
Mark Sieracke
Aquatan (Pty) Ltd.
Piet Meyer
PRS Mediterranean Ltd.
Arik Nagler
Jones Edmunds, Inc.
Donald E. Hullings
The Mannik & Smith Group, Inc.
John S. Browning III/Francis J. Biehl
Plasticos Agricolas y Geomembranes, S.A.C.
Jhoana Carolina Diaz Martinez
Afitex-Texel
Pascal Saunier
EVAL Americas (Kuraray)
Robert Armstrong
In-Line Plastics
Mark Williams
Bombay Textile Research Institute
A. N. Desai
BASF Corporation
Chris Fagouri/Ralph Maier
ClosureTurf
Michael Ayers
ThermaGreen
Tim Walter/Blu Alexander/Ken vander Velden
Milliken & Co
Randy Kohlman

Delaware Solid Waste Authority
Anne Germain
Nebraska Department of Environmental Quality
Gerald Gibson
New York State Dept. of Environmental Conservation
Robert J. Phaneuf
Maine Department of Environmental Protection
David E. Burns
New York State Department of Transportation
Robert Burnett/James Curtis
California Water Resource Control Board
Leslie Graves/Ed Wosika
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
Jay Swihart
Michigan Dept. of Environmental Quality
Margie Ring/Xuede (Dan) Qian
Environment Agency of U. K.
Rob Marshall
Florida Dept. of Transportation
Mario Paredes
National Design, Construction & Soil Mechanics Center
Stephen D. Reinsch
Virginia Dept. of Environmental Quality
Donald Brunson
Massachusetts Dept. of Environmental Protection
Paul Emond
Philadelphia Water Department
Vahe Hovsepian
Oak Ridge National Laboratory
(c/o Savannah River Remediation LLC)
Amit Shyam

IN THE NEXT ISSUE

- Activities of the GSI Directors and Board
- Overview of GRI (Research) Projects
- Activities within GII (Information)
- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- The GSI Centers-of-Excellence
- Items of Interest
- Organizational Structure of GSI and its Board of Directors
- GSI's Member Organizations