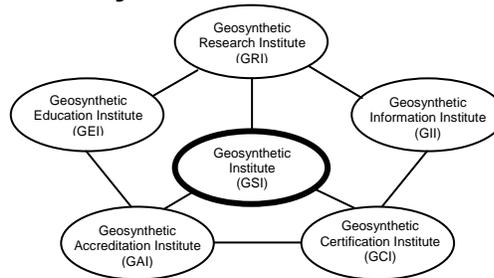


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 19, No. 1

March 2005

This quarterly newsletter, now in its 19th 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 mashley@dca.net.

Activities of the GSI Board of Directors & Institute Director

1. With GRI-18 and GeoFrontiers behind us (there is a brief writeup in this Newsletter/Report) we are organizing GRI-19 set for Las Vegas, December 14-16, 2005 in cooperation with NAGS. We will have the three morning sessions and NAGS has the three afternoon sessions.
2. Our three ½-day themes are (i) heap leach pads and mining, (ii) low permeability soil backfills for MSE walls and slopes, and (iii) a potpourri of geosynthetic topics.
3. In addition, we will have our Annual Meeting on the evening of Wednesday, December 14, 2005. The Focus Group Meetings will be announced.
4. The venture with GMA of providing technical answers on a internet e-mail site is operational. By going to [<GMAtechline@ifai.com>](mailto:GMAtechline@ifai.com) and posing your question you will get the best answer we can provide. [Of course GSI members can tap into any of us at any time and we will respond immediately].
5. As many of you are aware, we, and others, have been very active in trying to sort out some GCL issues. A draft White Paper was sent recently and we hope to have it finalized by the end of April.
6. By action of the GSI Board of Directors at its January 25, 2005 meeting, Dr. George R. Koerner was appointed "Director Designate of GSI". Sincere congratulations go to George!
7. Your board members are as follows. Please don't hesitate to contact them as need be.

NOTICE: This Newsletter/Report is mailed to the contact persons of the GSI member organizations (≈ 100 total). Obviously, we wish you would share it with colleagues and friends. Please recognize, however, that it is always available on our Home Page at www.geosynthetic-institute.org in the open section under the heading "Newsletter/Report".

Term Ends 2005

Dick Stulgis - GeoTesting Express

Jim Olsta - CETCO

Dave Suits - NY State DOT

Term Ends 2006

Tony Eith - Waste Management Inc.

Boyd Ramsey (Chairman) -

GSE Lining Technology, Inc.

At Large; Sam Allen - TRI/Environmental, Inc.

Term Ends 2007

David Jaros - Corps of Engineers

Rex Bobsein - Chevron/Phillips Co.

Kent von Maubeuge - Naue Fasertechnik GmbH

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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 write-ups. **Projects marked with an asterisk have been written up as short "in-progress" papers.** Grace can be reached at (610) 522-8440 or e-mail at <grace.hsuan@coe.drexel.edu>.

1. **Stress Cracking of Geomembranes*** - Dr. Grace Hsuan is project manager of our ongoing efforts to evaluate stress cracking of geomembrane resins, sheets and seams. In addition to her ongoing evaluations of HDPE geomembranes, Grace is now focusing on HDPE drainage and duct pipe. The goal for both geomembranes and geopipe is to include technically viable test methods and limiting values in generic specifications.
2. **Durability and Lifetime Prediction*** - This project is based on our previous 8-year long study on the lifetime prediction of HDPE geomembranes. George Koerner has set up 20 replicate columns each of which is subjected to a compressive stress equivalent to a 50-m high landfill. In each of the columns are the following:
 - (a) 1.5 mm HDPE geomembrane with no antioxidants (Stage B and C degradation will be evaluated)
 - (b) 140 g/m² needle punched nonwoven PP geotextile
 - (c) 140 g/m² woven slit film PP geotextile
 - (d) 90 kN/m woven multifilament PP geotextile
 - (e) 175 kN/m woven multifilament PP geotextileTemperatures are being maintained at 85, 75, 65 and 55°C and the samples are being removed on approximate 6-mo. intervals. Grace Hsuan and George Koerner are in charge of the project.
3. **Durability of Polypropylene Geotextile Fibers and HDPE Geogrid Ribs** - Incubation at temperatures of 75, 65 and 55°C in forced air ovens is ongoing using PP-woven geotextile fibers and HDPE geogrid ribs. 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.
4. **Durability of Polyester Geotextile Fibers and Polyester Geogrid Yarns** - PET geotextile

fibers and coated geogrid yarns are being incubated at temperatures of 65°C, 55°C and 45°C while being immersed in deionized water. Additional parameter variations are crystallinity, molecular weight and CEG content. This study periodically measures changes in mass, diameter, morphology, strength, elongation, modulus, molecular weight, crystallinity and CEG content. Dr. Hsuan is in charge of the project.

5. **In-Situ Temperature Monitoring of Liner and Cover Geomembranes in Dry and Wet Landfills*** - Dr. George Koerner is evaluating the in-situ temperature behavior of geomembranes and has installed 60± thermocouples for long term measurements in both a wet and dry municipal solid waste landfill in Pennsylvania. Presently data for 10-years is available. This is clearly the longest in-situ measurement project in all of geosynthetics.
6. **Bioreactor (aka, Wet) Landfill Behavior and Properties*** - The above temperature monitoring has segued into a major effort under sponsorship of GSI and Waste Management, Inc. The wet cell under investigation is at field capacity, hence it is a true anaerobic bioreactor. Dr. George Koerner is in charge of considerable monitoring which includes the following:
 - waste moisture content
 - waste temperature
 - leachate chemical analysis
 - waste gas analysis
 - perched leachate within the wasteData is being collected on a quarterly 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.
7. **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 are both natural soils and geosynthetic drains. The project has commenced this summer at a landfill in the Philadelphia area.
8. **Hydrostatic Creep Puncture of Geomembranes*** - The effect of sustained long-term hydrostatic and geostatic pressures on the puncture strength of geomembranes is an ongoing project. A series of tests using 600 g/m² protection geotextiles on 1.5 mm thick HDPE geomembranes is being evaluated; the time is currently 8-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.

Results are used in a puncture design method that has been published previously. The purpose of these current tests is to better define the creep reduction factors used in the design method.

9. 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 is proposed for up to 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 will be national and perhaps even international 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.

10. UV Exposure of Geomembranes* - GSI is using its new Xenon Arc device along with its two existing UV-fluorescent devices to evaluate the simulated outdoor lifetime of nine different types of geomembranes 2 HDPEs, LLDPE, 3 fPPs, 2 PVCs and PE-R. The effort is considered as part of GSI's Center for Polymers in Hydraulic Structures (CPHyS), but has relevancy in many other applications as well.

11. High Pressure Incubation for Lifetime Prediction* - Dr. Grace Hsuan has an ongoing National Science Foundation project on this topic. Five high pressure cells are involved: four are at 2.1, 3.5, 4.9 and 6.3 MPa and one is the control at atmospheric pressure. In the cells are HDPE geogrids, needle punched nonwoven PP geotextiles, and woven slit film PP geotextiles. They will be periodically retrieved and tested for OIT and tensile strength. Comparison will then be made to nonpressure incubation to assess the acceleration factor.

12. Generic Specifications - A major effort is ongoing with respect to the development of generic geosynthetic specifications. As described at our recent annual meeting, the current status of these specifications is as follows:

Completed

- GM13 – HDPE Geomembranes
- GM17 – LLDPE Geomembranes
- GM18 – fPP Geomembranes (Temporarily Suspended as of May 3, 2004)
- GM21 – EPDM Geomembranes
- GM19 – Geomembrane Seams
- GT10 – Geotextile Tubes
- GT12 – Geotextile Cushions
- GT13 – Geotextile Separators

Working Within Focus Groups

- GCXX – TRMs for Erosion Control
- GNXX – Biplanar Geonet Drainage Composites
- GCLXX – Geosynthetic Clay Liners

Delayed or Off in the Distance

- GGXX – Biaxial Geogrids
- GGXX – Uniaxial Geogrids
- GCXX – Drainage Geocomposites

The completed 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.

These specifications are available on a separate power point CD which shows photos of the test methods and can be used as a presentation to your clients and customers, as well as being an in-house training vehicle... don't hesitate to ask for a copy.

13. Technical Guidance Documents on QC/QA of Waste Containment Facilities - Drs. David Daniel and Bob Koerner have completed the Second Edition of this EPA project by greatly updating the original 1993 report. It will be published by ASCE Press, but if you want a preliminary copy on CD (≈ 390 pages) contact us accordingly.

14. The 5th Edition of Designing with Geosynthetics was taken to the printers in August, 2005. It will be published in mid-2005. To those who are interested, here is the track-record of this textbook over the years.

Edition	Date	Books Sold	Units
1	1984	3197	English only
2	1990	2645	English, SI in paren.
3	1994	4194	SI, English in paren.
4	1998	3500	SI only
5	2005	?	SI only

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 geosynthetics knowledgeable people 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 GSI Home Page (which is "terrific") 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
- Prospectus
- Associate Membership (Agencies)
- Members by Focus Groups
- GSI Publications
- GRI Specifications & Guides
- Laboratory Accreditation
- CPR&S & CPHyS
- Laboratory Accreditation
- Product Certification
- Newsletter/Reports
- Internet Courses
- Winter 2005 Courses
- Geosynthetics Links
- GSI Member Meetings
- Next GRI Conference

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 mashley@dca.net. When you get into this section, a treasure-trove of information is presented. This includes:

- GRI Test Methods
- GRI Reports (Summaries)
- 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 7500 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 site.

Progress within GEI (Education)

The following four (each 1-day long) courses will be offered at GSI in August, 2005. They are good and they are also inexpensive!

Course #1 - August 4, 2005

Geosynthetics in Transportation/Geotechnical Applications

Goal: This one-day course is focused on the design, testing and construction of geosynthetics used in transportation and infrastructure facilities such as paved highways, unpaved roads, railroads, walls, steep slopes, embankments, filters, drains, and erosion control. The geosynthetics utilized are the following:

- geotextiles,
- geogrids,
- geonets,
- geomembranes,
- GCLs, and
- geocomposites.

Course #2 - August 5, 2005

Geosynthetics in Reinforced Walls and Slopes incl. Computer Design

Goal: This one-day course is focused on the proper design and construction of reinforced retaining walls and steep soil slopes using geogrids or geotextiles. Included are the following:

- overview of concepts, aesthetics, costs, designs and performance,
- actual testing for tension, shear and transmissivity of geosynthetics,
- computer design using MSEWall® and ReSlope® - with Dr. Dov Leschinsky of the University of Delaware, and
- design of wall and slope drainage systems

Course #3 - August 11, 2005

Geosynthetics in Waste Containment Applications

Goal: This one-day course is focused on the proper design, testing, and construction of geosynthetics used in liner and cover systems for landfills, surface impoundments and waste piles. Included are the following geosynthetics:

- geomembranes,
- geotextiles,
- geonets,
- geogrids,
- geosynthetic clay liners,
- geocomposites, and
- geopipe.

Quality Control/Quality Assurance of Geosynthetics

Goal: This one-day course is focused on the quality control and quality assurance of geosynthetics as placed in permanent and/or critical applications. Specifications and testing are emphasized. It focuses on both the manufactured geosynthetics and on the installation processes. Applications are mainly in the waste containment area, i.e., landfills and surface impoundments, but applicability to walls, slopes, dams, canals, etc., will also be discussed. Included are the following geosynthetics:

- geomembranes,
- geosynthetic clay liners,
- geosynthetic drainage systems (geonets and geocomposites),
- vertical cutoff walls,
- ancillary materials & appurtenances.

All of these courses come with a complete set of notes, are fast-paced, extremely current, come with a great lunch, and are cheap! (\$100 for GSI members; \$200 for nonmembers). In addition, continuing education credits are given for each course!

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.

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. 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. These additions are twofold; ISO methods, and plastic pipe related methods. There are currently 157 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of March 2005, 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. (110 tests)
Sam Allen -- (512) 263-2101
- 3^A - Golder Associates (43 tests)
Henry Mock -- (770) 496-8280
- 4^C - Geosynthetic Institute (114 tests)
George Koerner -- (610) 522-8440
- 5^A - NTH Consultants, Ltd. (52 tests)
Debra Klinger -- (610) 524-2300
- 6^A - GeoSystems Consultants (27)
Craig Calabria -- (215) 654-9600
- 7^B - Synthetic Industries Inc., Chickamauga (10 tests)
Steve Thaxton -- (800) 258-3121
- 8^B - Synthetic Industries Inc., Ringgold (19 tests)
Toni Ruppert -- (800) 258-3121
- 9^B - Synthetic Industries, Inc., Alto (10 tests)
Melvin Wallace -- (770) 532-9756
- 11^A - STS Consultants Ltd. (13 tests)
Bill Quinn -- (847) 279-2500
- 13^A - Precision Laboratories (87 tests)
Ron Belanger -- (714) 520-9631
- 14^A - Geotechnics (61 tests)
Rick Lacey -- (412) 823-7600
- 18^A - EMCON/OWT (51 tests)
Rasheed Ahmed -- (845) 492-3170
- 19^A - HTS Inc. (42 tests)
Larry McMichael -- (713) 692-8373
- 20^A - GeoTesting Express, MA (45 tests)
Gary Torosian -- (978) 635-0424
- 22^B - CETCO Arlington Heights (13 tests)
Jim Olsta -- (847) 392-5800
- 23^B - CETCO Fairmount (10 tests)
Derek Reece -- (706) 337-5316
- 24^B - CETCO Lovell (10 tests)
Suze Wilkerson -- (307) 548-6521
- 25^B - TC Nicolon (10 tests)
Melissa Medlin -- (706) 693-2226
- 26^B - Agru America Inc. (16 tests)
Grant Palmer -- (843) 546-0600
- 27^B - Amoco Fabrics and Fibers Co. (14 tests)
Barbara Barr-Howell -- (770) 944-4718
- 29^C - FITI Testing & Research Institute (70 tests)
Moon-Hyun Jeong -- (011-82-2-960-8034)
- 31^D - NYS Dept. of Transportation (9 tests)
Dave Suits -- (518) 457-4704
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
- 33^D - Arizona DOT (5 tests)
Oscar Mousaui -- (602) 712-8200
- 34^B - GSE Richey Road (16 tests)
Jane Allen -- (281) 230-6726
- 35^B - GSE Hardy St. (12 tests)
Jimmy Youngblood -- (281) 230-6726
- 37^B - SL Limitada (16 tests)
Mauricio Ossa -- 56-2 6010153
- 38^C - Sageos/CTT Group (54 tests)
Eric Blond -- (450) 771-4608
- 40^B - GSE Lining Technology Inc. (14 tests)
Charles Miller -- (843) 382-4603
- 41^A - SGI Testing Service, LLC (18 tests)
Robert Swan, Jr. -- (770) 931-8222
- 42^C - NPUST (GSI-Taiwan) (32 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 - Polyfelt Geosynthetics SDN Bhd. (23 tests)
C. P. Ng -- (603) 519 28568
- 46^B - Bentofix Technologies (13 tests)
Pat Thiffault -- (705) 725-1938
- 47^A - Precision Laboratories (13 tests)
Ron Belanger -- (866) 522-0843

- 48^B - Tenax Corporation (9 tests)
Tim Bauters -- (410) 522-7000
49^B - Engopol Geosinteticos (20 Tests)
George Nastas -- (55) 11-4166 3001

^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:

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E-mail: gkoerner@dca.net

Activities within GCI (Certification)

We have an ongoing product certification program for all geosynthetics which have a generic specification. The program has as its target, conformance to a specific GRI specification such as GRI-GM13 for HDPE geomembranes. This specification has been in use for approximately 4 years with generally good reviews and considerable exposure. The specification is seen referenced in many project plans, specifications and quality assurance documents around the world.

The GCI certification program using this specification is based on ISO 9000 audits conducted on a 6-month cycle wherein the manufacturer's quality control plan and statistical data base are evaluated, along with sampling of the product. Upon testing by an accredited laboratory, the results are assessed and certification is granted, postponed or rejected. Certification carries with it the right to identify products as "GRI-Certified"; in this case "GRI-GM13 Certified". We are delighted to report that SL Limitada of Chile is approved to mark its HDPE geomembrane.

GRI-GM13 Certified

Our sincere congratulations go to the following people who are the principals involved:

Enrique Saavedra - General Manager
Mauricio Ossa - Technical Manager
Michael Mathieson - N.A. Representative
(WASEW Technologies Inc.)

The GSI Affiliate 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 many 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. We introduce these institutes to you in this Newsletter/Report and will present ongoing details of their respective activities.

GSI-Korea was formed on February 9, 1998 as a collaborative effort between FITI Testing and Research Institute (a quasi-government organization) and Chonnam National University (through its Department of Textile Engineering).

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. It employs 120 people (8 with doctoral degrees) and 42 engineers. The geosynthetics testing group within FITI has 12 people (2 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.

Chonnam National University is located in Kwangju (southern Korea) and the geosynthetics laboratory within the Textile Engineering Department 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. The ongoing efforts of both FITI and Chonnam will be described in future Newsletter/Reports.

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. The ongoing efforts of GSI-Taiwan will be described in future Newsletter/Reports.

The Geosynthetic Institute Centers-of-Excellence

1. The Center for Polymeric Reinforced Structures (CPReS) was formed on Dec. 27, 2002 for the purpose of proper use of geosynthetics in walls, slopes, and foundation reinforcement. It involves Dov Leshchinsky of Delaware, Grace Hsuan of Drexel and George Koerner of GSI as Co-Directors. The mission statement and goals are available on the GSI Home Page at <geosynthetic-institute.org>. Ongoing projects are the following:

- (a) Dov Leshchinsky is modifying and incorporating two important aspects of reinforced walls into his widely-used computer program "MSEWall". They are; design to accommodate short reinforcement lengths when full space is unavailable, and the incorporation of drainage geocomposites in accommodating low permeability backfill soils. The first topic was presented at GRI-17 in Las Vegas and a paper and report to GSI is available. The second topic is ongoing.
- (b) Grace Hsuan is utilizing the Stepped Isothermal Method (SIM) for assessing the long-term behavior of various geosynthetic reinforcements including geofoam. Graduate student Sang-Sik Yeo, is performing the requisite research.
- (c) George Koerner has supervised the construction of a segmental retaining wall at GSI which has 3-different masonry block types. He is measuring the pH-values directly between block surfaces and will do so for many years into the future... the following photograph is of the "GSI Wall". Data is currently available. [As a comment, this wall has geogrid reinforcement between every block layer and is backfilled completely with AASHTO #57 stone. It will not collapse or even deform!]



2. The Center for Polymers in Hydraulic Structures (CPHyS) was formed on June 20, 2003 for the purpose of proper use of geosynthetics in dams, canals, reservoirs, tunnels, pipes and related hydraulic systems. Jorge Zornberg of the University of Texas at Austin, Grace Hsuan of Drexel, and George Koerner of GSI are Co-Directors. The mission statement and goals are available on the GSI Home Page at <<geosynthetic-institute.org>>. Initial projects are being decided upon, but two are certain.

- (a) Grace Hsuan is focusing on exposed geomembrane durability and lifetime. (See Item 10 previously). This issue is critically important to gain confidence regarding polymer lifetime in the minds of owners, regulators, designers and specifiers in the focused application areas.
 - (b) Jorge Zornberg's activity, via a GSI funded graduate student, Christine Weber, will focus on drainage behind exposed geomembranes on dams.
 - (c) George Koerner's activities are within GSI and focus on the Xenon Arc and UV fluorescent devices.
3. In both CPReS and CPHyS, Bob Koerner will act in an advisory manner and as quality assurance! In both centers existing GSI Members and Associate Members are fully entitled to the information that is developed and their interaction is encouraged. No additional funding is anticipated. We will keep the membership advised as to progress in this regard. We sincerely hope that the membership is supportive of these initiatives and your comments/suggestions are always solicited.
4. There is a distinct possibility for additional centers of this type. Please contact Bob Koerner with suggestions and ideas.

Items of Interest

1. LRFD for Bridges

Presently 23% of new bridges are designed by load and reduction factor design (LRFD). Twelve states use the method (over the classical FS-design) exclusively. In geosynthetics we use reduction factors on laboratory values, but not load factors on design values. It could be that we are next. (ref. *Civil Engineering*, February 2005)

2. Strong Demand for Cleanups

The EPA estimates that, under current regulations and practices, approximately 294,000 sites in the categories addressed in its report will require remediation during the period from 2004 to 2033. That number comprises 77,000 sites already discovered

and another 217,000 that the EPA estimates will come to light in the future.

Overall, the report says, the cleanups will probably cost approximately \$210 billion, most of which will be borne by the property owners or those held responsible for the contamination. However, because the estimate does not account for inflation, the total is likely to be even higher, the EPA says.

(ref. Civil Engineering, February 2005)

3. Going Backwards???

"I am pleased to announce your association's latest success on Capitol Hill. You will recall that in the mid-1990s, the federal government began implementing a policy designed to force many U.S. industries, including ours, to convert to metric production. This was a very serious threat to nearly all NCMA members. It was estimated that it would cost at least half a billion dollars at that time to convert the U.S. industry to hard-metric capability, solely to serve government construction... last evening at 6:45 p.m. (Eastern), the U.S. House of Representatives House suspended its rules, took up and passed legislation that will extend the protective law beyond 10-years... into perpetuity".

(quoted from M. B. Hogan, President, National Concrete Masonry Association)

4. A Boom in SRWs

Combining a retaining wall with a stabilized mass of earth is the basic idea behind segmented retaining walls, which are in the midst of an ongoing boom. Bob Gravier, the president of Allan Block in Edina, Minnesota, predicts that 60 million square feet of stackable block wall materials will be sold this year. Segmented retaining walls, with their associated tie-backs and geogrid products, add up to a \$3 billion annual business.

(ref. Civil Engineering, September 2004)

5. Global Municipal Solid Waste Status

The combined population of 26 European countries--about 760 million people--discard about 860,000 tons of MSW per day. The three North American countries with a combined population of 572 million discard about 650,000 tons of MSW per day. Now if one wants to know where the real problem is one should look at Asia. China, India, Indonesia, and Pakistan have a combined population of 2.78 billion and discard over 1.5 million tons per day. While there are no reliable measurements in the world at large, one could estimate that every day open dumps receive at least 2 million tons of solid waste. That rate is growing daily while the waste-discard rate in the rich countries is becoming stable.

(ref. MSW Management, Sept./Oct., 2004)

Summary of Panel Sessions at GRI-18 Conference

GRI-18, which was held in conjunction with GeoFrontiers on January 26, 2005 in Austin, Texas, is now history. There were sixty-nine in-progress papers which are included in the conference CD. They are evenly split between Transportation/Geotechnical in the morning, and Geoenvironmental/Hydraulics in the afternoon. Each session had its respective panel of experts who counterpointed the R & D in-progress papers against their own knowledge of the literature, and then projected into the future their ideas on R & D insofar as research needs. Let me dwell on these latter issues.

In the Transportation/Geotechnical session, specific needs were identified as follows:

Walls and Slopes

- restrictions on backfill soils
- specifications on acceptable fine grained soils
- designing to include uncertainty (risk assessment)
- adequate drainage designs

Foundations

- geosynthetics used in unsaturated soils
- electrically conductive wick drains
- horizontal drains for hydraulic falls
- intelligent geosynthetics for monitoring

Pavements

- low maintenance drainage systems
- parallel drain lines
- reverse filter grates
- adequate moisture barriers
- better understanding of soil-geosynthetic interaction
- establishment of benefit/cost behavior

In the Geoenvironmental/Hydraulics session, specific needs were identified as follows:

Landfilling

- geonet friction and normal stress behavior
- final cover design with respect to geocomposites and geomembranes
- design of exposed geomembrane covers
- effect of gas pressure on cover stability
- benefit/cost of electrical leak location
- installation damage during construction

Hydraulic

- geomembrane batten connections for impoundments
- plastic pipe performance under high stresses
- leakage under high hydraulic heads

- residual stresses in HDPE pipe
- geotextile tube dewatering and decontamination
- residual stresses in HDPE pipe
- geopipe design bridging voids

The oral presentation of papers and the prepared remarks by the panel members were then followed by open discussion from the audience. Here the tone of the discussion somewhat changed from highly focused research needs (as just described), to more general issues and concerns. Some that were expressed by the overflow crowd of 150 people (we apologize for the room being much too small) are the following:

- better intellectual knowledge transfer
- smoother implementation techniques
- publication of more synthesis documents
- more activity in community venues
- more design manuals (like the pipe industry)
- need to codify standard applications
- much more education and outreach in general

In summary, the GRI-18 Conference was an exploratory trial to try to look beyond the horizon as to what R & D needs are necessary to propel geosynthetics to the next level. As just listed, there are some "gems" included and thanks go to all involved (speakers, panelists, and audience) for sharing. George Koerner, Grace Hsuan, and Marilyn Ashley did a super job in organization and putting the papers together. Focus is now on the next conference in which we will team with NAGS. The combined conference will be held in Las Vegas on December 14-16, 2005. Please look for advertisements and details in the very near future.

Bob Koerner

Upcoming Events

- March 23-25, 2005 - 21st Central Pennsylvania Geotechnical Conf. at Hershey, PA
Contact: <cbeenenga@gfnet.com>
- March 30-31, 2005 - Engr. Society of Detroit (ESD) Short Course and Solid Waste Landfill Conference in Lansing, MI
Contact: <www.esd.org>
- June 1-3, 2005 ASCE Engineering Mechanics Session on Geosynthetics in Baton Rouge, LA
Contact: <cbowders@asce.org>
- June 16-17, 2005 - ASTM D-35 Meeting in Reno, NV
Contact: <csierk@astm.org>
- One Day Courses at GSI
August 4, 2005 - GSs in Transportation
August 5, 2005 - Walls and Slopes
August 11, 2005 - GSs in Waste Containment
August 12, 2005 - QA/QC in Waste Containment

Contact: <mashley@dca.net>

- December 14-16, 2005 - NAGS '05/GRI-19 Combined Conference in Las Vegas, NV
Contact: <janeharris@nagsigs.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. The newest member organization is CTI and Assoc., Inc., with Drs. Te-Yang Soong and P. D. Deo as our contact members... thanks and welcome!

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