The GSI Newsletter/Report

Geosynthetic Institute

Vol. 36, No. 1 **March, 2022**

This quarterly newsletter, now in its 36th 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 George R. Koerner or Jamie Koerner at phone (610) 522-8440; or e-mail at gsigeokoerner@gmail.com or Jamie@geosynthetic-institute.org.

Activities of GSI's Officers and Board of Advisors (BOA)

We welcome Brian Fraser from the Layfield Group as our newest BOA advisor, representing the Barrier Group Members of GSI. An election with four nominated candidates was held in February 2022 to fill the vacant spot created when Nathan Ivy took a new position with Concrete Canvas Ltd. We thank Nathan for his years of service and wish him the best. Congratulations to Brian; we look forward to working with him!

2022-2024 Board of Advisors

Term Ends 2022

- Kent von Maubeuge – NAUE GmbH & Co. KG
  (International-1)
  email: kvmaubeuge@naue.com
- Vergil Rhodes – C.P. Chemical
  (Resin and Additives Group)
  email: RhodeVH@cpchem.com
- David Carson – U.S. EPA
  (Agencies)
  email: carson.david@epa.gov

Term Ends 2023

- Te-Yang Soong - CTI Co.
  (Consultants and Testing Labs)
  email: tsoong@cticompanies.com
- Brian Fraser - Layfield Group
  (Barrier Group)
  email: brian.fraser@layfieldgroup.com
- Mathieu Cornellier - Solmax
  (International - 2)
  e-mail: mcornellier@solmax.com

Term Ends 2024

- Burrill (Bo) McCoy - Waste Management Inc.
  (Owners and Operators)
  e-mail: bmccoy2@wm.com
- Rene Laprade - Tencate Geosynthetics
  (Geotextiles and Geogrids)
  e-mail: r.laprade@tencategeo.com
- Sam Allen – TRI Environmental Inc.
  (At-Large)
  e-mail: Sallen@tri-env.com

GSI has continued to have virtual quarterly meetings with the Board of Advisors throughout 2021 and 2022 via Zoom. We are happy to announce that conferences and live meetings will resume this year. While virtual meetings have certainly been productive and a necessity during COVID, there is no comparison (in our opinion) to in person meetings. George has started traveling again and will be teaching "Landfill Design Considerations in the Age of Sustainable Development on April 6-7 at "GEO U".

We thank the BOA for sharing their time and talent to fulfill the GSI mission and hope to see many of our members in person during the year.

IN THIS ISSUE

Overview of GRI Projects (Research)

The following projects are all funded by GSI membership dues unless specifically noted. Most are long-term projects for which we are well positioned to accomplish. In an attempt not to repeat information in the quarterly newsletters, we will merely list the ongoing projects that have been written about in previous newsletters and will only provide details of new research. For details and/or discussion of ongoing projects contact:
George Koerner (gsigeokoerner@gmail.com)
Grace Hsuan (hsuanyg@drexel.edu)

1. Durability of Geosynthetics

2. GSI wall, pH and durability of PET GGs

3. Creep axisymmetric behavior of HDPE and LLDGE GM's

4. Long term filtration tests

5. Leakage through holes in geomembranes

6. Multicomponent geomembranes & service life projection (Polk County)

7. GS survivability in ultra-light weight aggregate **(ULWA)**

8. Wicking Geotextiles (capillary action)

9. Elevated temperatures on geomembranes

10. Anchorage and connection strength of HP-TRMS

11. Stress cracking with respect to strain hardening Modulus & update to GRI GM13

12. Seepage induced by geosynthetic in fine grained soils

13. High normal pressure direct shear

14. Improved extrusion welding

15. Concrete Canvas (GCCM) Testing per ASTM D8364

GCCMs contain geosynthetic and cementitious materials, both of which possess very different physical mechanical, hydraulic and durability properties. GCCMs are unlike most geosynthetics as their properties change on hydration from flexible to rigid. Both the uncured and cured properties need to be reported to understand the GCCM capabilities in both deployment and in-service conditions.

In March of 2021, ASTM International D35 Geosynthetics published ASTM D8364/D8364M-21: 'Standard Specification for Geosynthetic Cementitious Composite Mat (GCCM) Materials'. This was a leap forward for the technology and provides clearly defined instructions on properties and intention for use and performance of three classes of GCCM's.

Upon implication of this new specification there are nuisances uncovered with it. We have been asked to kick the tires of this specification and refine it if possible. It is our intent to test several classes of GCCMs and find any loopholes in it from the perspective of continuous improvement.

Installation of GCCM as a canal lining

Close up photo of GC

George Koerner will be giving a lecture in Wales, UK on Tuesday, July 13th at the annual conference of Concrete Canvas on "Geosynthetics in Hydraulics focusing on GCCBs". The outline for the lecture is as follows:

Outline:

1. Introduction and Background
2. Dam, Levee, and Dike Waterproofing
3. Canal Linings
4. Reservoir Linings
5. Tunnels and Culvert Lining
6. Material characteristics
7. Material selection based on benefit/cost
8. Standard specifications & test method requirements
9. Field Performance
10. Market Demand
11. Future trend
12. Conclusions and Recommendations

Participants will become familiar with GCCBs, GCCMs, geomembranes and their function in varying applications as discussed in the outline above. It appears that geocomposites at the "it" materials in geosynthetics for 2022.

16. Determining the Conductivity of Geosynthetics

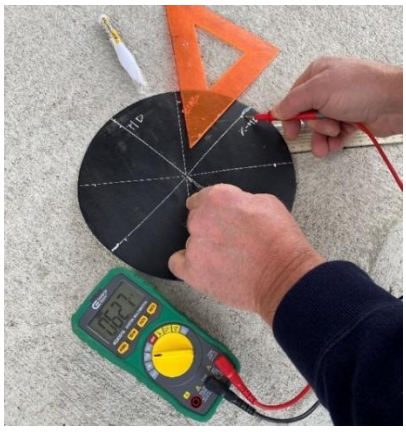
GSI has a new test method that looks at resistance measured across positions on conductive geosynthetics. Conductive backed geosynthetics contain an electrically charged layer that allows leaks to be detected in lined systems without the need for a conductive subgrade beneath the liner system.

This test method presents a technique for determining the resistivity of conductive geosynthetics by way of a digital Ohm meter. It can be used for testing geomembranes or geotextiles that incorporate a conductive layer into their cross section. Conductive backed geosynthetics may be used in combination with electric leak location surveys using the dipole, water puddle or water lance methods.

There are several limitations with completing leak location surveys on nonconductive backed geosynthetics that are duly overcome by conductive backed geosynthetics of good quality. Some of the limitations that are overcome for leak location are as follows:

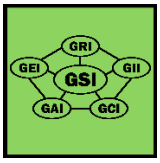
- The need for a conductive subgrade for current to flow from a source electrode through a leak in the liner system.
- Frozen, dry, or low moisture subgrades, where there may be little or no current flow through such subgrades to complete the ELL survey.
- Flooding of the detection layer will not be required between the primary and secondary liners of a double lined facility if a conductive backed geosynthetic is used.
- Wrinkles are an issue with field deployed polyethylene geomembrane without a normal pressure from overburden. There is no need for intimate contact between the geomembrane and subgrade when conductive geosynthetics are used. This means that you can run an ELL survey anytime during the day.

All that is needed for this test is a multimeter, tape measure and protractor. The specimen is marked at 100 mm (4 in) spacing in the machine, bias and transverse directions as shown in the figure below. The conductive skin is then touched by one free end lead near each mark around the perimeter of the circle while the other lead is held fast at the origin. If a resistance is recorded, the material is conductive, and if no resistance is recorded, then the material is an insulator.



Photograph of GRI GS-30 Experiment of Conductive Geomembrane

Progress within GII (Information)



GSI has updated it's LinkedIn page… Check it out!

https://linkedin.com/company/geosynthetic-institute.org

Our GSI Home Page is accessed as follows:

www.geosynthetic-institute.org

Everyone (members and nonmembers) can access the open part, which has the following menu:

Newsletter
Prospectus
Specifications
White Papers
Bookstore
Keyword Search
Members Only
Research
Certification
Information
Education
Accreditation
Personnel
Contacts
Upcoming Webinars

To go further one needs a members-only password. Your contact person (names beneath member company) must obtain a password from Jamie Koerner. Jamie can be reached by e-mail at Jamie@geosynthetic-institute.org. When you get into this section, the following information is then available.

- **GRI Test Methods (all)**
- **GRI Reports**
- **GRI Technical Papers (419 Citations)**
- **Notes of GSI Meetings**
- **Links to the GSs World**
- **Keyword Search for Generic Papers**
- **Example Problems**
- **Frequently Asked Questions (FAQs)**

GRI Reports

To date, we have 48 GRI Reports available to members and associate members. These reports vary in length from 30 to 200 pages. They are in the password protected section of our home page at www.geosynthetic-institute.org/member/reports.html.

White papers are available for free to everyone, however GRI reports are only free to members (located in the member's only section of the website). Non-members can purchase the reports from the online GSI bookstore.

Progress within GEI (Education)

IFAI's GS23 Kansas City, MO USA Conference

GSI's proposal for a Special Session at the Geosynthetic Conference 2023 "Exposed Geosynthetic Performance" has been accepted. It will be an action-packed session with George Koerner moderating the following five speakers:

David Beaumier, Eng., M. A. Sc.
Director of Technological Innovation
Polymer CTT Group SAGEOS
"Laboratory Predicted Performance of Exposed Geosynthetics"

Eric Blond, Eng., M. A. Sc.
CEO of EB Consultants
"Service Life Prediction of Exposed Geomembranes"

George A. Reinhart, III, PhD, PE
Senior Engineer / Vice President
Jones Edmunds Consultants Inc.
"Exposed Geomembrane Cover Performance at Polk County Landfill in Florida"

Stephan Fourmont, Eng., M. A. Sc.
Business Development Manager
Afitex-Texel Geosynthetics inc.
"Exposed NPNW GT performance at a large surface impoundment for over one year"

Bryan Scholl, Ph. D., P.E.
Director of Engineering
Watershed Geo Inc.
"Closureturf - a ten-year retrospective of UV performance"

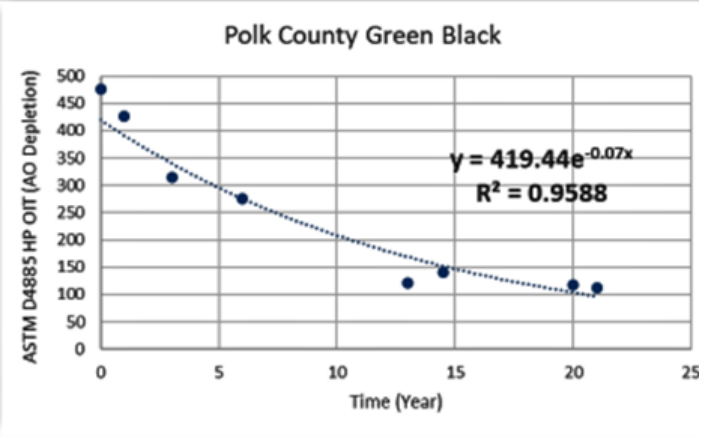
GSI will support the last three efforts in earnest for this special session. Some preliminary information below may spark interest as well as invite commentary prior to the conference in 2023.

1) EGC

The days when geomembranes were only constructed as one thick monolithic layer are gone. They currently can be made of different colors, conductivity, diffusion characteristics etc. to meet the needs of clients in different application all over the world. We have come across a case history at a site of opportunity in Polk County Florida that Jones

Edmunds group asked us to collaborate with them on the evaluation of the exposed geomembrane cover (EGC) as it ages over time.

In the summer of 2001, exposed geomembrane cover (EGC) made of 1.5 mm (60-mil) high density polyethylene (HDPE) green/black textured geomembrane was installed as a cap at the Polk County Florida MSW disposal facility. It covers approximately 4 hectares (16 acres) on both flat and side sloped sections of the landfill. The EGC has performed extremely well and has exceeded the designed lifespan expectations despite being subjected to severe weather events. This paper will present a summary of the testing (like shown in the figure below) and performance of the geomembrane and offers a projection of the future performance of the material by way of OIT data.



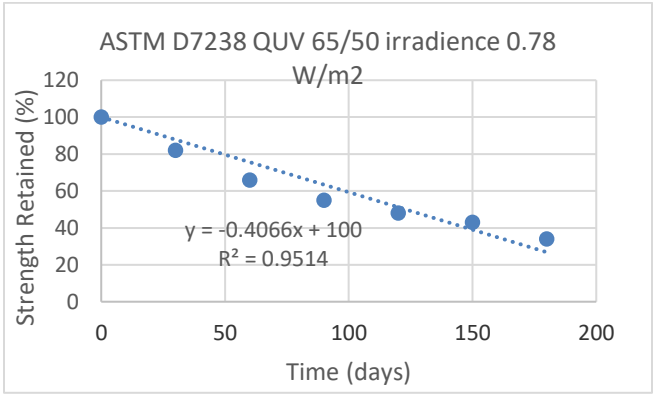
21 Years of HPOIT Depletion over time at Polk Co. EGC

2) Exposed GT

Geotextiles used in civil engineering applications are expected to perform a function over a given design life. The functional requirements of the geotextile in each application will determine the properties required, and any assessment of the products durability will be based on the degradation of these properties over a given time. There are several factors that will help to determine the durability of a geotextile; the physical structure of the fabric, the nature of the polymer used, the quality and consistency of the manufacturing process and the environment in which the product is placed. It is essential that a geotextile performs effectively for the required duration of the design life.

Navigable waterways are essential to inland transportation. Along with such navigation is the maintenance of adequate depths (which was originally regulated by the U.S. Congress in 1824!). The typical maintenance method to gain navigable depths is, and has been for centuries, that of dredging. Historically, dredge spoils have been placed in lined impoundments.

This case history is of a 105-ha dredge disposal site adjacent to the C & D Canal in the state of Maryland USA. The roughly triangular site was lined with a geomembrane and had a geotextile beneath and above the geomembrane. Both geotextiles were 350 g/m^2 black needle-punched nonwoven polypropylenes. The *geotextiles* were intended to serve both protection and drainage functions. Unexpectedly the upper geotextile was left exposed to ultraviolet degradation for nine months prior to soil covering at the Pierce Creek dredge disposal facility. A separate laboratory study was conducted using fluorescent ultraviolet exposure devices to make a half-life prediction of the geotextile durability (as shown in the figure below). The paper will compare and contrast the field and laboratory results and access how good our current technology is for predicting service life of exposed geotextiles.



3) Watershed Geo ClosureTurf - HydroTurf

As a response to numerous challenges at landfills enclosures, engineers have advanced new approaches to establish more stable and environmentally friendly solutions. Traditional landfills require large amounts of soil throughout their lifespan and are often lacking adequate soil to complete closure construction. Many of these landfill closures also experience on-going erosion issues.

Watershed GEO's ClosureTurf is a patented, three component system comprised of a structured geomembrane, engineered turf, and a specialized sand infill that serves as a final cover for RCRA subtitle D facilities. ClosureTurf is fast and easy to install for an aesthetically pleasing, cost-effective landfill closure solution which is sustainable in challenging applications.

GSI has been conducting research and development of the components of Closureturf for years. In this effort we will present results from field and laboratory work that will help answer "how long will this material last?" We will also present three years' worth of temperature data that will shed some light on how well the infilled turf has insulated the geomembrane within the cover system.

Geo Asia 7 - Taipei, Taiwan

Due to the uncertainty surrounding COVID, the Geo Asia 7 organizing committee has decided to hold the conference in a hybrid format allowing presenters to choose in-person of virtual options. GSI has had two papers accepted for this conference. These efforts are summarized below.

High Performance Turf Reinforcement Mats (HP-TRMs)

High Performance Turf Reinforcement mats (HP-TRMs) have taken erosion control with natural vegetation to a whole new level. Reinforced vegetation can now handle many times the velocity and shear stresses of natural turf; sites that were once the sole domain of hard armor are now within the purview of HP-TRMs. This new generation of materials will be discussed in the paper. Ultimately, it will cover the following: Concerns and mechanisms of channel and slope erosion, GS erosion control products currently available (HP-TRMs in the market), Applications and case histories, Index laboratory tests, Small scale laboratory simulations, Full scale test sites, Design guidance and a Generic specification.

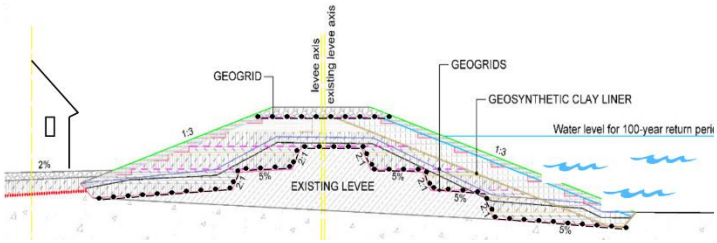
Credible analytic modeling of erosion control situations from routine to exotic application for both channels and slope will be presented. Simulated laboratory and field tests for identifying unique products variables for the purpose of documenting field behavior based on cost/benefit performance. Erosion-soil loss and its control is a massive (and worthwhile) target application for geosynthetics. The quantification of such enhancement will be discussed. In so doing, geosynthetic applications are compared insofar as their sustainability (i.e. embodied carbon) to the same applications using traditional construction materials such as concrete, steel, timber, clay or granular soils. The status of geosynthetics erosion control materials and HP-TRMs will be offered as well. It is felt that geosynthetics options are indeed viable for many of these extreme applications and will be dependable for very long service lifetimes. As such,

geosynthetics provide better and longer performance than traditional material solutions, less costly solutions than using traditional materials and thus enhance "relative sustainability." This takes into account all of the directly applicable material and labor requirements. As will be seen, the traditional civil engineering materials contribute greatly to the embodied carbon of any construction project. By avoiding or minimizing the use of these traditional materials through utilization of geosynthetics, the latter will help to reduce the inherent embodied carbon on project where erosion control is an issue.

Summary and conclusion will also be presented which demonstrates the logic of combining engineering ideas and principles for improving the environment through earth-friendly erosion control practice and procedures.

Induce Seepage Path Adjacent to and Around Geogrid Layers

Understanding the performance of geogrid reinforced levees, dikes and dams subjected to flooding and drawdown is critical to maintaining our infrastructure. In this paper, an attempt has been made to answer the question, "Will a Geogrid Reinforced structure Induce a Seepage Path Adjacent to and Around Geogrid Layers?" At this point, we have no case histories where we can quantify such behavior. As seen in the figure below, geogrids are critical reinforcing elements in levees providing lateral support to the structure. This work is significance because of the frenetic pace of levee heightening due to sea level rise (a result of global warming).



Reinforced dike expansion over existing levee utilizing geosynthetics

Laboratory data is presented from two modified methods as follows for this paper.

ASTM D5887 "Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter", and

ASTM D4716 "Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head".

Both tests were run with soil alone and then with a geogrid incorporated into the midsection of the specimen. Results are heavily dependent of geogrid type, soil type, gradient, normal pressure, and several site-specific conditions. A comparison of conditions will be made as well as subsequent recommendations.

"GSI Fellowships for Graduate Students"

Every year GSI awards several fellowships to support research in various fields, all involving geosynthetics. The program recognizes and supports outstanding students from around the world who are studying geosynthetics.

Proposals for the upcoming 2022-2023 fellowship year must be submitted jamie@geosynthetic-institute.org before **August 22, 2022.**

2021-2022 GSI Fellow recipients

Mahmoud Ali	Queens University, Canada
Florian Christ	Ruhr University, Germany
Po-Chung Chuang	NPUST, Taiwan
Mostafa Ebrahimi	Southern Illinois University Edwardsville, USA
Bahia El Rafai	Institute of tech. Sligo, Ireland
Sara Fayek	Missouri University of S&T, USA
Li He	University of Mass-Amherst, USA
Mian Huang	University of Victoria, Canada
Wei Huang	Rutgers University, USA
Jung Geun Hwang	Columbia University, USA
Hao Liu	University of Kansas, USA
Tavakoli Mehjhardi	RWTH Aachen University, Germany
Miyurudarshi Piyathilake	Colorado State University, USA
Hamid Rostami	Sothern Illinois University Edwardsville, USA
Pitak Ruttithivaphanich	University of South Carolina, USA
Matheus Cardoso Santos	Federal University of Sao Carlos, Brazil
Sankaranarayanan Subramanian	University of Texas at Austin, USA
Thandar Swe	Technische Hochschule Georg Agricola, Germany
Mohen Zafari	Queens University, Canada
Md. Wasif Zaman	University of Kansas, USA

Testing Innovation Fellowship Program

for more information, please go to IGS North America's website www.igs-na.org/awards/

Webinar Wednesday schedule for 2022

GSI Webinars (90 minutes long)

11:30 AM – 1:00 PM (Eastern Time Zone)

Register at:
www.geosynthetic-institute.org/webinar.htm

1.5 Professional Development Hours available upon completion of a short quiz

GSI Members Cost - $200
(unlimited number of attendees for GSI Members)
Nonmembers Cost - $250

Date	GSI #	Title	# Portals
1/12/2022	W5	Geosynthetics in Hydraulic Applications	12
2/09/2022	W6	Geosynthetics in Heap Leach Mining	21
3/16/2022	W7	Geosynthetics in Agriculture/Aquaculture	9
4/20/2022	W9	Behavior of 20 Landfill Failures	
5/11/2022	W12	Landfill Covers: Past-Present-Emerging	
6/08/2022	W14	Lifetime Predictions of Geosynthetics	
7/20/2022	W17	Geosynthetics in Erosion Control	
8/10/2022	W20	Geosynthetic Drainage Materials	
9/07/2022	W26	Applications and Design of Geotextile Tubes	
10/12/2022	W27	Stability Design of Landfill Cover Soils	
11/09/2022	W29	QA/QC of Geosynthetics	
12/07/2022	W34	Geosynthetics in Roadways	

Courses

We have abandoned our in-house, one-day, courses (which have been given for the past 30-years) and are presently delivering two of them in six segments over three consecutive days, one each morning and then afternoon. They are the following:

1. Quality Assurance/Quality Control of Geosynthetic in Waste Containment Facilities
   (Recordings are available)

2. Construction Inspection of Mechanically Stabilized Earth (MSE) Walls, Berms and Slopes
   (Recordings are available)

The third and newest of GSI courses is an On-Line "Designing with Geosynthetics (DwG)" course. Please go to www.geosynthetic-institute.org/courses.htm and scroll down to Course #3. Here you will see the requisite details. The course itself is completely synchronized with the 6th Edition of the DwG textbook. It consists of 1540 slides with ~ 18 hours of voice over; about one minute for each slide.

Contact Jamie Koerner at jamie@geosynthetic-institute.org if you want additional information and details.

Activities within GAI (Accreditation)

The Geosynthetic Accreditation Institute's (GAI) current mission is focused on a Laboratory Accreditation Program (LAP) for geosynthetic test methods. George Koerner is in charge of the program. The GAI-LAP was developed for accrediting geosynthetic testing laboratories on a test-by-test basis. GAI-LAP suggests that laboratories use ISO 17025 as their quality system model. In addition, the program uses the GSI lab as the reference test lab and operates as an ISO 17011 enterprise. ***It should be emphasized that our GSI lab does not conduct outside commercial testing***. It should also be made clear that GAI-LAP does not profess to offer ISO certification, nor does it "certify" laboratory results. GAI-LAP provides accreditation to laboratories showing compliance with equipment training and documentation for specific standard ASTM or ISO test methods. In addition, GAI-LAP verifies that an effective quality system exists at accredited laboratories by way of proficiency testing.

There have been significant additions to the number of GAI-LAP tests. Presently, there are 263 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of March 2022, the following laboratories are accredited by the GAI-LAP for the number of test methods listed in parenthesis. Contact personnel, telephone numbers and e-mails are also listed.

1[A] - TRI/Environmental Inc. (155 tests)
Jarrett Nelson -- (512) 263-2101
jnelson@tri-env.com

3[A] - Golder Associates (43 tests)
Henry Mock -- (770) 492-1893
Henry_Mock@golder.com

4[C] - Geosynthetic Institute (108 tests)
George Koerner -- (610) 522-8440
gsigeokoerner@gmail.com

8[B] - Propex Operating Co., Ringgold (18 tests)
Todd Nichols -- 438-553-3757
todd.nichols@propexglobal.com

9[B] - Lumite (17 tests)
Rebecca Kurek -- (770) 869-1787
rkurek@lumiteco.com

13[A] - Precision Geosynthetic Labs (TRI Env.) (84 tests)
Chad Blackwell -- (714) 520-9631
cblackwell@tri-env.com

14[A] - Geotechnics (50 tests)
J. P. Kline -- (412) 823-7600
JPkline@geotechnics.net

20[A] - GeoTesting Express, MA (61 tests)
Barbara Sanchez-- (978) 635-0424
bsanchez@geotesting.com

22[B] - CETCO Hoffman Estates (11 tests)
Minerals Technologies Inc.
Dennis Wind – (847) 851-1904
Dennis.wind@mineralstech.com

24[B] - CETCO Lovell (12 tests)
Minerals Technologies Inc.
Stuart Yates -- (307) 548-6521
stuart.yates@mineralstech.com

25[B] - Ten Cate, Pendergrass (13 tests)
Melissa Medlin -- (706) 693-2226
m.medlin@tencategeo.com

26[B] - Agru America Inc. (24 tests)
Maria Coffey -- (843) 546-0600
mcoffey@AgruAmerica.com

29[e] - FITI Testing and Research Institute (79 tests)
Hang Won-Cho -- 82-2-3299-8071
hwcho@fitiglobal.com

31[D] - NYS Dept. of Transportation (9 tests)
Tom Burnett -- (518) 485-5707
tburnett@dot.ny.gov

34[B] - Solmax (GSE) - Houston, TX USA (29 tests)
Jeremy Stephenson
Jstephenson@solmax.com

38[C] - CTT Group SAGEOS (120 tests)
Oliver Vermeersch -- (450) 771-4608
overmeersch@gcttg.com

40[B] - Solmax (GSE) - Kingstree, SC USA (20 tests)
Thomas Harrelson -- (843) 382-4603
tharrelson@solmax.com

41[A] - SGI Testing Service, LLC (19 tests)
Zehong Yuan -- (770) 931-8222
ZYuan@sgilab.com

42[C] - NPUST (GSI-Taiwan) (71 tests)
Chiwan Wayne Hsieh -- 011-886-8-7740468
CWH@mail.npust.edu.tw

43[A] - Ardaman & Associates (22 tests)
George DeStefano -- (407) 855-3860
gdestafano@ardaman.com

44[B] - Berry Global Inc. (9 tests)
Julie Solarz -- (615) 847-7299
juliesolarz@berryglobal.com

45[B] - Ten Cate Geosynthetics Malaysia SDN Bhd. (24 tests)
Boon Kean Tan -- (603) 519 28576
BK.tan@tencategeo.com

46[B] - TAG Environmental Inc. (13 tests)
RyanAckerman -- (705) 725-1938
ryan_ackerman@tagenv.com

49[B] - Engepol Geossinteticos (16 tests)
Patricia Natali -- (55) 51 3303-3901
patricia@engepol.com

50[B] - ADS, Inc. Hamilton (7 tests)
Justin Elder -- (513) 896-2065
justin.elder@ads-pipe.com

51[B] - SOLMAX - Canada (21 tests)
Claude Cormier -- (450) 929-1234
ccormier@solmax.com

53[B] - Polytex Autofagasta (18 tests)
Mario Contreras Cardenas -- 011 55-288-3308
mcontreras@polytex.cl

55[B] - Atarfil Geomembranes (21 tests)
Gabriel Martin Sevilla -- 34 958 439 200
gmartin@atarfil.com

56[B] - Polytex Santiago (14 tests)
Luedy Utria Caicedo -- 011 56-2-677-1000
Lutria@polytex.cl

57[B] - Ten Cate Cornelia (22 tests)
Randy Johnson -- (706) 778-9794
r.johnson@tencategeo.com

58[B] - Propex Furnishing Solutions - Hazlehurst (10 tests)
Lee Branch -- (912) 375-6180
Lee.Branch@propexglobal.com

59[B] - Firestone (9 Tests)
Janie Simpson -- (864) 439-5641
SimpsonJanie@firestonebp.com

60[B] - TDM Geosintéticos S.A. (17 tests)
Roberto Diaz -- 051-1-6300330
rdiaz@tdmgeosinteticos.com.pe

61[B] - Raven Industries (24 tests)
Clint Boerhave -- (605) 335-0288
Clint.Boerhave@ravenind.com

62[B] - SOLMAX - Selangor - Malaysia (16 tests)
Pei Ching Teoh -- (450) 929-1234
pcteoh@solmax.com

63[A] - TRI-SC Labs (12 tests)
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[A]Third Party Independent [C]Institute
[B]Manufacturers QC [D]Government

We already have added 3 new laboratories this year. If anyone desires more information on the GAI-LAP program, its test methods, the associated laboratories, etc., please go to our website www.geosynthetic-institute.org/gai/lab.htm or contact George Koerner.

Activities within GCI (Certification)

GSI presently has three separate inspector certification programs. One (begun in 2006) is focused on QA/QC of field inspection of waste containment geosynthetics and compacted clay liners. The second (begun in 2011) is focused on MSE Wall, Berm and Slope field inspection. The third on Geosynthetic Designer Certification began on September 1, 2016. See our website at www.geosynthetic-institute.org under "certification" for a description and information on all three of them. They are similar in that a perspective candidate must…

- Be recommended by a superior or professional engineer who knows, and can attest to, at least six months of acceptable experience performing

professional services within the specific application area.

- Submit a completed application and be approved by the Geosynthetic Certification Institute to take the exam.
- Must successfully pass a written examination (70% of the questions is the passing grade) proctored by GCI or a GCI designated organization and graded by the Geosynthetic Certification Institute to become a certified inspector or engineer.
- Must pay a one-time fee which covers a five-year period upon completion of the above items. The fee is $500 for five-years of certification. It is renewable if so desired.

Program #1 - Inspection of Liner Systems for Waste Containment Facilities

This program, now in its sixteenth (16) year, has been recommended, and in some cases required, by solid waste owners, state regulators, and design consultants for proper QA/QC in field installation of both geosynthetic materials and compacted clay liners. The statistics to date are listed below. TRI Environmental Inc. has organized "GEO U" during the week of April 4-8 and the GCI-ICP exams will be given to those registered on April 8, 2022. This is the first full-scale examination for year 2022 and the results will be added to the chart below in the June quarterly newsletter.

Inspector Certification Test Results
2006 – 2022

There are currently 530 practicing certified inspectors, 422 inspectors (2017-2022) and 108 inspectors (2006-2016) who have renewed to keep certification current. A recap of the Inspector Certification Program is below:

Year	Geosynthetic Materials		Compacted Clay Liners	
	No. of people taking exam	No. of people failing exam	No. of people taking exam	No. of people failing exam
2006	141	5 (3%)	128	12 (9%)
2007	82	11 (13%)	73	12 (16%)
2008	95	25 (26%)	89	20 (22%)
2009	36	7 (19%)	36	2 (5%)
2010	59	12 (20%)	54	7 (13%)
2011	54	6 (11%)	53	3 (6%)
2012	34	5 (15%)	28	3 (11%)
2013	32	4 (12%)	30	1 (3%)
2014	45	1 (3%)	42	3 (7%)
2015	56	6 (11%)	51	6 (12%)
2016	36	3 (10%)	35	5 (18%)
2017	78	5 (6%)	66	3 (4%)
2018	53	5 (10%)	51	1 (3%)
2019	114	20 (18%)	119	15(13%)
2020	100	14 (14%)	92	10 (11%)
2021	70	14(20%)	61	8 (13%)
2022	**7**	**0**	**3**	**0**
Total	**1092**	**143 (13%)**	**1011**	**111 (11%)**

GSI has a pre-recorded "QA/QC of geosynthetics in waste containment facilities" course that can be purchased by anyone wanting to take the course online (accommodates your schedule) in preparation for the GCI-ICP certification exams. More information can be found at:

www.geosynthetic-institute.org/courses.htm

Please contact Jamie Koerner if you are in need of a proctor to administer the GCI-ICP exams or have any questions regarding the program.

jamie@geosynthetic-institute.org

Program #2 - Inspection of MSE Walls, Berms and Slopes

While a field inspector cannot require proper design or direct a contractor how to build a wall, flaws can be identified for possible design modification or mitigation action. Furthermore, and at minimum, construction practices can be observed and corrected if inadequate or improper.

The official launch of this inspection program was on December 1, 2011 with a course and the examination afterward. A somewhat revised course on November 29, 2012 was presented. Presently, the corresponding course for this certification program has been transferred into a series of six presentations that have been recorded and can be viewed at your leisure. Contact Jamie Koerner at jamie@geosynthetic-institute.org for more information.

Program #3 - Geosynthetic Designer Certification

The "Geosynthetic Designer Certification Program (GDCP)" is also now available. Please go to www.geosynthetic-institute.org/gdcpintro.pdf for the requisite details. Included are introduction (rationale behind the program was given in a recent GSI Column called "We're Losing the Battle"), disclaimer, requirements, application, reference material, sample questions, proctor manual and proctor application. In the *requirements section* you will see that the applicant must;

- be a graduate of an accredited engineering program,
- have six-months geosynthetic designer experience,
- complete the application form,
- pay the $500 fee for 5-years certification, and
- take a 45-question examination with ≥ 70% passing.

All three programs are on-going and if you have questions and/or comments please contact us accordingly.
Jamie Koerner jamie@geosynthetic-institute.org

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 three countries (Korea, Taiwan and India), 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). It is presently held entirely within INHA University. **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. His active participation at conferences worldwide is very admirable. He has provided research and development in many geosynthetic subjects including geotextiles, geomembranes, geocells, additives for GCLs, recycled plastics for improved formulations, etc.

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). The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Dean of the R & D Office. We inform you that the 7th Asian Regional Conference on Geosynthetics (GeoAsia7) & IGS First Young Engineers Conference will be held on October 31- November 4, 2022 at the Taipei International Conference Center (TICC), Taipei, Taiwan. GeoAsia7 is organized by the Chinese Taipei Chapter of the International Geosynthetics Society and Dr. Hsieh is Chairman of the GeoAsia7 Organizing Committee. Information about the conference can be found at http://www.geoasia7.org

GSI-India under the direction of Dr. T.V. Sreekumar was formed in 2015. The hosting organization is the Bombay Textile Research Association (BTRA) which is a premier textile research institute providing testing, research, training and consultancy services. BTRA is located in Mumbai, India and is accredited as per ISO 17025. The Geosynthetic test lab is also GAI-LAP accredited. Testing at BTRA is performed as per the latest EDANA, ASTM, INDA, AATCC, ISO, EN and AASHTO international standards. BTRA is known for its excellence in textile R & D and is currently branching out into all forms of geosynthetics with a fantastic R & D laboratory.
BTRA has a quarterly publication called “BTRA scan” and is worth checking out if you haven’t seen it. The latest news report was issued January 2022 and can be found at www.btraindia.com/btrascan.html

GSI Member Organizations

We sincerely thank all of our sponsoring organizations for their continued support. Without members, GSI could not exist. The current GSI member organizations and their contact members are listed below.

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U.S. Environmental Protection Agency
David A. Carson (BOA)
Federal Highway Administration
Silas Nichols/Daniel Alzamora
Golder Associates Inc.
Frank Adams/Paul Whitty/Linda Grover
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Huesker, Inc.
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Waste Management Inc.
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In The Next Issue

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- Overview of GRI (Research) Projects
- Progress within GII (Information)
- Progress within GEI (Education)
- Activities within GAI (Accreditation)
- Activities within GCI (Certification)
- The GSI Affiliate Institutes
- GSI's Member Organizations