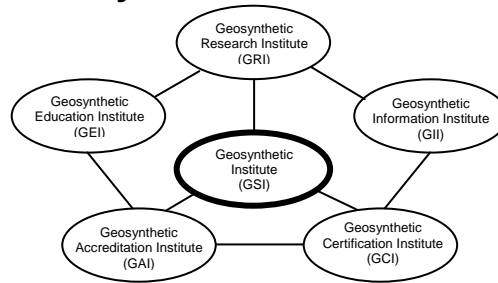


The GSI Newsletter/Report

Geosynthetic Institute



Vol. 20, No. 3

September 2006

This quarterly newsletter, now in its 20th 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

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.

1. The Inspectors Certification Exams (for both geosynthetics and CCLs) for the Fall have been posted on our Website. Please visit it and make it available to those interested.
2. The dropping of our Product Certification Program was accepted by all after some discussion with our Latin American Members. Thank you for understanding. We do not envision reinstating this program anytime in the near future.
3. The dropping of material warranties on our geomembrane specifications brought a number of questions from Members and Associate Members alike. In response we crafted a GSI White Paper. It is available on our Website under the topic "Specifications, Guides, and White Papers". More specifically, it is White Paper #9 entitled, "On the Topic of Geomembrane Warranties", dated July 10, 2006.
4. Regarding specifications under development, there are the following:
 - Turf Reinforcement Mats for Erosion Control
 - Temporary Geomembrane Covers
 - High Strength Geotextiles for Reinforcement Applications
 - Reinstatement of the Flexible Polypropylene Geomembrane Specification (GRI-GM18)
5. In regard to this last item, we sent all of the membership data regarding our activities on accelerated laboratory weathering (using Ultraviolet Fluorescent and Xenon Arc methods)

of exposing and testing nine different geomembranes for 2-years duration. There are four fPP geomembranes in the study. We had numerous comments in this regard. We will have a more formalized report at the end of 20,000 hours exposure (2.28 years) which will be available by year's end. If you missed the e-mail due to summer activities, please advise and we will resend it to you. See also Item #9 in this GRI Newsletter/Report.

6. A listing of your GSI Board of Directors follow. Please don't hesitate to contact any of them with respect to GSI activities and programs.

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Term Ends 2006

Tony Eith - Waste Management Inc. (Owners and Operators)
Boyd Ramsey (Chairman) - GSE Lining Technology, Inc.
(Geotextiles and Geogrids)

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

Term Ends 2007

David Jaros - Corps of Engineers (Government Agencies)

Rex Bobsein - Chevron/Phillips Co. (Resin Producers)

Kent von Maubeuge - Naue Fasertechnik GmbH
(International)

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)

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 short "in-progress" 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*** - 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 mainly for the Florida DOT. 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*** - Last summer we reconfigured our 20-columns simulating landfill conditions for the purpose of estimating half-life of LLDPE geomembranes. The study was meant to extend the previous lifetime study of HDPE geomembranes which took approximately 10-years to conclude. The study uses elevated temperatures of 85, 75, 65, and 55°C to hasten degradation, followed by Arrhenius modeling to obtain the predicted lifetime. Unfortunately, our master temperature controller went "out-of-control" and became extremely hot with some columns having temperatures of over 100°C. This, of course, was way beyond our desired statistical control of temperature thereby negating all incubation to date. As a result, we

have abandoned the present 20-columns and must start over again from "scratch". We will see what the Fall brings since there is significant physical work necessary to set up these columns.

- 3. 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.
- 4. 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 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 11-years is available. This is clearly the longest in-situ measurement project in all of geosynthetics.
- 5. 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 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.
- 6. 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 approximately 1-year old and is at a landfill in the Philadelphia area.
- 7. 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 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 factors used in the design method.

8. 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.

9. UV Exposure of Geomembranes* - GSI is using its Xenon Arc device along with its two existing UV-fluorescent devices to evaluate the simulated outdoor lifetime of nine different types of geomembranes; HDPE, LLDPE, 4 fPPs, PVC, EPDM 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.

10. Generic Specifications - A major effort is ongoing with respect to the development of generic geosynthetic specifications. The current status of these specifications is as follows, with the fPP spec being revised using weatherometer testing as opposed to OIT testing for the endurance criteria.

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
- GCL3 – Geosynthetic Clay Liners

*An important note regarding textured geomembranes was recently added to the effect that direct interface shear testing should always be performed to assure against slope instability.

Working Within Focus Groups

- GMXX – Exposed Temporary Covers
- GCTX – TRMs for Erosion Control
- GTXX – High Strength Reinforcement Geotextiles

Delayed or Off in the Distance

- GNXX – Geonet Drainage Composites
- GGXX – Bidirectional Geogrids
- GGXX – Unidirectional Geogrids
- GCTX – 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 also available as a separate power point CD which shows photos of the test devices 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 use and share this information which is on the open part of our Web Site.

11. Technical Guidance Document on QC/QA of Waste Containment Facilities - Drs. Dave Daniel and Bob Koerner have completed the Second Edition of this Technical Guidance Document by greatly updating the original 1993 EPA report. Its publication will be through the ASCE Press and will be available this fall. If members want a preliminary copy on CD (≈ 390 pages) contact us accordingly.

12. Various Power Point Presentations - To date we have distributed about 500 copies of three different CDs;

- Introduction to Geosynthetics
- Selected Lectures I (SRWs, LF Expansions, and Dam Waterproofing)
- Selected Lectures II (Bioreactor LFs, GCL Test Plots, and Erosion Control)

Every screen has a short voice-over and each lecture can be presented in about 50-minutes. They are ideal for classroom use or for "brown-bag" seminars, and the like. Ask if you want copies; no charge.

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

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
- 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 17,000 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)

The following 1-day long course will be offered in the Fall, 2006.

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.

The course comes with a set of notes, is fast-paced, extremely current, and are very interactive with the participants. The course is very well positioned for those intending to take the CQA-Inspectors Certification Test for Geosynthetic Materials administered by the Institute. These dates are presently as follows:

- October 28, 2006 at GSI in Folsom, PA
- November 14, 2006 at Geocomp in Boston, MA
- December 5, 2006 at CTI in Detroit, MI
- December 9, 2006 at GSI in Folsom, PA
- December 15, 2006 by TRI in Chicago, IL

Contact M. Ashley at GSI for further information 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.

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. There are currently 161 GAI-LAP methods available for accreditation. Please consult our home page for a current listing.

As of September 2006, 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 (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
- 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, CA (95 tests)
Ron Belanger -- (714) 520-9631
- 14^A - Geotechnics (61 tests)
Rick Lacey -- (412) 823-7600
- 18^A - EMCON/OWT (55 tests)
Rasheed Ahmed -- (845) 492-3170
- 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 (12 tests)
Jim Olsta -- (847) 392-5800
- 23^B - CETCO Cartersville (10 tests)
Derek Reece -- (706) 337-5316
- 24^B - CETCO Lovell (10 tests)
Roger Wilkerson -- (307) 548-6521
- 25^B - Ten Cate Nicolon (10 tests)
Beth Wilbanks -- (706) 693-2226
- 26^B - Agru America Inc. (14 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)
James Curtis -- (518) 457-4735
- 32^A - Vector Engineering (6 tests)
Ken Criley -- (530) 272-2448
- 34^B - GSE Richey Road (16 tests)
Jane Allen -- (281) 230-6726
- 37^B - GSE Chile (16 tests)
Mauricio Ossa -- 56-2 6010153
- 38^C - Sageos/CTT Group (82 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)
Zehong Yuan -- (770) 931-8222
- 42^C - NPUST (GSI-Taiwan) (39 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, TX (13 tests)
Ron Belanger -- (866) 522-0843
- 48^B - Tenax Corporation (9 tests)
Tim Bauters -- (410) 522-7000
- 49^B - Engepol Geosinteticos (20 tests)
George Nastas -- (55) 11-4166 3001
- 50^B - Advanced Drainage Systems, Inc. (7 tests)
Terry McElfresh -- (513) 896-2065
- 51^B - Solmax International Inc. (14 tests)
Guy Elie -- (450) 929-1234
- 53^B - Polytex (13 tests)
Cristian Valdebenito -- 011 56 57 42 90 00
- 54^B - Hancor (9 tests)
David Gonso -- (419) 424-8377
- 54^B - Atarfil Geomembranes (21 tests)
Isabel Merida Fernandez -- 34 958 439 278

^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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475 Kedron Avenue
Folsom, PA 19033-1208
Telephone: (610) 522-8440
Fax: (610) 522-8441
E-mail: gkoerner@dca.net

Activities within GCI

(a) Inspectors Certification Program

This new venture for GCI was initiated in January, 2006 and presently consists of a certification program for Construction Quality Assurance field inspectors for installation of geosynthetic materials and for compacted clay liners. It is focused on landfill liner and cover systems, as well as surface impoundments, waste piles, and related geoenvironmental applications.

The requirements are as follows:

1. Candidate must be recommended by a Professional Engineer (or equivalent) who knows and can attest to at least six months of acceptable field experience performing CQA activities with geosynthetic materials and/or compacted clay liners.
2. Pay a one-time \$400 fee for either geosynthetic materials or compacted clay liners, or \$500 for both material systems each of which covers a 5-year period upon successful completion of an examination.
3. Successfully pass a written examination proctored by GCI or a GCI designated individual and subsequently graded by the Geosynthetic Certification Institute.

There are separate examinations for both geosynthetic materials and compacted clay liners. To date, 97 people have taken the Geosynthetic Materials Examination (1-failed) and 94 have taken the Compacted Clay Liner Examination (10-failed). The dates for the Fall, 2006 examinations were given under the GEI section. See also our Website for the most recent additions and/or changes.

The GCI Steering Committee is as follows:

Jeff Blum of STS	Jim Olsta of CETCO
Maria Tanase of Earth Tech	Boyd Ramsey of GSE
Rick Thiel of Vector	Te-Yang Soong of CTI
Jeff Fassett of Golder	Steve Wintheiser of CTI
Sam Allen of TRI	Dan Rohe of EPI
Mark Sieracke of Weaver Boos	Jim Goddard of ADS

(b) Product Certification Program

We have discontinued our GCI-PCP as described in Item #2 of the Activities of the Institute Director and GSI Board of Directors comments in this Newsletter/Report.

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 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 INHA University (through its Geosynthetic 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. It employs 120 people (8 with doctoral degrees) and 42 engineers. The geosynthetic 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 geosynthetic activities.

INHA University is located in Incheon (50 km west of Seoul) and the geosynthetic 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. The ongoing efforts of both FITI and INHA 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 and a paper is available. The second topic will be presented at GRI-19 in December, 2005.
 - (b) Grace Hsuan is utilizing the Stepped Isothermal Method (SIM) for assessing the long-term behavior of various geosynthetic

reinforcements including geofabric. Graduate student Sang-Sik Yeo, is performing the requisite research. A paper will be presented at GRI-19 in the Student Paper Session.

- (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 CPRoS 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. In particular we are looking to team with a university specializing in CAFO's, i.e., large-scale agricultural operations. Please contact Bob Koerner with suggestions and ideas.

Items of Interest

1. Bioremediation for Acid Rock Drainage

Recent testing of an innovative approach for treating what is termed acid rock drainage (ARD) at an abandoned South Dakota coal mine indicates that the in situ bioremediation method can successfully remove metals from highly acidic water without the need to construct costly water treatment facilities. As shown in the following photo the treatment reservoirs are all geomembrane lined.



(ref. *Civil Engineering*, July, 2006)

2. Wick Drains Galore!

The country of Dubai is presently adding 1500 km of new beachfront to its existing (only) 80 km coastline. It is doing so by creating 300 offshore islands in interesting patterns, many of which are for sale. The scale of the dredging operations are "awesome". The amount of rock riprap (hopefully with geotextiles beneath) is also incredible. This is a fascinating project.

(ref. *The American Surveyor*, July/August, 2006)

3. Riding the Boom in Precious Metals

Frank Holmes, the manager of the best-performing U.S. metals mutual fund of the last five years, says gold is heading to \$700 an ounce.

The U.S. Global Investors World Precious Minerals Fund has risen 46.5 percent so far this year, as gold prices climbed above \$600 for the first time since 1981. The advance will extend for at least another year, as countries including Russia increase reserves, Holmes said.

(ref. *Philadelphia Inquirer*, April 23, 2006)

4. National Science Foundation Budget for 2007

There will be a 7.9% increase over FY 2006 for NSF for a total of \$6.02 billion. Research and Related Activities would receive a 7.7% increase to \$4.666 billion. Education and Human Resources would receive a 2.5% increase to \$816 million and the Major Research Equipment and Facilities Construction would rise by 26% to \$240 million. *Note: For a complete listing of all the proposed budget allocations, go to their website - http://www.agiweb.org/gap/legis109/appropsfy2007_nsf.html (ref. ADSC, May 2006)*

Final Draft Program of GRI-20 Conference on January 18, 2007 in Washington, DC

“Use of Geosynthetics to Combat or Mitigate Acts of Terrorism and/or Natural Disasters”

Morning Session - Geotextile and Geogrid Related
Solutions
[George R. Koerner (Moderator)]

- 1.1 Soil Filled Geotubes® for Emergency Sealing of
Levee Breaks
Tom Stephens and Ed Trainer
Ten Cate Nicolon
Commerce, Georgia
- 1.2 Rapidly Deployed, Soil-Filled, Blast Resistant
Barrier Walls
Richard A. Reid
South Dakota State University
Brookings, South Dakota
- 1.3 Response of Fiber Reinforced Soils to
Explosions and Related Excitations
Jorge Zornberg
University of Texas
Austin, Texas
- 1.4 Blast Behavior and Its Mitigation Using
Geosynthetic Reinforced Walls and Slopes
Dov Leshchinsky
University of Delaware
Newark, Delaware
- 1.5 Potential Use of Nonwoven Geotextiles to
Mitigate and/or Neutralize Biological Agents in
Water Supplies
Joseph P. Martin and Charles N. Haas
Drexel University
Philadelphia, PA
- 1.6 Geotextiles as Camouflage to Mitigate Sensitive
Target Areas
Richard A. Reid
South Dakota State University
Brookings, South Dakota

- 1.7 Illegal Immigration and Entry Fencing
Lara D. Costa and Elizabeth Peggs
I-Corp International
Ocean Ridge, Florida
- 1.8 Geogrid Evacuation Slides for Rapid Escape
and/or Providing Emergency Supplies
Ralph T. Baker
Baker Safety Equipment Co.
Townsend, Delaware
- 1.9 Concepts and Applications of Smart
Geosynthetics in Fabrics and Grids
 - (a) Embedded Fiber Optic Sensors for
Geosynthetic Applications
Mahmoud El-Sherif (carbon fibers)
Photonics GTT, Inc.
Philadelphia, Pennsylvania
 - (b) Sibel Pamukcu (fiber optics concepts)
Lehigh University
Bethlehem, Pennsylvania
 - (c) John Henderson (fiber optics applications)
Ten Cate Nicolon
Pendergrass, Georgia

LUNCH - Technology Café - Elizabeth Peggs
(Discussion Leader)

Afternoon Session - Geomembrane and Geo-Other
Related Solutions
[Robert M. Koerner (Moderator)]

- 2.1 Smart Floating Geomembrane Covers for Water
Reservoirs
Grace Hsuan and Nihat Bilgutay
Drexel University
Philadelphia, Pennsylvania
- 2.2 Floating Geomembrane MegaBags for
Emergency Water Supply
J. Richard Weggel and Robert M. Koerner
Drexel University
Philadelphia, Pennsylvania
- 2.3 Double Walled Oil Transmission Pipelines
Designed to Withstand Explosive Blasts
Joseph V. Mullin and Robert M. Koerner
Drexel University
Philadelphia, Pennsylvania
- 2.4 Geosynthetic Barrier Mounds to Guard Buildings
from Truck-Bomb Explosions
Steve Gale
Gale-Tec Engineering Inc.
Minneapolis, Minnesota
- 2.5 Air Blast Attenuation using Concrete-Geofoam
Panels
Richard J. Bathurst
Royal Military College of Canada
Kingston, Ontario
- 2.6 Blast Protection for Lightweight Shelters via the
Use of Retrofitting Polyurea Liner Systems
Sam R. Allen
TRI/Environmental, Inc.
Austin, Texas

- 2.7 Title-to-be-Announced
Dr. Craig R. Calabria
GeoSystems Consultants
Fort Washington, Pennsylvania
- 2.8 Potential Use of Geosynthetics in Airport
Engineered Materials Arrester Systems (EMAS)
Ian D. Peggs
I-Corp International
Ocean Ridge, Florida
- 2.9 Geosynthetic Use for Temporary Roadway and
Airfield Remediation
George R. Koerner
Geosynthetic Institute
Folsom, Pennsylvania
- 2.10 Comments and Opinions from the Audience

- March 2-5, 2008
GeoAmericas
Cancun, Mexico
Contact: <jmrutledge@ifai.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 organizations are Pétromont (Sylvie Coulange-Suarex and Nathalie Legros), EPI (Daniel S. Rohe and Mark Wolschon), Vector Engineer (Vince Suryasmita and Richard Thiel), and Weaver Boos Consultants, Inc. (Mark Sieracke). A sincere thanks to all and welcome!

Upcoming Events

- Sept. 8-22, 2006 8th
8th Intl. Conf. on Geosynthetics
Yokohama, Japan
Contact: <www.8icg-yokohama.org>
- October 12, 2006
GSE Seminar on Geosynthetics
Princeton, New Jersey
Contact: <bramsey@gseworld.com>
- November 2-3, 2006
PennDOT/PA-ASCE Geotech Conf.
Hershey, Pennsylvania
- December 4, 2006
CTI Seminar on Landfill Design
Detroit, Michigan
Contact: <tsoong@cti-assoc.com>
- December 8, 2006
QA/QC course at GSI
Folsom, PA
Contact: <mvashley@verizon.net>
- December 13-14, 2006
QA/QC courses by TRI
Chicago, Illinois
Contact: <Sallen@tri-env.com>
- January 16-19, 2007
GMA/GSI/NAGS Conference
Washington, DC
Contact: <jmrutledge@ifai.com>
- January 31, February 1-2, 2007
ASTM D35 on Geosynthetics
Costa Mesa, California
Contact: <csierke@asmt.org>
- June 27-29, 2007
ASTM D35 on Geosynthetics
Norfolk, Virginia
Contact: <csierke@asmt.org>
- January 29-31, 2008
ASTM D35 on Geosynthetics
Tampa, Florida
Contact: <csierke@asmt.org>

- 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**
Albert F. DiMillio/Jerry A. DiMaggio
- Golder Associates Inc.**
Mark E. Case/Jeffrey B. Fassett
- Tensor Earth Technology, Inc.**
Donald G. Bright/Joseph Cavanaugh
- Poly-Flex, Inc.**
James Nobert/George Yazdani
- Colbond Geosynthetics**
Wim Voskamp/Joseph Luna/Dennis Wedding
- Tenax, S.p.A.**
Aigen Zhao/Piergiorgio Recalcati
- Basell USA, Inc.**
Robert G. Butala/Michael J. Balow
- TC Nicolon USA**
John Henderson/Chris Lawson
- CETCO**
James T. Olsta
- Huesker, Inc.**
Thomas G. Collins/Dimitar Alexiew/Steven Lothspeich
- Naue GmbH & Co.**
Georg Heerten/Kent von Maubeuge [BoD]
- Propex**
Mark Marienfeld/Scott Manning
- STS Consultants**
Jeff Blum/John Trast
- BBA Nonwovens**
William M. Hawkins/William Walmsley
- NTH Consultants, Ltd.**
James J. Parsons/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]

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John C. Volk/Robert B. Wallace

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Robert Denis

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Richard J. Kenter/Chris O'Connor

Agru America, Inc.
Paul W. Barker/Peter Riegl

Firestone Specialty Products
Mark Munley/Paul Oliveira

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Jeonhyo Kim/H.-Y. Jeon

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*Anthony W. Eith [BOD]/Greg Cekander/
 Charles P. Ballod*

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EPI, The Liner Co.
Daniel S. Rohe/Mark Wolschon

Vector Engineering, Inc.
Vince Suryasmita/Richard Thiel

Weaver Boos Consultants, Inc.
Mark Sieracke [BoD]

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IN THE NEXT ISSUE

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- Activities within GII (Information)
- Progress within GEI (Education)
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- The GSI Centers-of-Excellence
- Items of Interest
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