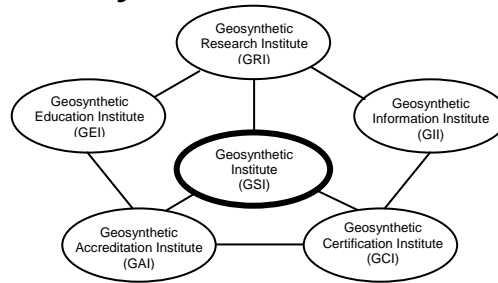


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 22, No. 3

September 2008

This quarterly newsletter, now in its 22nd 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.

Activities of the Institute Directors & GSI Board of Directors

1. We have awarded \$10,000 stipends to five graduate students doing geosynthetics-related research. They are as follows and some detail is provided later in this Newsletter/Report.

Virginia Tech University
Michael P. McGuire

Drexel University
Wai-Kuen (Connie) Wong

RWTH Aachen University
Axel Ruiken

National Technical University of Athens
Elena Kapogianni

The University of Kansas
Xiaoming Yang

2. Note that we no longer will promote Centers-of-Excellence at different universities since we are now funding students directly via the GSI Fellowship program as just mentioned.
3. The "Landfill Berm" sessions at the Global Waste Management Symposium in Colorado on September 9, 2008 were very successful with about 150 people in attendance. The papers presented are available as GRI Report #35 and a CD is available. Please advise in this regard.

NOTICE: Due to the increasing cost of printing, shipping and handling, this Newsletter/Report will be made available on our Home Page at www.geosynthetic-institute.org. It is in the open section under the heading "Newsletter/Report". Please share it with your friends and colleagues.

4. The GRI-22 Conference on the theme "It's All in the Details" is set for Salt Lake City on Friday, February 27, 2009. It will be held in conjunction with Geosynthetics '09.
5. The GSI Board of Directors elections will begin shortly. Three positions are available for balloting. They are the following:

- Consultants and Testing Labs – currently held by Dick Stulgis of GeoComp/GeoTesting Express
- Geomembranes and GCLs – currently held by Gary Kolbasuk of Raven Ind.
- At-Large currently held by Mark Sieracke of Weaver Boos Consultants

The At-Large position will transfer to a second International Member as recently approved by the BoD and membership.

IN THIS ISSUE

- Activities of the GSI Directors and Board
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- The GSI Affiliate Institutes
- GSI Fellowships
- Items of Interest
- Geosynthetics; A Key Toward Sustainability
- Upcoming Events
- GSI's Member Organizations

6. Don't hesitate to contact us at GSI, or any of your board members who are as follows:

Term Ends 2008

Dick Stulgis - GeoTesting Express (Consultants and Testing Laboratories)

Gary Kolbasuk - Raven (Geomembranes and GCLs)

Mark Sieracke - Weaver Boos Consultants, Inc. (At-Large)

Term Ends 2009

Tony Eith (Chairman) - Waste Management Inc. (Owners and Operators)

Boyd Ramsey - GSE Lining Technology, Inc. (Geotextiles and Geogrids)

Sam Allen - TRI/Environmental, Inc. (At-Large)

Term Ends 2010

David Jaros - Corps of Engineers (Government Agencies)

Paul Oliveira - Firestone bp Inc. (Resin Producers)

Kent von Maubeuge - NAUE GmbH & Co. KG (International)

Overview of GRI Projects (Research)

Each issue of our Newsletter/Report provides a brief glimpse and update of current GRI research projects. 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>.

1. **Stress Cracking of Geomembranes and Geopipe*** - In addition to Grace Hsuan's ongoing evaluations of HDPE geomembranes, she is presently focusing on HDPE drainage and duct pipe mainly for the Florida DOT. The goal for both geomembranes and geopipe is to include technically viable test methods and limiting values for inclusion in generic specifications.
2. **Durability of Polypropylene Geotextile Fibers** - Incubation at temperatures of 75, 65 and 55°C in high oxygen pressure containers is ongoing using PP-woven geotextile fibers. This study periodically measures changes in density, dimensions, mass, morphology, strength, elongation, modulus, melt index, OIT and carbonyl content. Dr. Hsuan is in charge of the project.
3. **In-Situ Temperature Monitoring of Liner and Cover Geomembranes in Dry and Wet Landfills*** - Dr. 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 updated into its 14th-year and has been presented at the Global Waste Conference in September, 2008.

4. **Bioreactor (aka, Wet) Landfill Behavior and Properties*** - One of the landfill cells mentioned in Item 3 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 for 5 to 10 years. This activity will now extend to an adjacent landfill to see how reproducible the data is with a slightly different waste mass. It was also presented at the Global Waste Conference in September.

5. **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 systems consist of both natural soils and geosynthetic drains. The project is now in its third year and is at a landfill in the Philadelphia area. It was our third paper at the Global Waste Conference in September.
6. **Hydrostatic Creep Puncture of Geomembranes*** - A series of tests using 600 g/m² protection geotextiles on 1.5 mm thick HDPE geomembranes is being evaluated; the time is currently 10-years. The four-test setups use truncated cone simulations of coarse subgrade stones against the geotextile protecting the underlying geomembrane. The behavior of the geomembranes under these tests is a combination of creep and stress relaxation. The purpose of these tests is to better define the creep reduction factor used in the design method. The setups are presently being dismantled and analyzed accordingly.
7. **Long-Term Benefits of Geotextile Separators*** - A full-scale field database of using geotextile separators on firm soil subgrades is being developed and maintained by Dr. George Koerner. Monitoring will be for 20+ years. The target sites are paved highways, driveways, parking lots, etc., where control sections without geotextiles are also available for comparison purposes. This database is national in scope. Included are sites which meet the following criteria:

- sites must have both geotextile and nongeotextile control sections
- known type of geotextile(s)
- known soil conditions
- known traffic conditions
- available hydrologic and environmental conditions
- capability of quantifying the original condition of the pavement surface vs. the aged condition... this will be accomplished visually as well as by using falling weight deflectometers.

There are currently 14-sites included in this program. If you have additional sites to add, please contact George at (610) 522-8440.

- 8. UV Exposure of Geomembranes*** - GSI is using UV-fluorescent devices to evaluate the projected exposed lifetime of many different types of geomembranes. Presently being incubated are HDPE, LLDPE, 5 fPPs, PVC, EPDM and PE-R.
- 9. UV Exposure of Geogrids** - We have recently begun the UV-fluorescent exposure of four different biaxial geogrids which are used at the exposed surfaces of welded wire mesh retaining walls. The geogrids are now up to 15,000 light hours and ongoing data is being generated and sent to the respective manufacturers.
- 10. UV Exposure of TRM Fibers** - We are also using UV-fluorescent exposure of several turf reinforcement mat fibers to assess their lifetime capabilities. Contact Bob Koerner if you have materials for inclusion into this effort.
- 11. 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
 GM21 – EPDM Geomembranes
 GM22 – Exposed Temporary Covers
 GM19 – Geomembrane Seams
 GT10 – Geotextile Tubes
 GT12 – Geotextile Cushions (ASTM & ISO)
 GT13 – Geotextile Separators (ASTM & ISO)
 GCL3 – Geosynthetic Clay Liners

Working Within Focus Groups

GCXX – TRMs for Erosion Control
 GTXX – High Strength Reinforcement Geotextiles

Delayed or Off in the Distance

GGXX – Bidirectional Geogrids
 GGXX – Unidirectional Geogrids

GNXX – Geonet Drainage Composites
 GCXX – Drainage Geocomposites

Tabled

GM18 – fPP & fPP-R Geomembranes

The complete 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.

Activities within GII (Information)

We are currently supporting 2-Home Pages. The first is the GRI Home Page which is accessed as follows:

<<<http://www.drexel.edu/gri>>>

This home page is very introductory as far as GSI members and associate members are concerned, and is meant to be promotional (for prospective students and potential institute members). It is probably only of nominal interest to most readers of this Newsletter/Report.

The second home page is the primary GSI Home Page and is accessed as follows:

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

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

- | | |
|-----------------------------------|---------------------------------|
| • Introduction to GSI | • Laboratory Accreditation |
| • Prospectus | • Answers to Your Questions |
| • Associate Membership (Agencies) | • Newsletter/Reports |
| • Members by Focus Groups | • Geosynthetics Links |
| • GSI Publications | • GSI Annual Meeting |
| • GRI Specs, Guides, White Papers | • GSI Focus Group Meeting |
| • CPReS | • GSI Short Courses |
| • CPHyS | • Inspector Certification Exams |

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 presented. This includes:

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

The keywords section contains about 25,000 citations of all 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 that we (and others we are told) use the most in our entire website.

Progress within GEI (Education)

Free CD

We sent a broadcast e-mail to everyone on February 25, 2008 stating that many power point presentations were available and would be sent upon request. About 20 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. We also have a new report on landfill berms (Report #35) available on CD.

Courses

We have scheduled the following sequence of courses for the winter season:

- December 8, 2008 and March 9, 2009
Geosynthetic Design in Waste Containment Systems
- December 9, 2008, and March 10, 2008
Quality Control/Quality Assurance of Geosynthetics

The above courses will be held at:

Geosynthetic Institute
475 Kedron Avenue
Folsom, PA 19033
(approx. 4.5 miles from Phila. International Airport)

Course Registration and Fee:

\$275/person for each one-day course (up to one month prior to course)

\$325/person thereafter

\$175/person – GSI Members

Contact: Marilyn Ashley (mvashley@verizon.net)

Activities within GAI (Accreditation)

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

It should be made clear, however, 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, usually ASTM or ISO 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. There are currently 178 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of September, 2008, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel and telephone numbers are also listed.

- 1^A - TRI/Environmental Inc. (118 tests)
Sam Allen -- (512) 263-2101
- 3^A - Golder Associates (44 tests)
Henry Mock -- (770) 492-8280
- 4^C - Geosynthetic Institute (116 tests)
George Koerner -- (610) 522-8440
- 6^A - GeoSystems Consultants (27)
Craig Calabria -- (215) 654-9600
- 8^B - Propex, Ringgold (19 tests)
Todd Nichols -- (800) 258-3121
- 9^B - Propex, Alto (10 tests)
Melvin Wallace -- (770) 532-9756
- 11^A - STS Consultants Ltd. (13 tests)
Bill Quinn -- (847) 279-2500
- 13^A - Precision Laboratories, CA (95 tests)
Ron Belanger -- (714) 520-9631
- 14^A - Geotechnics (61 tests)
J. P. Kline -- (412) 823-7600
- 19^A - HTS Inc. (42 tests)
Larry McMichael -- (713) 692-8373
- 20^A - GeoTesting Express, MA (58 tests)
Gary Torosian -- (978) 635-0424
- 22^B - CETCO Arlington Heights (13 tests)
Jim Olsta -- (847) 392-5800
- 23^B - CETCO Cartersville (10 tests)
Sid Weiser -- (706) 337-5316
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
- 25^B - Ten Cate, Pendergrass (11 tests)
Beth Wilbanks -- (706) 693-2226
- 26^B - Agru America Inc. (17 tests)
Grant Palmer -- (843) 546-0600
- 29^C - FITI Testing & Research Institute (70 tests)
Moon-Hyun Jeong -- (011-82-2-960-8034)
- 31^D - NYS Dept. of Transportation (9 tests)
John Remmers -- (518) 457-4704
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
- 34^B - GSE Richey Road (28 tests)
Jane Allen -- (281) 230-6726
- 37^B - GSE Chile (21 tests)
Mauricio Ossa -- 56-2 6010153
- 38^C - Sageos/CTT Group (82 tests)
Eric Blond -- (450) 771-4608

- 40^B - GSE Lining Technology Inc. (17 tests)
Vicky Parrott -- (843) 382-4603
- 41^A - SGI Testing Service, LLC (19 tests)
Zehong Yuan -- (770) 931-8222
- 42^C - NPUST (GSI-Taiwan) (49 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
- 43^A - Ardaman & Associates (18 tests)
George DeStafano -- (407) 855-3860
- 44^B - BBA Fiber Web, Inc. (9 tests)
Ken McLain -- (615) 847-7575
- 45^B - Ten Cate Malaysia SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
- 46^B - Bentofix Technologies (13 tests)
Colin Murphy -- (705) 725-1938
- 47^A - Precision Laboratories, TX (13 tests)
Mike Bishop -- (866) 522-0843
- 48^B - Tenax Corporation (9 tests)
Andrew Barker -- (410) 522-7000
- 49^B - Engepol Geossinteticos (20 tests)
George Nastas -- (55) 11-4166 3001
- 50^B - ADS, Inc. Hamilton (7 tests)
Terry McElfresh -- (513) 896-2065
- 51^B - Solmax International Inc. (17 tests)
Guy Elie -- (450) 929-1234
- 53^B - Polytex Inquique (13 tests)
Cristian Valdebenito -- 011 56 57 42 90 00
- 54^B - ADS, Inc. Finley (9 tests)
David Gonso -- (419) 424-8377
- 55^B - Atarfil Geomembranes (20 tests)
Isabel Merida Fernandez -- 34 958 439 278
- 56^B - Polytex Santiago (11 Tests)
Jamie Morales -- 56-2-627-2054
- 57^B - Ten Cate Cornelia (15 Tests)
Melissa Medlin -- (706) 778-9794
- 58^B - Propex Nashville (9 Tests)
Tim Smith -- (229) 686-5511
- 59^B - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
- 60^B - Polytex Lima (11 Tests)
Elias Jarufe -- 51-16169393

^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, 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:

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

The annual GAI-LAP meeting was held in Denver, Colorado USA in conjunction with ASTM D35 on June 16, 2008. Eighteen people attended representing 13 of 42 GAI-LAP labs (31%). The results of the meeting were as follows:

1. A brief introduction and background of the GAI-LAP program was discussed. (Incidentally, we never envisioned it would grow to sixty laboratories – Thanks to all).

- (a) Program started in 1995
- (b) Accredit only geosynthetic labs
- (c) ISO 17025 is our model
- (d) On-site audits (years 1, 5, 10 etc...)
- (e) Proficiency tests every year
- (f) Our Goal is to get Cv < 5
- (g) The newest member is:

- Industrial Polytex Ltda. (Lima, Peru) – Elias Jarufe

2. The Demographics of the current GAI-LAP organizations are summarized as follows:

13 independent labs
25 manufacturer QC labs
4 centers (research or government)
42 = total

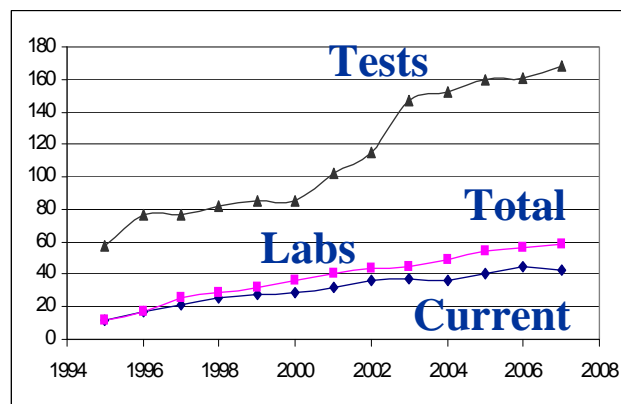
Also:

31 are GSI members
11 nonmember labs
(15 international labs)

There are 178 possible tests for accreditation (135 ASTM, 1 FTM, 8 GRI, 34 ISO). The number of accredited tests per lab are as follow;

5 min., 30 ave. 119 max.

The graph below shows the trends for both the number of possible accredited tests and the number of laboratories participating in the program.



The graph clearly shows that there has been a rapid rise of new test methods, with a near tripling of methods covered in a ten year period. The number of labs enrolled shows a steady increase in both overall labs and labs currently participating in the program.

3. Proficiency testing is still the hallmark of the GAI-LAP. Of the 1392 proficiency test results submitted this year, 21 first submittals were outliers representing 1.5% of the total. All outliers were closed by June 30, 2008. Results of the proficiency tests were shared at the meeting.

Electronic and hardcopy of the 2008 proficiency test results is available upon request.

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

- Propex Inc.
- GSE Inc.
- CETCO Inc.
- ADS Inc.
- TC Nicolon Inc.
- WM Inc. of North America

4. The GAI-LAP Customer Survey was again sent out to all program participants and the findings were reviewed at the meeting. The results were as follows;

- (a) 27% return; following are results (5 best to 1 poorest)
- (b) Information exchange = 4.1
- (c) Conflict resolution = 4.8
- (d) Proficiency Testing = 4.7
- (e) Directory and Internet = 4.0
- (f) Overall = 4.4
- (g) Overall results to date: 2007 (3.9), 2006 (4.0), 2005 (4.0), 2004 (4.1), 2003 (4.1), 2002 (4.2)

We had a very good year in 2008 and showed improvement across all categories. Individual comments that we find very helpful are listed below;

- Do we need a hardcopy directory (cost)? Yes, but it has limited distribution since the advent of the internet.
- Time-table is slipping. Can we make proficiency due date in March? Yes unanimously.
- Lab environmental control, particularly relative humidity, are not applicable for most of our tests. Could GAI-LAP change this in ASTM across the board of all D35 standards? A recommendation was so made at the Denver meeting of ASTM Committee D35.

Henry Mock of Golder Associates graciously conducted the GSI/GAI audit on January 9, 2008. Thank you Henry. Highlights of the audit included the following:

- GSI is operating its lab per ISO 17011
- Thirty-seven observations were made
 - Most pertained to editorial update required of the Quality Manual
 - Document Control update required
 - Equipment file need enforcement
 - Training was incomplete

- Corrective and preventative action files need more detail
- GSI closed all of its findings by April 15, 2008

5. Discussion about conflict resolution activities dominated the remainder of the meeting. Conflict resolutions were conducted on the following 14 test methods over the course of the past year;

(a) ASTM D638 versus ASTM D6693, GM Tensile

- Problem with specimen preparation
- Extensometer usage
- Analysis of data



(b) ASTM D1004, 90 degree tear

- Specimen preparation
- IEEE interface problems
- Grips, balance greater than 10% load range of most geomembranes



(c) ASTM D1204, dimensional stability

- Traceability
- Specimen preparation
- MD vs XMD



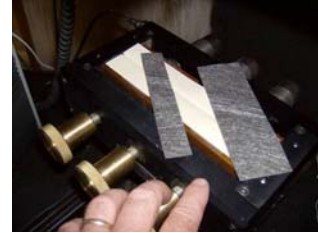
(d) ASTM D1238 Melt Flow Index

- Cleaning agents
 - Oxidize
 - Lubricate
- Orifice needs to be plumb



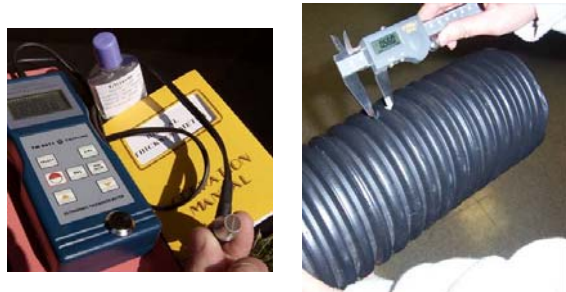
(h) ASTM 5035, GT Strip Tensile

- Specimen preparation options affect results
- One versus two inch wide
- This effect is particularly significant with nonwoven geotextiles
- Need to specify method and procedure



(e) ASTM D2122, Pipe Dimensions

- Ultrasonic versus Micrometer resulted in new GRI-GP3 standard



(i) ASTM D5885, HP OIT by DSC

- Specimen preparation effects results
- Need to specify methods & procedure
- Options include plaqueing, milling, cutting surface or cutting cross section



(f) ASTM D4595, WWT GT

- High strength geotextile
- Calibration curves
- Poor specimen preparation

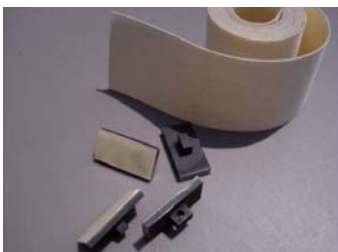


(j) ASTM D5995, Core Thickness

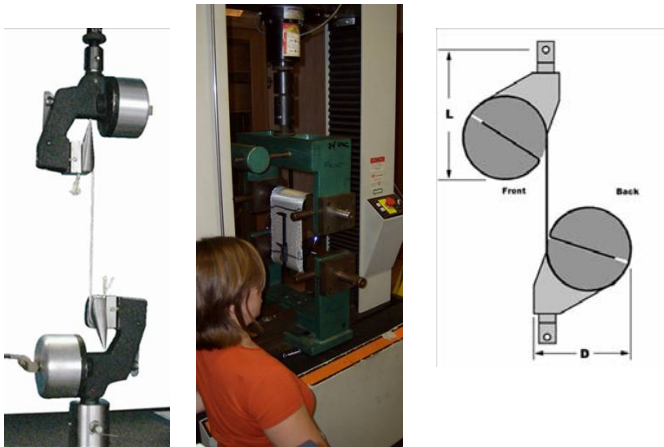
- Educated search pattern

(g) ASTM D4632, Grab Tensile Geotextiles

- Padding influences results
- Grip face opinions include flat, serrated steel and rubber
- Manual versus auto grips



(k) ASTM D6637, Geogrid Tensile



There is a large difference between testing a fiber, a yarn bundle and a wide width test specimen. It is inappropriate to test a fiber and then use an algorithm to compute the UTS of a geotextile or geogrid.

(l) ASTM D6693, Tensile

- Density
- One tests LLDPE and HDPE at different speeds
- Speed
- Analysis



6. Request from TRI/Environmental to accredit two field erosion control performance tests. As you can see from the following photos these tests are intense, large and complex.

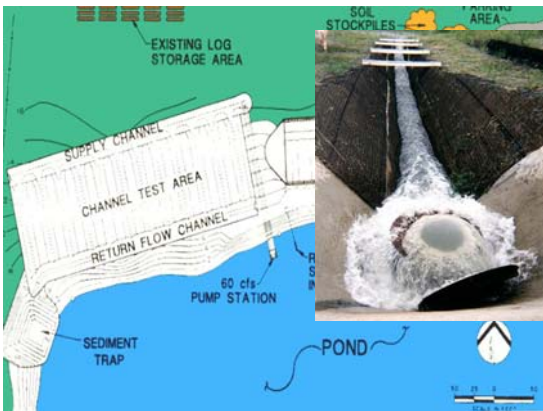


Figure 1. ASTM D6460-07 Standard Test Method for Determination of Rolled Erosion Control – Product (RCEP) Performance in Protecting Earthen Channels from Stormwater.

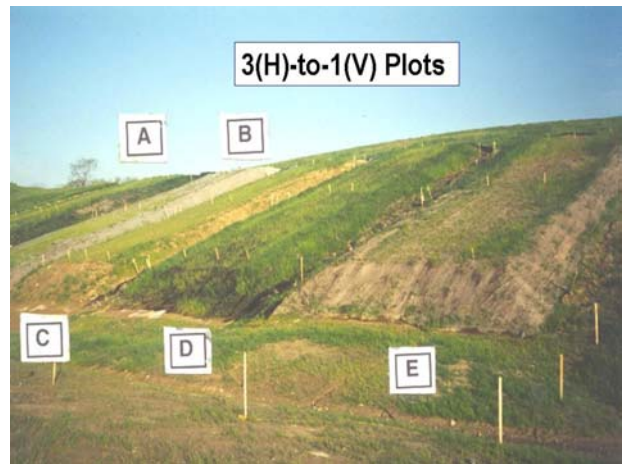


Figure 2. ASTM D6459-07 Standard Test Method for Determination of Rolled Erosion Control – Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion

After much discussion, it was decided to include such tests in the GAI-LAP repertoire even though they are not lab tests and GSI does not plan to run these tests internally.

7. The open discussion portion of the meeting was highlighted by the following housekeeping items;
 - (a) The next GAI-LAP annual meeting will be held in June 2009 in conjunction with ASTM D-35 in Vancouver, BC Canada.
 - (b) GAI solicited manufacturers for geosynthetic materials for 2009 proficiency testing.
 - (c) GSI requests a volunteer auditor for 2009.
 - (d) Note that each lab can add up to seven tests per year.
 - (e) The directory is kept current on our home page:

www.geosynthetic-institute.org

It is a pleasure working with you and thanks for participating in the GAI-LAP program. If you have questions, please call to discuss.

George Koerner

Activities within GCI (Certification)

Due in part to the active interest by many GSI members and associate members we give the outcomes of the Inspectors Certification Program as of March, 2008. The table following gives the pass/fail statistics by year as well as insight as to the impact of taking a course before the written examination. In looking at the data it appears as though we are not "teaching-the-exam" and, if anything, there is an inverse correlation; no comment in this regard...

Year	Course Situation	Geosynthetic Materials		Compacted Clay Liners	
		No. of people taking the exam	No. of people failing the exam	No. of people taking the exam	No. of people failing the exam
2006	GSI Course	34	0	27	5 (18%)
	Other Course	59	3 (5%)	57	4 (7%)
	No Course	48	2 (4%)	44	3 (7%)
	TOTAL	141	5 (3%)	128	12 (9%)
2007	GSI Course	46	9 (19%)	38	6 (16%)
	Other Course	18	2 (11%)	18	3 (16%)
	No Course	18	0	17	3 (17%)
	TOTAL	82	11 (13%)	73	12 (16%)
2008 (to date)	GSI Course	14	3 (21%)	13	3 (23%)
	Other Course	0	0	0	0
	No Course	17	3 (18%)	16	1 (6%)
	TOTAL	31	6 (19%)	29	4 (14%)
2006- 2008 (to date)	GSI Course	94	12 (13%)	78	14 (18%)
	Other Course	77	5 (6%)	75	7 (9%)
	No Course	83	5 (6%)	77	7 (9%)
	TOTAL	254	22 (9%)	230	28 (12%)

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 Director of the Computer Center. 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 32 geosynthetic test methods. Dr. Hsieh has 10-students working on geosynthetic-related projects and is extremely active nationally and internationally. GSI Taiwan has hosted two very successful conferences to date and has plans for another, followed by a broader conference for Southeast Asia.

GSI Fellowships

As mentioned in Item #1 on the opening page of this Newsletter/Report we have awarded five GSI Fellowships in the amount of \$10,000 for research in geosynthetics.

The students are all doctoral candidates doing research in geosynthetics. From a worldwide solicitation of proposals the following five were selected. Their full proposals are on our website at www.geosynthetic-institute.org; click on "GSI Fellowships and Projects".

University	Advisor	Student	Topic
Virginia Tech Univ.	George Filz	Michael McGuire	Geosynthetically reinforced pile supported embankments
Drexel Univ.	Grace Hsuan	Connie Wong	Durability specification development for corrugated HDPE pipe
RWTH Aachen	Martin Ziegler	Axel Ruiken	Geogrid behavior when used in wall and slope applications
Univ. of Athens	Michael Sakellari	Elena Kapogianni	Geosynthetic reinforced soil slope stability under seismic conditions
Univ. of Kansas	Jie Han	Xiaoming Yang	Geocell behavior when used to reinforce aggregate bases

Their reports are due on or before June 30, 2009 and, pending appropriate progress, they can reapply for a second and even a third year. We will begin a new solicitation on July 15, 2009. In the steady state after the third year we expect to be supporting 12 to 15 students per year. Funding for this program comes from the GSI endowment fund.

Items of Interest

1. **The American Society of Civil Engineers (ASCE) position on Metrication** (from *Civil Engineering*, Sept. 2008)

As adopted by ASCE's Board of Directors on April 16, 1994, ASCE's Policy on Metrication reads as follows:

The American Society of Civil Engineers (ASCE) will carry forward the following program with respect to metrication:

Support actively the conversion to the metric SI (Le Systém International d' Unités) in civil engineering practice and research.

Recommended that no customary or old metric units be incorporated into the SI.

Implement the use of SI units in all ASCE publications.

Adopt the current edition of ASTM's standard practice guide for SI (E380) for ASCE use.

Encourage civil engineering schools to stress the use of SI units in instruction and in all books and instructional materials.

Issue

With the primary exception of the United States, the nations of the world have implemented the SI. As a result, the United States is not in the mainstream of international measurements and is becoming less able to compete in the world markets.

Rationale

A section on metrication was included in the 1988 Omnibus Trade and Competitiveness Act, PL 199-418 (August 23, 1988) that modified Title 15—Commerce and Trade, Subchapter I—Metric Conversion, of the U.S. Code. The law declares it is the policy of the United States to convert to metric (SI) units by 1992 to strengthen the position of U.S. firms in international markets and directs federal agencies to establish guidelines to carry out the policy and to report annually in budget submissions on actions taken and planned for conversion to metric.

2. **The word has a water shortage, not a food shortage**

(from *the Economist*, September 20, 2009)

As the world's population grows and incomes rise, farmers will need a great deal more water to keep

everyone fed: 2,000 more cubic kilometers a year by 2030, according to the International Water Management Institute (IWMI), a research centre, or over a quarter more than they use today. Yet in many farming regions, water is scarce and likely to get scarcer as global warming worsens. The world is facing not so much a food crisis as a water crisis, argues Colin Chartres, IWMI's director general.

The solution, Mr. Chartres and others contend, is more efficient use of water or, as the sloganeers put it, "more crop per drop". Some 1.2 billion people, about a fifth of the world's population, live in places that are short of water. Farming accounts for roughly 70% of human water consumption. So when water starts to run out, as is happening in northern China, southern Spain and the western United States, among other places, farming tends to offer the best potential for thrift.

3. **Arizona canal project could supply water to 500,000 homes**

(from *Engineering News-Record/The Sun*, Yuma, AZ)

One of the largest water conservation projects in the U.S. is under way in the Arizona desert, where construction crews are replacing a 23-mile section of the All American Canal, a 70-year-old channel just north of the Mexican border. The canal, which carries more than three million acre-feet of water annually from the Colorado River to the Imperial Valley, seeps badly in the sandy dunes around Yuma, Ariz., losing enough water to supply the needs of 500,000 households in Southern California. The canal's new section, lined in concrete with a geomembrane, is expected to be completed in late 2010 at a cost of about \$285 million.

Geosynthetics; A Key Toward Sustainability

Papers from two recent conferences prompted our thoughts vis-à-vis the important role that geosynthetics can (and should) play toward sustainability. The first conference was the 4th European Geosynthetics Conference (EuroGeo4) held in Scotland September 7-10, 2008. The paper by Belton, et al.⁽¹⁾ hit the sustainable issue head-on by illustrating how geotextiles and geogrids save large quantities of natural materials, mainly stone aggregates for highways, railroads, parking lots, building foundations, etc. They also describe the use of "site won" materials such as the use of on-site soils for use in walls and slopes rather than using imported sands and gravels.

In addition they bring into context the carbon footprint of both materials and the processes involved in obtaining these materials, e.g., transportation from quarries to construction sites.

In the same conference, Robinson and Quirk⁽²⁾ present details of the U.K.'s Aggregate Levy tax in the amount of £1.60 per tonne. This incentive should readily propel the widespread use of geosynthetics for the same applications as just mentioned. In this context geosynthetics could even be considered to be a *negative cost* material. Interestingly, the intent of this tax was to increase the use of recycled materials but it appears to more immediately play into the use of geosynthetics; to all of our advantage. Robinson and Quirk give several tables of aggregate thickness saved using geogrids in highway base courses. They also illustrate aggregate savings when using geodrains, fin drains and geocomposites in walls and bridge abutments. Lastly, they describe the many uses of these drainage geosynthetics in waste containment. Landfills require drainage of leachate at their base, drainage of water at the surface, and sometimes drainage within the waste mass itself.

A second conference, the Global Waste Management Symposium was held at Cooper Conference Center in Colorado on exactly the same days as EuroGeo4. At this conference there was a session on "Sustainable Waste Management and Climate Change". The papers were obviously focused on methane gas capture and its use for power co-generation, but two other papers brought carbon credits into landfill situations directly. Mailet⁽³⁾ described the use of carbon credits to finance solid waste projects in developing countries and Welsh⁽⁴⁾ in his keynote address presented the trading of carbon credits. Interestingly, one ton of carbon presently is valued, and trades at, \$40 on the Chicago Carbon Exchange. This reminded the writers of a comment from an audience participant at the GRI-21 Conference in Cancun this past February. He approaches small cattle farmers and offers to completely finance the building a concrete holding basins which have a geomembrane floating cover for encapsulation of the animal waste. As the waste rapidly degrades the methane is used to power a generator for on-farm use. *Everything is free to the farmer/rancher even the power usage.* What the entrepreneur wants is the carbon credits to sell or trade on the open market!

To us at GSI we feel that carbon footprints, carbon taxes and trading, and the entire sustainability effort can, and should, be a powerful incentive for using geosynthetics in myriad future applications.

- (1) Belton, J., et al. (2008), "Using Geosynthetics to Meet the Challenge of Improving Material Resource Efficiency," Proc. EuroGeo4, Scotland, Paper #128.

- (2) Robinson, P. N. J. and Quirk, C. M. (2008), "The UK Aggregate Levy and Its Implications to Geosynthetics," Proc. EuroGeo4, Scotland, Paper #80.
- (3) Mailet, B. K. (2008), "The Use of Carbon Credits to Finance Solid Waste Infrastructure Projects in Countries with Developing Economies," Global Waste Management Symposium, Cooper Conference Center, Colorado, (presentation only).
- (4) Welsh, M. (2008), "The Potential for National Carbon Emissions Trading to Reduce Greenhouse Gas Emissions," Global Waste Management Symposium, Cooper Conference Center, Colorado, (presentations only).

Robert M. Koerner

Upcoming Events

- December 8, 2008 and March 9, 2009
GSI Short Course
GS Design in Waste Containment Systems
GSI in Folsom (Philadelphia), PA
Contact: mvashley@verizon.net
- December 9, 2008 and March 10, 2009
GSI Short Course
QA/QC of Geosynthetics
GSI in Folsom (Philadelphia), PA
Contact: mvashley@verizon.net
- January 28-30, 2009
ASTM D35 on Geosynthetics
Atlanta, Georgia
Contact: csierke@astm.org
- February 25-27, 2009
Geosynthetics '09
Salt Lake City, Utah
Contact: bbwistrill@ifai.com
- June 17-19, 2009
ASTM Committee D35
Vancouver BC, Canada
Contact: csierk@astm.org

GSI's Member Organizations

We sincerely thank all of our sponsoring organizations. Without them, GSI simply could neither happen nor exist. The current GSI member organizations and their contact members are listed below. The newest member organizations are Intertape Polymer Group with Dohn Berger as the contact member, and Geosyntec Consultants with Steve Poirier as the contact member. Welcome and welcome back, respectively.

GSE Lining Technology, Inc.
Boyd Ramsey [BoD]

Earth Tech Consultants, Inc.
Kevin McKeon/Ken Bergschultz

U.S. Environmental Protection Agency
David A. Carson

E. I. DuPont de Nemours & Co., Inc.
John L. Guglielmetti/David W. Timmons

Federal Highway Administration
Jerry A. DiMaggio

Golder Associates Inc.
Mark E. Case/Jeffrey B. Fassett

Tensar International Corporation
Donald G. Bright/Joseph Cavanaugh

Poly-Flex, Inc.
James Nobert/George Yazdani

Colbond Geosynthetics
Joseph Luna/Wim Voskamp

Geosyntec Consultants
Steve Poirier

Tenax, S.p.A.
Aigen Zhao/Piergiorgio Recalcati

LyondellBasell Industries
Michael J. Balow/Fabio Ceccarani

TC Nicolon USA
John Henderson/Chris Lawson

CETCO
James T. Olsta

Huesker, Inc.
Steven Lothspeich/Dimiter Alexiew

NAUE GmbH & Co. KG
Georg Heerten/Kent von Maubeuge [BoD]

Propex
Scott Manning

STS Consultants
Jeff Blum/John Trast

Fiberweb, Inc.
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NTH Consultants, Ltd.
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TRI/Environmental Inc.
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U. S. Army Corps of Engineers
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Rex L. Bobsein

URS Corp.
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Solmax Géosynthétiques
Robert Denis

Envirosource Technologies, Inc.
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CARPI, Inc.
Alberto M. Scuero/John A. Wilkes

Civil & Environmental Consultants, Inc.
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Firestone Specialty Products
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Waste Management Inc.
Anthony W. Eith [BOD]/Greg Cekander

NPUST (GSI-Taiwan)
Chiwan Wayne Hsieh

GeoTesting Express
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GSE Chile, S.A.
Mauricio Ossa

Atarfil, S. L.
Mario Garcia Girones/Emilio Torres

Republic Services Inc.
Clarke Lundell

GSE Europe
Stefan Baldauf/Mike Everest

Precision Geosynthetics Laboratories
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Vector Engineering, Inc.
Vince Suryasmita/Richard Thiel

Weaver Boos Consultants, Inc.
Mark Sieracke [BoD]

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Morne Breytenbach/Piet Meyer

PRS Mediterranean Ltd.
Arik Nagler

Jones Edmunds, Inc.
Donald E. Hullings

Intertape Polymer Group
Dohn Berger/Trevor Arthurs

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Paul Emond

IN THE NEXT ISSUE

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- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
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- The GSI Centers-of-Excellence
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