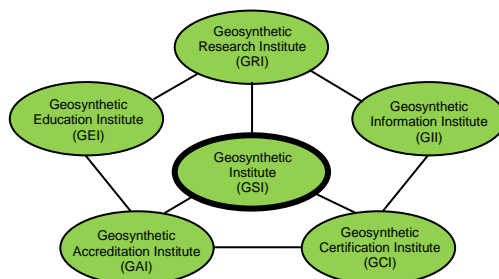


# The GSI Newsletter/Report



## Geosynthetic Institute

Vol. 33, No. 4

December, 2019

This quarterly newsletter, now in its 33<sup>rd</sup> 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](http://www.geosynthetic-institute.org). It also serves as a quarterly report to its member organizations. Details are available by contacting George R. Koerner or Marilyn Ashley at phone (610) 522-8440; fax (610) 522-8441 or e-mail at [gsigeokoerner@gmail.com](mailto:gsigeokoerner@gmail.com) or [mvashley@verizon.net](mailto:mvashley@verizon.net).

## Holiday Greetings from GSI

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

We want to extend congratulations to long time board member John Workman (Waste Management) on his retirement. We appreciate his hard work and contributions to the BOA and wish him well. Burrill (Bo) McCoy of Waste Management will be taking over John's position, representing owners and operators. Bo McCoy's term will continue through 2021.

Voting results for the three GSI Board of Advisor positions for 2020-2022 are as follows:

Vergil Rhodes of CP Chemical will be replacing Ashish Sukhadia as the resin and additives group representative. David Carson of the U.S. EPA, who will be representing the agencies, will be replacing A. K. Mukhopadhyay. Kent von Maubeuge of NAUE GmbH & Co. will remain on the board as the international representative through the end of 2022. We thank Ashish Sukhadia and A. K. Mukhopadhyay for the service over the last 3 years.

#### 2020-2022 Board of Advisors

##### Term Ends 2020

- Tony Eith - CEC Consultants, Inc. (Consultants and Testing Labs)  
email: [teith@cecinc.com](mailto:teith@cecinc.com)
- Jimmy Youngblood - GSE Environmental (Geomembranes and GCL's)  
e-mail: [jyoungblood@solmax.com](mailto:jyoungblood@solmax.com)
- Moreno Scotto - Maccaferri (International - 2)  
e-mail: [moreno.scotto@gmail.com](mailto:moreno.scotto@gmail.com)

##### Term Ends 2021

- Burrill (Bo) McCoy - Waste Management Inc. (Owners and Operators)  
e-mail: [bmccoy2@wm.com](mailto:bmccoy2@wm.com)
- David Andrews – Propex (Geotextiles and Geogrids)  
e-mail: [David.Andrews@propexglobal.com](mailto:David.Andrews@propexglobal.com)
- Sam Allen – TRI Environmental Inc. (At-Large)  
e-mail: [Sallen@tri-env.com](mailto:Sallen@tri-env.com)

##### Term Ends 2022

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

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## Happy Holidays to our GSI Member Organizations

We sincerely thank all of our sponsoring organizations for their continued support. Without them, GSI could not exist. The current GSI member organizations and their contact members are listed below. **Our newest member is Engepol Geossinteticos Ltda., located in Brasil. We welcome you to GSI.**

### **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*

### **Tensar International Corporation**

*Mark H. Wayne/Joseph Cavanaugh/Doug Brown*

### **TenCate Geosynthetics**

*John Henderson/John Lostumbo/Chris Lawson*

### **CETCO**

*Dave Chiet/Michael Donovan/Rob Valorio*

### **Huesker, Inc.**

*Flavio Montez/Andreas Elsing/Lilma Schimmel*

### **NAUE GmbH & Co. KG**

*Kent von Maubeuge [BOA]*

### **Propex Operating Company LLC**

*Drew Loizeaux/David Andrews [BOA]*

### **Berry Global Inc.**

*Keith Misukanis*

### **TRI/Environmental Inc.**

*Sam R. Allen [BoA]/C. Joel Sprague*

### **U. S. Army Corps of Engineers**

*Kevin Pavlik/Richard DePasquale*

### **Chevron Phillips Chemical Co.**

*Ashish Sukhadia/Vergil Rhodes [BOA]*

### **AECOM (formerly URS Corp.)**

*John Volk/John Bove/Michael Stepic*

### **Solmax Géosynthétiques**

*Jacques Cote/Simon Gilbert St-Pierre/*

*Jimmy Youngblood [BOA]*

### **CARPI, Inc.**

*Alberto M. Scuero/John A. Wilkes*

### **Civil & Environmental Consultants, Inc.**

*Tony Eith [BOA]*

### **Agru America, Inc.**

*Nathan Ivy [BoA]/Markus Haager*

### **INHA (GSI-Korea)**

*H.-Y. Jeon*

### **Waste Management Inc.**

*Greg Cekander/Burrill (Bo) McCoy [BOA]*

### **NPUST (GSI-Taiwan)**

*Chiwan Wayne Hsieh*

### **GeoComp/GeoTesting Express**

*W. Allen Marr/Gary T. Torosian*

### **GEI Consultants**

*Michael A. Yako/Michael Ruetten/*

*Helen Robinson/John Trast*

### **Atarfil, S. L.**

*Emilio Carreras Torres/Tamara Jurado Corrasco*

### **Republic Services Inc.**

*Joe Benco/Mike Beaudoin/Dave Vladic*

### **GSE Europe**

*Catrin Tarnowski*

### **InterGEO Services Co.**

*Şükrü Akçay/Archie Filshill*

### **Raven Industries, Inc.**

*Clint Boerhave/Stacy Coffin/Greg Anderson*

### **CTI and Associates, Inc.**

*Te-Yang Soong/Kevin Foye*

### **Advanced Earth Sciences, Inc.**

*Kris Khilnani/Suji Somasundaram*

### **Carlisle Syntec, Inc.**

*Paul Markel/Brinda Mehta*

### **EPI, The Liner Co.**

*Daniel S. Rohe/Ryan Whalen*

### **Geo-Logic Associates**

*Monte Christie*

### **Weaver Consultants Group, Inc.**

*Mark Sieracke*

### **Aquatan (Pty) Ltd.**

*Piet Meyer/ Sanet van der Merwe*

### **Jones Edmunds, Inc.**

*George Reinhart/Tobin McKnight*

### **Afitex-Textel**

*Pascal Saunier/Stephan Fourmont/Jocelyne Grenier*

### **EVAl Americas (Kuraray)**

*Edgar Chow*

### **BTRA (GSI-India)**

*Anjan K. Mukhopadhyay*

### **Watershed Geosynthetics LLC**

*Michael Ayers/Paul O'Malley*

### **Maccaferri**

*Moreno Scotto [BoA]/Sachin Mandavkar/Pietro Rimoldi*

### **Jones & Wagener (Pty) Ltd.**

*Riva Nortje*

### **Ardaman & Assoc.**

*Thomas S. Ingra/Deborah Scott/Ernie Cox/*

*Mark Mongeau*

### **American Wick Drain**

*Scott Morris/Craig Phelps/Seth Marlow*

### **INOVA Geosynthetics/AERO Aggregates**

*Archie Filshill/Theresa Loux*

### **Sotrafa S. A.**

*Jose Miguel Munoz Gomez/Rosa Ruiz*

### **Kaytech Fabrics Group Ltd.**

*Paul Pratt*

### **Owens Corning Science & Technology LLC**

*Steve Thaxton/Clive Mills/Jason Woodall*

### **SKAPS Industries**

*Nilay Patel/Anurag Shah*

### **Duke Energy**

*Evan Andrews/Ken Karably*

### **Chesapeake Containment Systems (CCS)**

*Steven Mayes*

### **Layfield Group**

*Deepaksh Gulati/Mark Simpson*

### **Engepol Geossinteticos Ltda**

*Patricia Ferreira/Andréia Machado/Ildo Oliveira*

## Associate Members

### **Delaware Solid Waste Authority**

*Robin Roddy/Jason Munyan*

### **Nebraska Department of Environmental Quality**

*Michael Behrens*

### **New York State Dept. of Environmental Conservation**

*Robert J. Phaneuf*

### **Maine Department of Environmental Protection**

*Victoria Eleftheriou*

### **California Water Resource Control Board**

*Scott Couch/ Brianna St. Pierre/Joshua Munn*

### **New Jersey Dept. of Environmental Protection**

*Mary Anne Goldman*

### **Pennsylvania Dept. of Environmental Protection**

*Jason Dunham*

### **Florida Dept. of Environmental Protection**

*Cory Dilmore*

### **U.S. Bureau of Reclamation**

*Brian Baumgarten/Peter Irej*

### **Michigan Dept. of Environmental Quality**

*Margie Ring/Xuede (Dan) Qian*

### **Environment Agency of U. K.**

*Darren Legge*

### **Florida Dept. of Transportation**

*David Horhota*

### **Virginia Dept. of Environmental Quality**

*Donald Brunson*

### **Massachusetts Dept. of Environmental Protection**

*Tom Adamczyk*

### **Dept. of Water Affairs of South Africa**

*Kelvin Legge*

### **Pennsylvania Dept. of Transportation**

*Beverly Miller*

We welcomed Huesker Inc.'s GeoForum attendees to GSI on October 18, 2019 for an open house after the event in King of Prussia, PA. Dr. George Koerner presented a lecture and demonstration on geosynthetic performance testing wide width tensile transmissivity and direct shear to approximately 20 participants. Good questions, good food, and 1.5 PDHs were issued to attendees who were willing to take a test on the lecture/demonstration.



Back row: Flavio Montez, Lilma Schimmel, Carolina Palmer, Oliver Detert, Bob Koerner, Greg Wright  
Front row: George Koerner, Roy McClinton, Jay McKelvey, Rick Smith, Jorge Zornberg



*In loving memory of those who are forever in our hearts*

***Robert M. and Paula W. Koerner***

*The Holidays bring a mixture of emotions as we remember GSI Founder, Robert M. Koerner and his wife of 60 years, Paula Koerner, GSI Treasurer. We remind you to cherish your loved ones during this Holiday Season.*

### ***In Memory of Robert M. Koerner, Ph.D., P.E., NAE***

It is with great sadness and heavy hearts that we announce the death of Robert (Bob) M. Koerner on December 1, 2019. He was the loving husband of Pauline (Paula) W. Koerner, and father of three children. Bob was born on December 2, 1933 in Philadelphia, PA to immigrant parents (Michael and Cecilia Koerner). He grew up in Lansdowne, PA and attended parochial school before entering University. He held a BSCE degree from Drexel University in 1956, a combined MSCE degree from Columbia, Delaware and Drexel Universities in 1963, and a Ph.D. in Civil Engineering from Duke University in 1968. He has also studied Law at Temple University from 1963-65. Educating himself and others was always a key component to what made and motivated Bob.

After his undergraduate degree, Bob began his career in construction. He worked on a number of projects including: the Walt Whitman bridge in Philadelphia (Conduit and Foundation Inc.), a Bailey Bridge in Easton, PA and the Cross Bronx Expressway in New York City (James J. Skelly). He married his wife Paula in 1959 and then transitioned into consulting with Dames and Moore out of NYC (Wilmington Harbor Project and dredging for Alcoa in Kingston, Jamaica). After three near fatal accidents, Paula convinced Bob that she didn't want to raise their three young children as a widow, so he needed to find a safer career. Bob loved his first job teaching at PMC (now Widener University), so he committed to a career path in education by moving his family to North Carolina for his Ph.D. at Duke University.

Bob and Paul moved back to Philadelphia in 1968 to join the Civil Engineering Department at Drexel University. His initial research was on deep foundations, acoustic emission monitoring of soil deformations, and nondestructive testing to locate below ground structures and objects. In the late 1970's Bob began research in the fledgling field of designing and installing fabrics and plastic materials in roadways and retaining walls. In 1980, he co-authored the first textbook on geosynthetics, and the "phone never stopped ringing". With Bob's full and complete focus on geosynthetics, he became renowned in the field, in the US and internationally, and is known for over 750 publications, most notably the text "Designing with Geosynthetics," which he updated to the 6<sup>th</sup> edition. He simply never stopped writing (his final CV is 65 pages long). If you know Bob you also know that he kept meticulous records, his publications include:

Books Authored, Edited or Co-Edited – 42  
Journal Papers – 168  
Symposia and Conference Publications – 255  
Book Chapters and Published Reports – 130  
Miscellaneous Articles - 400±

Bob supported the growing industry of geosynthetic education and research by founding the Geosynthetic Research Institute (GRI) in 1986. It was located at Drexel University until 1998 when he moved off-campus to its present location near the Philadelphia International Airport. GRI was, and is, tremendously successful. Federal, state and private research expenditures were over \$10M and a consortium of organizations was formed from the outset which continues to the present.

The Geosynthetic Institute (GSI) was formed and incorporated in 1991 and it was granted tax-free IRS 501(C)(3) status in 1993. Bylaws, a Board of Advisors, annual conferences, annual meetings, specific focus group meetings, and related activities followed in succession and continue to the present. There are currently 73 organizations involved representing the entire cross-section of the industry, i.e., agencies, owners, consultants, testing laboratories, resin producers, manufacturers of all types of geosynthetics, and installers as well.

In 1998 Bob was elected into the National Academy of Engineering. He has proudly served the local, national, and international engineering community for over 50 years. At his core, Bob was a teacher. He was always networking with people, sharing his latest insights, rehearsing lectures to himself if he was running alone, or laughing and talking when with others through thousands of training miles. (Bob completed 25 marathons and over 200 shorter races.) He has taught in lectures, classrooms, businesses, conferences, on the streets, in our home, and even on the beach. His latest recorded sessions for internet geared education affectionately earned him the title "Webinar Bob".

Bob could get a group of strangers conversing with each other faster than anyone. He loved to put a question forward and manage the conversation to draw each person out and voice their opinion. This made each one of us better, smarter, inquisitive, more articulate, and thoughtful.

Bob is survived by Michael R. Koerner (and wife Mary), George R. Koerner (and wife Jamie), and Pauline Koerner Limberg (and husband Douglas), and his six grandchildren whom he cherished.

## *In Memory of Paula Koerner*

It is with great sadness and heavy hearts that we announce the death of Pauline (Paula) W. Koerner (nee Feuerer) on December 1, 2019. She was the loving wife of Robert M. Koerner, and mother of three children.

Paula was born in Gmünd am Tegernsee, Bavaria, in the southern part of Germany on May 29, 1932 to her parents Paula and Georg Feuerer. She was trained as a tailor and as a young adult she moved to Munich and worked as a cutter in the Wilhelm Franke Company. She lived in a small studio apartment, with a one-burner hot plate, eating vegetable soup every night for dinner, and dreamed of having a 1-bedroom apartment. Planning ahead, with the currency exchange rate in her favor, she decided to work in the United States for two years and live with her aunt and uncle, Barbara and George Korber, and then go back to Germany when an apartment would be available. While in the US, through friends of her aunt and uncle in the German-American club, she met a German couple who had a handsome son who was an engineer named Robert M. Koerner. They met in the summer of 1959, Bob proposed to her over the Labor Day weekend, and were married on November 14, 1959. In less than 10 weeks, Paula worked a full-time job, planned her wedding, made her own dress and two bridesmaids' dresses, learned to drive a car and got her driver's license, took classes to learn English, and studied for her US citizenship. Paula and Bob just celebrated their 60<sup>th</sup> wedding anniversary, surrounded by their family. Their honeymoon was to Germany so Bob could meet her family.

Paula and Bob's son Michael was born in 1960. The couple was overjoyed and named him after Bob's father. Bob had given Paula a dog she named Rea to keep her company while she lived in these houses but had few neighbors. Rea was truly a nanny to little Mike, who would be found cuddled up with this big German shepherd. Their second son George was born in 1962, named for Paula's father, and they moved again. Bob was in an accident working on a job site (his third), which shook Paula. She told him she didn't want to raise their kids alone, so as Bob recovered, he switched jobs and joined a consulting firm. Pauline was born in 1964, named for Paula's mother, and they moved again. Bob was traveling so much that he was gone for weeks at a time. They had a hard discussion about how to proceed forward and raise a family. Bob had part-time teaching position at Pennsylvania Military College (which is now Widener University) that he loved. But in order to become a tenured faculty member at any accredited university, he needed a PhD. So, they packed up the family and moved to Durham, NC. Paula made their home off-campus in a small house in the neighborhood. Bob finished graduate school at Duke University and became a faculty member at Drexel University in Philadelphia. Finally, Paula could put down roots. They had moved 11 times in 9 years with three small kids (and a dog).

"Roots" is a great word to describe Paula. She was an avid gardener and enjoyed collecting seeds from wherever she went, potted them, watered them, and everything sprouted. Successful gardeners are said to have a green thumb, and Paula had two! The house on Springfield Road, bought in 1970, had beautiful gardens on the side and a large vegetable garden in the back. Whenever she was outside Paula was "scratching in the dirt". Inside the house Paula made all the clothes for the family, suits, overcoats, shirts and pants, hats and costumes. When the family took up jogging and running,

she turned out the first matching jogging outfits for all five family members. No one knew they were crafted by her very skilled hands. Clothes that didn't fit were taken apart, cut into squares and assembled into patchwork quilts. (We all have one.) Paula was also a legendary cook. She had a knack with sauces and gravies, so everything tasted great. And with three active men in the house, she was constantly feeding people. Paula was on a mission to save as much of Bob's paycheck as possible. Her thrift was legendary. She composted, recycled, reused, and repurposed to the extent that the amount of money coming into the household far exceeded their spending. They could afford to go on weekend trips in the winter to ski and to the beach in the summer to enjoy the sand and the surf. Paula and Bob lived in the Springfield Road house for twenty years, were upstanding members of their community, and hosted Drexel faculty, students, runners, international guests, family, and friends. Everyone was welcomed.

When the kids were grown and out of college, Paula returned to work as the office administrator and treasurer for GRI and then GSI, the Geosynthetic Institute. She traveled extensively with Bob, ran the administration and registration for many of his conferences, handled distribution of his books and papers, and was affectionately known as "the mother of geosynthetics". She was Bob's sounding-board and was instrumental in most of his business decisions, including the conception and formation of the Koerner Family Foundation for the advanced education of engineering students in the United States.

Paula was a devoted wife and fabulous mother, but what perhaps brought her the most joy was loving her six grandchildren who were all born within six years of each other. She purposed to make sure we would remain a family unit by orchestrating wonderful vacations. She started us all skiing, and we all continue to enjoy the snow in the winter. She took us to gorgeous beaches in Jamaica, Mexico, and Aruba, where we gathered to build sandcastles, engage in engineering conversations, answer Bob's survey questions, and crowded around the dinner table to share a meal. Paula taught us how to live with each other in practical ways and love each other in personal ways that stitched us together into a beautiful fabric called "family". She was our soil, our backbone, and always our greatest champion.

Paula drew her strength from her family and gave us the following advise;

- Live each day with courage and do the things that need to be done
- take pride in hard work
- clean up your messes and leave the place better than you found it and
- waste absolutely nothing
- be a lifetime learner and good citizen of the world

Paula embodied the work ethic, tenacity and hopeful spirit of most immigrants. She thought that education was the "great equalizer" and convinced many to pursue their dreams.

Paula is survived in Germany by her brother Georg (and wife Irma) Feuerer, sister Winnifred (and husband Helmut) Fitzki. In the US she is survived by Michael R. Koerner (and wife Mary), George R. Koerner (and wife Jamie), and Pauline Koerner Limberg (and husband Douglas), and her six grandchildren, David & Paula Limberg, Addie & Robert F. Koerner, Maxwell & Helena Koerner, whom she absolutely adored.

## 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. *Those projects marked with an asterisk have written papers available; please ask and we will send them accordingly.* Contact George Koerner ([gsigeokoerner@gmail.com](mailto:gsigeokoerner@gmail.com)), Grace Hsuan ([hsuanyg@drexel.edu](mailto:hsuanyg@drexel.edu)) for details and/or discussions.

- 1. Field Exposed Lifetime of Geogrids Used at the Facing of Landfill Berms** - The facing of mechanically stabilized earth landfill berms (and other walls and slopes as well) often uses a wrap-around configuration leaving the geogrid exposed to the atmosphere. A project being conducted by George Koerner is presently investigating the behavior of two different geogrids and two erosion control materials at a local landfill over time. These four materials are also being exposed on the roof of the GSI carport. A 50-year time frame is envisioned! The long-term behavior will eventually be compared to our UV laboratory predicted database.
- 2. Laboratory Exposed Lifetime of Geomembranes\*** - GSI is using three UV-fluorescent devices to estimate the projected exposed lifetime of six different types of geomembranes. They are HDPE, LLDPE, fPP, EPDM and PVC (N.A. and European). They are being incubated at 60, 70, and 80°C until half-life of strength and elongation are measured. The goal is lifetime prediction. Incubation times are now over 60,000 light hours (8.2 years) and several are not yet complete. They will probably take as long as 90,000 light hours ( $\approx$  12.3 years). The information up to this point in time was made available to the public on April 6, 2016 at the GeoAmericas Conference in Orlando, Florida. It has been republished in the International Geosynthetics Journal. A copy is available. It is now also being offered as a 90 min. webinar.
- 3. HDPE Geomembrane Lifetime as a Function of Thickness** - This often-encountered question is being evaluated at elevated temperature exposure at in a QUV weathering device per ASTM D7238. Formulations are exactly the same and only the sample thicknesses vary. These thicknesses are 2.76, 2.44, 1.58, 1.08, 0.77 and 0.48 mm. Parameters being evaluated in this decades long study are change in thickness and presence of crazing or cracking. Time will tell!
- 4. Laboratory Exposed Lifetime of PVC (European) Geomembranes** - We have been evaluating five different European formulations for nine years using three dedicated UV-fluorescent devices and the results are very impressive. The study is being conducted for CARPI Tech, a GSI member organization. The project also allows us to distinguish between PVC geomembranes manufactured in North America versus Europe. The differences are in the type of plasticizers used in the formulations as well as thicknesses. The program will end this year but may be extended with new formulations.
- 5. Retaining Wall Failure Evaluations\*** - We have past GRI Reports 38, 39, and 40 addressing mechanical stabilized earth (MSE) walls using geosynthetic reinforcement which document 82-failures. Our data base has grown to 141, then 171, then 320 and now 346! *Readers, we have a very serious situation in this regard!* The failures are either excessive deformation or actual collapses. We have presented one-day courses on this topic along with inspector training and development insofar as a field inspectors certification program; see the certification section of this Newsletter/Report. An updated paper on 320 case histories has just been published in the Journal of Geotextiles and Geomembranes. Lastly, three ongoing GSI webinars are also available on this general topic.
- 6. pH Between Masonry Block Wall Units\*** - George Koerner has been measuring the pH between three types of masonry blocks for over eight years to monitor the values. Concern here is over PET geogrids which are known to be sensitive to very high alkalinity environments. Indeed, the values started high, but over time they are now down to eight and lower. George has published a paper in this regard.
- 7. Slow Pressurization of HDPE Geomembranes in Axi-Symmetric Testing\*** - The ASTM D5716 method of testing geomembranes in a 3-D axis-symmetric mode uses a pressure rate of 6.9 kPa/min (1.0 psi/min). While such a rate is appropriate for most geomembrane types, it is very fast for HDPE which is semi-crystalline and cannot readily stress relax so as to accommodate the applied pressure. To investigate slower rates we have initiated a project with rates as low as 6.9 kPa/month (1.0 psi/month)! The last test, begun in 2017, is at a rate of 6.9 kPa/six months (1.0 psi/six months) and it will take an estimated five years to conclude. Recently, yield was observed in the deformed geomembrane but air pressure is still sustained. A preliminary paper was presented at Geosynthetics '15 in Portland.
- 8. Residual Stress in GS** - Short term project involving the tensile behavior of textiles, grids and fibers to hysteresis temperature modulation. Temperatures range from -10°C to 50°C.
- 9. Generic Standards** - A major continuing effort is ongoing with respect to the development and updating of GRI's generic geosynthetic standards. As customary, "standards" consist of specifications, guides, practices and test

methods. The current status of these standards is as follows.

- 9a. **GRI Specifications** - Currently we have 21 generic specifications on most of the products generally used. The notable exception is geogrids, which is, and has been for years, very contentious with no obvious accommodations. Incidentally, all are currently copyrighted.
- 9b. **GRI Guides** - Currently we have 12 guides on detailed aspects of geosynthetics, their installation and project performance. Topics vary widely; from statistical sampling-to-constructing test pads. Topics of interest for our development should be communicated to George or Bob Koerner.
- 9c. **GRI Practices** - Currently we have 8 practices on wide ranging topics generally used in design methods. They are very detailed and sometimes are based on our concept of what we perceive to be "best practice".
- 9d. **GRI Test Methods** - Currently we have 29 test methods available on the following geosynthetic types:

- Geotextile Related - 2
- Geogrid Related - 2
- Geomembrane Related - 6
- GCL Related - 2
- Geocomposite Related - 11
- Geosynthetic (multipurpose) Related - 6

Additionally, 31 of our test methods have been co-opted by ASTM and we have depreciated our version. Incidentally, our test methods are for members only and are in the password protected portion of our website. We are delighted to report that ASTM has given the David Suits Award to GSI for our cooperation in sharing these GRI standards. We will continue to distribute our test methods in this manner, but specifications, guides and practices are available free as mentioned previously.

## Changing the "One per 500 Feet" Paradigm on Geomembrane Field Seam Sampling!

Dr. Henry Haxo, president of Matrecon, Inc., deserves considerable credit for developing many of the concepts and practices involved in waste containment liner and cover systems. Beginning in the 1970's, various projects, many of them funded by the now U.S. Environmental Protection Agency, were actively researched. His capstone document is the 1069 page (2.5 in. thick) report on September 1988 designated as EPA/600/2-82/052. In it is referenced the minimum

sampling of geomembrane field seams at the rate of one per 500 ft (150 m). Haxo states that Wright, et al. (1987) originally made the recommendation. This amount of periodic destructive testing is embedded in many U.S. State regulations (even some worldwide) and has become entrenched in geomembrane installation practice as well as being evaluated by construction quality assurance (CQA) personnel. Shown below is a removed geomembrane field seam sample which was then sent to a geosynthetics laboratory for testing to see if the project specification values were met. Also shown is the patch made to repair such a sampling area.



Fig. 1. Area of seam sample removal. (GSI Photo)



Fig. 2 Extrusion fillet welded patch over sampled area. (GSI Photo)

While such sampling is certainly possible, and is done on a regular basis, it is not without many disadvantages. Furthermore, the fundamental practice of making field seams has progressed meaningfully over the past 30+ years. The following items come to mind:

1. Geomembrane seaming devices have improved from extrusion flat, to extrusion fillet, to single hot wedge, to double hot wedge methods over the years.
2. The double hot wedge seam allows for a nondestructive air-channel testing method.
3. Hot wedge seaming does not require surface grinding of the sheets.



4. Off-site testing of destructive seams is both time consuming and represents added expense.
5. Statistical sampling methods are now available (for the methods of attributes and control charts see GRI-GM14 and GRI-GM20, respectively) which provide spacing flexibility and rewards good installers (opens spacing) and penalizes poor installers (closes spacing).
6. A geosynthetic installer's certification program is now available for both installation companies and individual installers; see [www.iagi.org](http://www.iagi.org).
7. Geomembrane sheet edges (tops and bottoms) can be manufactured with protective films which are stripped off immediately before seaming, leaving the area to be bonded both clean and dry.
8. Automatic hot wedge welders are available, which continuously track the surface temperature of the sheets and can computer regulate the device's seaming speed.
9. Infrared and ultrasonic methods are available for nondestructive seam testing.
10. The electrical leak location survey (ELLS) method is now fully developed. Importantly, it evaluates the integrity of both the seams and the sheets themselves. There are five separate standards available for the various variations of the method (ASTM D7002, D7003, D7007, D7240 and D7953).

In light of these ten items, all developed since the 1 in 500 ft. sampling interval was first advanced, a major shift in destructive seam testing seems warranted. The recommended process is embodied in the attached chart. See <https://geosynthetic-institute.org/grispeccs/gm29.pdf> for additional details. The entire process begins with a seam of any length passing the air channel test of a dual track hot wedge seam. Thereafter, three separate changes to the 1 in 500 ft. spacing strategy are suggested.

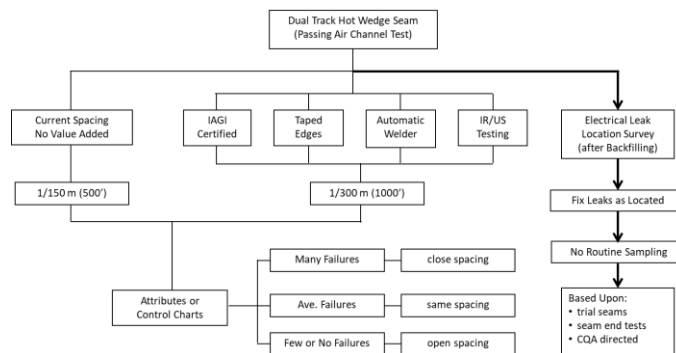
**Minor change** - Begin seaming with the 1 in 500 ft. spacing, but then modify it according to statistical methods insofar as closing, maintaining or opening the spacing as seaming progresses.

**Intermediate change** - If any of the four "value added" installers criteria are initiated, increase the spacing initially to 1 in 1000 ft, but then modify it per one of the statistical methods.

**Major changes** - Go directly to using the ELLS and repair holes or defects in both seams and sheet as indicated. This can be done before and/or after backfilling. The only destructive tests would be on trial seams, on seam ends and as the CQA personnel direct.

In summary, we feel that geomembrane installation practices have advanced significantly since the original "one in 500 ft" paradigm was advanced. The key to changes in this regard, is, of course, the regulatory community, since liner waste containment regulations are involved. These regulations must be changed or modified at least on a provisional basis. We are available to interact in this regard insofar as possible.

Suggested Strategy for Destructive Test Sampling  
(see GRI-GM29 for details)



George Koerner

## Progress within GII (Information)

Our GSI Home Page is accessed as follows:

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

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

Newsletter  
Prospectus  
Specifications  
White Papers  
Bookstore  
Keyword Search (new)  
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 Marilyn Ashley. Marilyn can be reached by e-mail at [mvashley@verizon.net](mailto:mvashley@verizon.net). When you get into this section, the following information is then available.

- GRI Test Methods
- 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)

The Keywords Section contains about 35,000 citations which is the vast (≈ 90%) majority of the geosynthetics literature published in English. It is updated as each published paper is received. Citation retrieval is quite easy provided that you have a specific topic, or area, in mind. This is the section of the website that we (and others we are told) use the most in our daily activities.

**Important Note:** This keyword search is now available to everyone, however, there is a charge for non-GSI members. ([www.geosynthetic-institute.org](http://www.geosynthetic-institute.org))

[institute.org/keywordpay.html](http://institute.org/keywordpay.html)). There is also a keyword search in the password protected section and is free for GSI members.

In addition to the information provided in our home page as just mentioned, Jamie Koerner (General Manager) performs various surveys on pertinent topics in geosynthetics. The latest surveys by Jamie Koerner were on the status of geosynthetic use by U.S. State Departments of Transportation (White Paper #39), State Pavement Design Methods (White Paper #40) and Post-Closure Care of Landfills (White Paper #42).

If you have topics that you feel warrant a survey, please contact us.

## **Progress within GEI (Education)**

### **GRI Reports**

To date, we have 46 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](http://www.geosynthetic-institute.org/member/reports.html). Most of them are also available in hard copy. Our most recent report is:

- #46 - Utilizing PVDs to Provide Shear Strength to Saturated Fine-Grained Foundation Soils

### **GSI Webinars (90 minutes long)**

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

**[www.geosynthetic-institute.org/webinar.htm](http://www.geosynthetic-institute.org/webinar.htm)**

**1.5 Professional Development Hours  
Nonmembers Cost - \$250;  
GSI and GMA Member Cost - \$200**

*Commentary on Webinars:* For the single cost of \$250 (non-members) or \$200 (members), Adobe Connect streams the webinar to all requested sites. Webinars can be transmitted anywhere and to anyone. Recently, NY-DEC streamed our webinar to their auditorium and 13 regional offices. Clearly hundreds of participants were involved! In December, George presented a 3-part webinar on Transportation to the U.S. Army Corps of Engineers, which was attended by several regional offices. Clearly, this is the most efficient way to communicate information to masses of people. Following is a list of topics given on behalf of GSI and ASCE. Contact us for details in each case.

### **GSI Webinars**

- GSI 1 – “A Data Base and Analysis of 320 Failed MSE Walls With Geosynthetic Reinforcement”
- GSI 2 – “MSE Wall Back Drainage Design”
- GSI 3 – “MSE Wall Remediation and Monitoring”
- GSI 4 – “MSE Wall Inspection”
- GSI 5 – “Geosynthetics in Hydraulic Applications”
- GSI 6 – “Geosynthetic Applications Used in Heap Leach Mining”
- GSI 7 – “Geosynthetics in Agriculture and Aquaculture”
- GSI 8 – “Geosynthetics Applications in the Private Sector”
- GSI 9 – “Behavior and Analysis of Twenty Solid Waste (Landfill) Failures”
- GSI 10 – “Wet (Bioreactor) Landfills for Rapid Degradation of MSW Organics”
- GSI 11 – “Lateral and Vertical Expansions Over Old and Existing Landfills”
- GSI 12 – “Landfill Covers: Past, Present, Emerging”
- GSI 13 – “Beneficial Uses of Abandoned and/or Closed Landfills”
- GSI 14 – “Lifetime Predictions of Covered and Exposed Geosynthetics”
- GSI 15 – “In-Situ Stabilization of Soil Slopes Using Nailed (or Anchored) Geosynthetics”
- GSI 16 – “Sand Drains-to-Wick Drains-to-Sand Columns (Including a Major Failure Case History)”
- GSI 17 – “Geosynthetics in Erosion Control”
- GSI 18 – Pond Liner Design and Performance
- GSI 19 – “Wave (or Wrinkle) Management [For Proper Deployment of Geomembranes]”
- GSI 20 – “Geosynthetic Drainage Materials: Applications, Design, Installation and Performance”
- GSI 21 – “A Brief Overview of Geosynthetics and Their Major Applications”
- GSI 22 – “Geosynthetic Reinforced MSE Walls; Overview, Failures and Items for Improvement”
- GSI-23 – “Geosynthetic Filters: Concerns and Issues
- GSI-24 – “Disposal of Coal Combustion Residuals”
- GSI-25 – “Soil Consolidation by Wick Drains, aka PVDs”
- GSI-26 – “Applications and Design of Geotextile Tubes”
- GSI-27 – “Stability Design of Landfill Cover Soils”

### **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 available)
2. Construction Inspection of Mechanically Stabilized Earth (MSE) Walls, Berms and Slopes (recordings available)

The third and newest of GSI courses is an On-Line “Designing With Geosynthetics (DwG)” course. Please go to <http://www.geosynthetic-institute.org/courses.htm> and scroll down to Course #3. Here you will see the

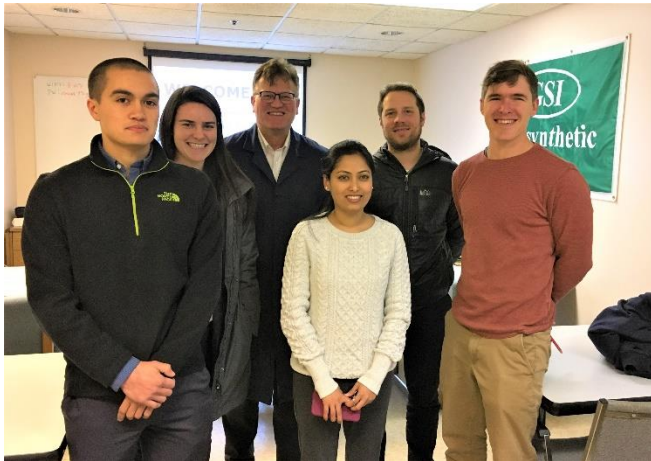
requisite details. The course itself is completely synchronized with the 6<sup>th</sup> Edition of the DwG textbook. It consists of 1540 slides with  $\approx$  18 hours of voice over; about one minute for each slide.

Contact Jamie Koerner at [jrkoerner@verizon.net](mailto:jrkoerner@verizon.net) if you want information and details.

### **GSI Fellowships**

Eighteen (18) fellowships at \$5000 each were awarded this year 2019-2020. For details please go to our website. [www.geosynthetic-institute.org/gusifellows.htm](http://www.geosynthetic-institute.org/gusifellows.htm).

### **Villanova Night at GSI - December 12, 2019**



George Koerner gave graduate Civil Engineering students from Villanova University a lecture and tour of GSI on Thursday evening, December 12, 2019. This event marked the end of their Fall 2019 classes and the start of winter break for the Villanova students. We thank Professor Shweta Shrestha for sharing her students with us! George truly enjoyed his interaction with both Shweta and the group of future engineers.

### **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 257 GAI-LAP test methods available for accreditation. Please consult our home page for a current listing.

As of September, 2019, 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<sup>A</sup> - TRI/Environmental Inc. (155 tests)  
Jarrett Nelson -- (512) 263-2101  
[jnelson@tri-env.com](mailto:jnelson@tri-env.com)
- 3<sup>A</sup> - Golder Associates (43 tests)  
Henry Mock -- (770) 492-8280  
[Henry\\_Mock@golder.com](mailto:Henry_Mock@golder.com)
- 4<sup>C</sup> - Geosynthetic Institute (108 tests)  
George Koerner -- (610) 522-8440  
[gsigeokoerner@gmail.com](mailto:gsigeokoerner@gmail.com)
- 8<sup>B</sup> - Propex Operating Co., Ringgold (17 tests)  
Todd Nichols -- 438-553-3757  
[todd.nichols@propexglobal.com](mailto:todd.nichols@propexglobal.com)
- 9<sup>B</sup> - Lumite (17 tests)  
Rebecca Kurek -- (770) 869-1187  
[rkurek@lumiteco.com](mailto:rkurek@lumiteco.com)
- 13<sup>A</sup> - Precision Geosynthetic Labs (TRI Env.) (87 tests)  
Cora Queja -- (714) 520-9631  
[cqueja@tri-env.com](mailto:cqueja@tri-env.com)
- 14<sup>A</sup> - Geotechnics (50 tests)  
J. P. Kline -- (412) 823-7600  
[JPkline@geotechnics.net](mailto:JPkline@geotechnics.net)
- 20<sup>A</sup> - GeoTesting Express, MA (60 tests)  
Gary Torosian -- (978) 635-0424  
[gtt@geotesting.com](mailto:gtt@geotesting.com)
- 22<sup>B</sup> - CETCO Hoffman Estates (11 tests)  
Minerals Technologies Inc.  
Barbara Gebka -- (847) 851-1904  
[Barbara.gebka@mineralstech.com](mailto:Barbara.gebka@mineralstech.com)
- 24<sup>B</sup> - CETCO Lovell (10 tests)  
Minerals Technologies Inc.  
Stuart Yates -- (307) 548-6521  
[stuart.yates@mineralstech.com](mailto:stuart.yates@mineralstech.com)
- 25<sup>B</sup> - Ten Cate, Pendergrass (13 tests)  
Darrell Scoggins -- (706) 693-2226  
[d.scoggins@tencategeo.com](mailto:d.scoggins@tencategeo.com)
- 26<sup>B</sup> - Agru America Inc. (27 tests)  
Maria Coffey -- (843) 546-0600  
[mcoffey@AgruAmerica.com](mailto:mcoffey@AgruAmerica.com)
- 29<sup>e</sup> - FITI Testing and Research Institute (80 tests)  
Dong Whan Kim -- 82-2-3299-8071  
[dwhkim@fitiglobal.com](mailto:dwhkim@fitiglobal.com)
- 31<sup>D</sup> - NYS Dept. of Transportation (9 tests)  
Tom Burnett -- (518) 485-5707  
[tburnett@dot.ny.gov](mailto:tburnett@dot.ny.gov)
- 34<sup>B</sup> - SOLMAX - Houston, TX USA (29 tests)  
Lana Hickman  
[Lhickman@solmax.com](mailto:Lhickman@solmax.com)
- 38<sup>C</sup> - CTT Group SAGEOS (123 tests)  
Jacek Mlynarek -- (450) 771-4608  
[jmlynarek@gcttg.com](mailto:jmlynarek@gcttg.com)
- 40<sup>B</sup> - SOLMAX - Kingstree, SC USA (14 tests)  
Thomas Harrelson -- (843) 382-4603  
[tharrelson@solmax.com](mailto:tharrelson@solmax.com)
- 41<sup>A</sup> - SGI Testing Service, LLC (18 tests)  
Zehong Yuan -- (770) 931-8222  
[ZYuan@sgilab.com](mailto:ZYuan@sgilab.com)

- 42<sup>C</sup> - NPUST (GSI-Taiwan) (71 tests)  
Chiwan Wayne Hsieh -- 011-886-8-7740468  
[CWH@mail.npust.edu.tw](mailto:CWH@mail.npust.edu.tw)
- 43<sup>A</sup> - Ardaman & Associates (22 tests)  
George DeStefano -- (407) 855-3860  
[gdestafano@ardaman.com](mailto:gdestafano@ardaman.com)
- 44<sup>B</sup> - Fiberweb, a Berry Global Inc. Co. (9 tests)  
Devin Clem -- (615) 847-7299  
[devinclem@berryglobal.com](mailto:devinclem@berryglobal.com)
- 45<sup>B</sup> - Ten Cate Geosynthetics Malaysia SDN Bhd. (24 tests)  
Boon Kean Tan -- (603) 519 28576  
[BK.tan@tencase.com](mailto:BK.tan@tencase.com)
- 46<sup>B</sup> - TAG Environmental Inc. (13 tests)  
Ryan Ackerman -- (705) 725-1938  
[ryan\\_ackerman@tagenv.com](mailto:ryan_ackerman@tagenv.com)
- 49<sup>B</sup> - Engepol Geosintéticos (15 tests)  
Patricia Ferreira -- (55) 51 3303-3901  
[patricia@engepol.com](mailto:patricia@engepol.com)
- 50<sup>B</sup> - ADS, Inc. Hamilton (7 tests)  
Justin Elder -- (513) 896-2065  
[justin.elder@ads-pipe.com](mailto:justin.elder@ads-pipe.com)
- 51<sup>B</sup> - SOLMAX - Canada (22 tests)  
Claude Cormier -- (450) 929-1234  
[ccormier@solmax.com](mailto:ccormier@solmax.com)
- 53<sup>B</sup> - Polytex Autofagasta (19 tests)  
Mario Contreras Cardenas -- 011 55-288-3308  
[mcontreras@polytex.cl](mailto:mcontreras@polytex.cl)
- 55<sup>B</sup> - Atarfil Geomembranas (21 tests)  
Gabriel Martin Sevilla -- 34 958 439 200  
[gmartin@atarfil.com](mailto:gmartin@atarfil.com)
- 56<sup>B</sup> - Polytex Santiago (13 tests)  
Luedy Utria Caicedo -- 011 56-2-677-1000  
[Lutria@polytex.cl](mailto:Lutria@polytex.cl)
- 57<sup>B</sup> - Ten Cate Cornelia (22 tests)  
Melissa Medlin -- (706) 778-9794  
[m.medlin@tencategeo.com](mailto:m.medlin@tencategeo.com)
- 58<sup>B</sup> - Propex Furnishing Solutions - Hazelhurst (10 tests)  
Victoria Shoupe -- (912) 375-6180  
[Victoria.Shoupe@propexglobal.com](mailto:Victoria.Shoupe@propexglobal.com)
- 59<sup>B</sup> - Firestone (9 Tests)  
Janie Simpson -- (864) 439-5641  
[SimpsonJanie@firestonebp.com](mailto:SimpsonJanie@firestonebp.com)
- 60<sup>B</sup> - TDM Geosintéticos S.A. (17 tests)  
Roberto Diaz -- 051-1-6300330  
[rdiaz@tdmgeosinteticos.com.pe](mailto:rdiaz@tdmgeosinteticos.com.pe)
- 61<sup>B</sup> - Raven Industries (18 tests)  
Clint Boerhave -- (605) 335-0288  
[Clint.Boerhave@ravenind.com](mailto:Clint.Boerhave@ravenind.com)
- 62<sup>B</sup> - SOLMAX - Selangor - Malaysia (14 tests)  
Pei Ching Teoh -- (450) 929-1234  
[pcteoh@solmax.com](mailto:pcteoh@solmax.com)
- 63<sup>A</sup> - TRI-SC Labs (11 tests)  
Jay Sprague -- (864) 346-3107  
[Jesprague@tri-env.com](mailto:Jesprague@tri-env.com)
- 64<sup>B</sup> - Agru America (NV) (14 tests)  
Ryan Steele -- (775) 835-8282  
[RSteele@AgruAmerica.com](mailto:RSteele@AgruAmerica.com)
- 65<sup>C</sup> - Bombay Textile Research Assoc. (BTRA) (21 tests)  
Riyaz Shaikh  
(0) 022-25003551  
[btra@vsnl.com](mailto:btra@vsnl.com)
- 66<sup>B</sup> - Rowad International Geosynthetics Co. Ltd (13 tests)  
Asad Ullah Khan -- +966-3-812-1360  
[asad@rowadplastic.com](mailto:asad@rowadplastic.com)
- 68<sup>B</sup> - Shawmut Corporation (4 tests)  
Tonia Walker -- (336) 229-5576  
[tcurrie@shawmutcorporation.com](mailto:tcurrie@shawmutcorporation.com)
- 69<sup>B</sup> - SOLMAX - Rayong - Thailand (13 tests)  
Siriporn Chayapornlert -- 6638-636638  
[siripornc@solmax.com](mailto:siripornc@solmax.com)
- 70<sup>A</sup> - RSA Geo Lab LLC (48 tests)  
Rasheed Ahmed -- (908) 964-0786  
[geolab13@yahoo.com](mailto:geolab13@yahoo.com)
- 71<sup>B</sup> - Plasticos Agrícolas y Geomembranas S.A.C. (24 tests)  
Manuel Constantino Olivares Espinoza --  
073-511814-511829  
[calidad@pgaperu.com](mailto:calidad@pgaperu.com)
- 72<sup>B</sup> - Tensar Corp. GA (5 tests)  
Lynn Cassidy-Potts (770) 968-3255  
[lcassidy@tensarcorp.com](mailto:lcassidy@tensarcorp.com)
- 73<sup>B</sup> - Gai Loi JSE (10 tests)  
Paul Wong 84-650-362-5825  
[paul905677@gmail.com](mailto:paul905677@gmail.com)
- 74<sup>B</sup> - Agru America Inc. (9 tests)  
Mark Locklear - (843) 221-4121  
[mlocklear@agruamerica.com](mailto:mlocklear@agruamerica.com)
- 75<sup>B</sup> - GeoMatrix S.A.S. (37 tests)  
Javier Diaz Cipagauta (571) 424-9999  
[jdiaz@geomatrix.com.co](mailto:jdiaz@geomatrix.com.co)
- 76<sup>B</sup> - Tehmco (Chile) (15 tests)  
Rodrigo Campoy 56-22-580-2852  
[rcampoy@tehmco.cl](mailto:rcampoy@tehmco.cl)
- 78<sup>B</sup> - PQA Mexico (15 tests)  
Cesar Augusto Arcila (669) 954-8202  
[directorcalidad@payg.mx](mailto:directorcalidad@payg.mx)
- 79<sup>A</sup> - TRI Geosynthetic Testing and Services (32 tests)  
Ping Wang 86-512-6283-1396  
[Pwang@tri-env.com](mailto:Pwang@tri-env.com)
- 80<sup>B</sup> - Texel Technical Materials (11 tests)  
André Parent (418) 387-4801  
[andre.parent@lydall.com](mailto:andre.parent@lydall.com)
- 81<sup>B</sup> - SOLMAX - Rechlin - Germany (18 tests)  
Evelyn Kroeger 49-40-767420  
[ekroeger@solmax.com](mailto:ekroeger@solmax.com)
- 83<sup>B</sup> - SOLMAX - 6<sup>th</sup> of October City - Egypt (13 tests)  
Ahmed Abdel Tawab - 202-2-828-8888  
[atawab@solmax.com](mailto:atawab@solmax.com)
- 84<sup>B</sup> - Owens Corning (14 tests)  
Ashutosh Dixit - 1-778-945-2888  
[Ashutosh.dixit@owenscorning.com](mailto:Ashutosh.dixit@owenscorning.com)
- 85<sup>B</sup> - PAG Tacna (17 tests)  
Manuel Constantino Olivares Espinoza --  
073-511814-511829  
[calidad@pgaperu.com](mailto:calidad@pgaperu.com)
- 86<sup>B</sup> - BOSTD China (29 tests)  
Zheng Hong - 86-532-8780-6919  
[zhenghong@bostd.com](mailto:zhenghong@bostd.com)
- 87<sup>B</sup> - Willacoochee Industrial (19 tests)  
Jason Booth - 912-534-5757  
[jason@winfabusa.com](mailto:jason@winfabusa.com)
- 88<sup>B</sup> - Geosynthetic Testing Services Pvt. Ltd. (16 tests)  
Ravi Kant - 02717-250019  
[rkant@gts-pl.com](mailto:rkant@gts-pl.com)
- 89<sup>B</sup> - Megaplast India Pvt. Ltd. (13 tests)  
Hermendra Behera - 91-937404-4620  
[geo.sgc@megaplast.in](mailto:geo.sgc@megaplast.in)
- 90<sup>B</sup> - Techfab (India) Industries Ltd. - Daman (10 tests)  
Jagdish Chandra Joshi - 91-22-2287-6224  
[nonwoven.qualitylab@techfabindia.com](mailto:nonwoven.qualitylab@techfabindia.com)  
Anant Kandi - [anant@techfabindia.com](mailto:anant@techfabindia.com)
- 91<sup>B</sup> - Techfab (India) Industries Ltd. - Rakholi (3 tests)  
Rajendra Chavan - 91-982-593-9922  
[geogrid.qualitylab@techfabindia.com](mailto:geogrid.qualitylab@techfabindia.com)
- 92<sup>B</sup> - Techfab (India) Industries Ltd. - Khadoli (2 tests)  
Navir Kumar - 91-22-229-76224  
[woven.qualitylab@techfabindia.com](mailto:woven.qualitylab@techfabindia.com)
- 93<sup>B</sup> - Garware Technical Fibres (18 tests)  
Rajendra K.Ghadge - 0-932-601-8083  
[rghadge@garwareropes.com](mailto:rghadge@garwareropes.com)
- 95<sup>B</sup> - Mexichem Colombia (Pavco) (8 tests)  
Juan David Lopez Torres - 57-1-782-5100 (ext. 1534)  
[juan.david.lopez@mexichem.com](mailto:juan.david.lopez@mexichem.com)
- 96<sup>B</sup> - Tensar China (6 tests)  
Zhu Shaolian - 603-6148-3276  
[zsl@tensar.com.cn](mailto:zsl@tensar.com.cn)
- 97<sup>A</sup> - TUV SUD PSB Singapore (16 tests)  
CHA Ming Yang - 65-6885-1514  
[ming-yang.CHA@tuv-sud.psb.sg](mailto:ming-yang.CHA@tuv-sud.psb.sg)

- 98<sup>B</sup> - NeoPlastic Filmes e Embalagens Plasticas Ltda. (7 tests)  
Daniel Meucci - 55 (11) 4443-1000  
[daniel.meucci@sapphireoffice.com.br](mailto:daniel.meucci@sapphireoffice.com.br)  
Nathalia Santos  
[nathalia.santos@neoplastic.com.br](mailto:nathalia.santos@neoplastic.com.br)
- 99<sup>B</sup> - Atarfil Middle East (16 tests)  
Mohammad Hneine - 971-564-33-1271  
[mhneine@atarfil.com](mailto:mhneine@atarfil.com)
- 100<sup>B</sup> - Atarfil Geomembranes USA (12 tests)  
Alejandro Carreras - 757-263-4057  
[acarreras@atarfil.com](mailto:acarreras@atarfil.com)
- 101<sup>B</sup> - SOLMAX - Spearfish, SD USA (7 tests)  
Chuck Taylor - 605-642-8531  
[ctaylor@solmax.com](mailto:ctaylor@solmax.com)
- 102<sup>B</sup> - SKAPS Industries (11 tests)  
Nilay Patel - 706-336-7000  
[nilay@skaps.com](mailto:nilay@skaps.com)
- 103<sup>B</sup> - STRATA Geosystems Pvt. Ltd. (6 tests)  
C. V. Kanade - 91-22-4063-5100  
[cv.kanade@strataindia.com](mailto:cv.kanade@strataindia.com)

<sup>A</sup>Third Party Independent    <sup>C</sup>Institute  
<sup>B</sup>Manufacturers QC            <sup>D</sup>Government

If anyone desires more information on the GAI-LAP, its test methods, the associated laboratories, etc., please go to our website <https://geosynthetic-institute.org/gai/lab.htm>.

The next GAI-LAP annual meeting will be held on February 5th, 2020 in conjunction with ASTM D-35 in Atlanta, GA. We appreciate your participation and congratulate you on your success! If you have questions, please contact George Koerner accordingly.

George Koerner ([gsigeokoerner@gmail.com](mailto:gsigeokoerner@gmail.com))

## 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](http://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 thirteenth 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. As you can clearly see, it was a very good year for the GCI-ICP program. We would like to thank TRI Environmental Inc. for their significant contribution to the success of this certification program. Their promotional strategies and in-house QA/QC course have generated renewed interest in the program. Special thanks to Sam Allen, Jeffrey Kuhn and Mark Sieracke for teaching the course.

#### Inspector Certification Test Results 2006 – 2019

Year	Geosynthetic Materials		Compacted Clay Liners		Commentary No. of people failing both exams
	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%)	2
2007	82	11 (13%)	73	12 (16%)	7
2008	95	25 (26%)	89	20 (22%)	13
2009	36	7 (19%)	36	2 (5%)	2
2010	59	12 (20%)	54	7 (13%)	5
2011	54	6 (11%)	53	3 (6%)	1
2012	34	5 (15%)	28	3 (11%)	3
2013	32	4 (12%)	30	1 (3%)	1
2014	45	1 (3%)	42	3 (7%)	0
2015	56	6 (11%)	51	6 (12%)	1
2016	36	3 (10%)	35	5 (18%)	0
2017	78	5 (6%)	66	3 (4%)	1
2018	53	5 (10%)	51	1 (3%)	0
2019	114	20 (18%)	119	15 (13%)	9
<b>TOTAL (to date)</b>	<b>915</b>	<b>115 (13%)</b>	<b>855</b>	<b>93 (11%)</b>	<b>47 (5%)</b>

There are currently 417 practicing certified inspectors, 337 inspectors (2015-2019) and 80 inspectors (2006-2014) who have renewed to keep their certifications current, i.e., we are not getting many renewals. Renewals represent 19%.

### 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 over a consecutive three-day period. The live on-line course has not been scheduled, however, recordings are available. Contact Jamie Koerner at [jrkoerner@verizon.net](mailto:jrkoerner@verizon.net) for details and arrangements.

The status of the program is shown in the following table. Here it can be seen that this particular GSI certification has not been successful even though we have 340 similar MSE wall failures (recall Item #5 in the research section on page 6).

Inspector Certification Test Results for  
MSE Walls and Berms Inspectors  
(2011-2019)

Year	Course Location	MSE Wall And Berms	
		No. of People Taking the Exam	No. of People Failing the Exam
2011	GSI Course	7	0
2012	GSI Course	6	0
2013	GSI Course	2	0
2014	GSI Course	3	0
2015	GSI Course	4	0
2016	GSI On-Line Course	2	2
2017-19	GSI On-Line Course	0	0
TOTAL		24	0

### Program #3 - Geosynthetic Designer Certification

The “Geosynthetic Designer Certification Program (GDGP)” is also now available. Please go to <http://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  $\geq 70\%$  passing.

The *examination* itself is subdivided into 15-sections, each consisting of five questions. A candidate must answer any 3 questions in each section, making a total of 45 questions to be answered. Most of the questions are numeric, as is geosynthetic design practice in general. Unlike our other certification examination questions, however, this examination is of an open-

book, open-notes format and does require a calculator so as to “crunch the numbers”.

Lastly, please spread-the-word within your organization and to others as well. We sincerely hope that one, or all three, of the above programs will be beneficial in upgrading the technical base of geosynthetic design and installation so as to properly utilize all of our geosynthetic materials in all of their many applications. All three programs are on-going and if you have questions and/or comments please contact us accordingly.

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## 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). It completely parallels GSI in that it has specific units for research, education, information, accreditation and certification. The Director is Dr. Chiwan Wayne Hsieh who is a Professor in the Department of Civil Engineering and Dean of the R & D Office. GSI-Taiwan has a Taiwanese consortium of geogrid/geotextile manufacturers who work toward producing quality products according to the draft GRI geogrid specifications and the associated test methods. As such, GSI-Taiwan is a GAI-LAP accredited

laboratory for 59 geosynthetic test methods. Dr. Hsieh has 10 students working on geosynthetic-related projects and is extremely active nationally and internationally. GSI Taiwan has hosted three very successful internal conferences to date and has also held a much broader one, namely, GSI-Asia in Taichung, Taiwan.

**GSI-India** under the direction of Dr. A. K. Mukhopadhyay was formed in 2015. The hosting organization is the Bombay Textile Research Association (BTRA) which is world known for its excellence in textile R & D and is currently branching out into all forms of geosynthetics.



GSI is on YouTube in a big way. We have 30 videos on the service ranging from an introduction to descriptions of the methods covering;

GRI-GM13 Specification  
GRI -GCL3 Specification  
AASHTO M2888 Specification

ASTM D4595 and D6637 Wide Width Tensile Testing  
ASTM D4716 Transmissivity of GN and GC  
ASTM D5321 and D6243 Direct Shear

Check us out, the clips are short and informative. To date we have gotten thousands of hits. They also serve as training videos to be used with standard (norms) and SOPs for our summer interns at GSI.

#### **IN THE NEXT ISSUE**

- Activities of the GSI Directors and Board
- 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