

IGS NEWS



NEWSLETTER OF THE INTERNATIONAL GEOSYNTHETICS SOCIETY

Dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies

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General Information for IGS Members

IGS Election Update

The 2018 IGS Elections have closed. With a field of 18 extraordinary candidates from 14 countries applying for 8 council positions there was significant competition! In keeping with IGS tradition the successful candidates will be announced in Seoul at the 11th ICG during the General Assembly to be held at 3:30 pm on Wednesday 19th September 2018. The newly elected council members will stand for the term which begins at the 2018 General Assembly and will conclude at the 12th ICG.

Thank you to all of the nominees and the members who voted.

Invitation to the 2018 IGS General Assembly with Awards Presentation

It is our pleasure to invite all IGS Members to the **2018 IGS General Assembly with Awards Presentation** at 3:30 pm on Wednesday 19th September 2018 at the 11th ICG in Seoul. It promises to be like no other! During this event we will review the progress of the IGS over the last four years, be introduced to the newly elected council, and recognize some of our Society's outstanding service & technical contributions.

The Presentation of IGS Awards

- The IGS Award – Our society's highest award, given to members for a substantive technical contribution to the geosynthetics discipline.
- Honorary Membership – An award to distinguish a person who has made a vast and long-term commitment to the Society and its aims.
- The IGS Service Award – Recognizes members of the IGS who have served the IGS in such a way as to significantly impact the IGS, its members and its aims.
- The Young IGS Service Award – To be presented here for the second time, the IGS Young Member Service Award is given to a Young Member of the IGS for outstanding contribution(s) to the society.

IGS Meetings and Events at the 11th ICG in Seoul Seoul, Korea, 16 – 21 September 2018

IGS meetings open for all IGS Members

Sep. 17 (Mon), 2018	12:40 – 13:40	TC Hydraulics – Membership Meeting
Sep. 18 (Tue), 2018	12:30 – 13:30	TC Filtration – Membership Meeting
Sep. 19 (Wed), 2018	12:30 – 13:30	TC Reinforcement – Membership Meeting
Sep. 20 (Thur), 2018	12:30 – 13:30	TC Barriers – Membership Meeting
Sep. 21 (Fri), 2018	10:30 – 12:30	IGS Regional Activities Committees Open to all IGS Members – Concurrent meetings
Sep. 21 (Fri), 2018	13:30 – 16:30	IGS Council Committee Meetings Open to all IGS members - Corporate, Communications, Education - Concurrent meetings

IGS Technical Committee Sessions

Drainage and Filtration for Reinforced Soil Walls

Organizer: Pietro Rimoldi (IGS TC Hydraulic Applications)

Geosynthetic Barriers – Current Hot Topics

Organizer: Kent P. von Maubeuge (IGS TC Barrier Systems)

New design and research approaches for fundamental geosynthetic – soil reinforcement applications

Organizer: Gerhard Bräu (IGS TC Soil Reinforcement)

And much more...

We hope to see you in Seoul! We welcome your questions. Contact the IGS Secretariat (IGSsec@GeosyntheticsSociety.org).

Call for proposal: GeoAfrica 2021

GeoAfrica 2021, the 4th African Regional Conference on Geosynthetics is fast approaching following the great successes of the previous GeoAfrica conferences in South Africa, Ghana and Morocco.

GeoAfrica is establishing a gateway for geosynthetics into Africa by providing a forum for engineers, practitioners and academia to explore current and future potential applications for geosynthetics, while offering an active market place for the promotion of geosynthetic products and technology to users throughout the Africa.

The International Geosynthetics Society – IGS calls for proposals in hosting GeoAfrica 2021

The proposal shall include, as a minimum, a letter from the proposing chapter/committee outlining the structure of the event, proposed location and dates with a general outline of the technical programme. The proposal should contain a high-level budget proposal demonstrating the feasibility of the event (including fees for IGS Members and possible sponsorship packages).

The official language of the conference must be English for the written version of the papers. However, presentations may be presented in another language provided that simultaneous translation into English is provided in all technical sessions.

The proposing committee must demonstrate its ability to manage a high-level conference with international attendees and a technical programme covering a variety of geosynthetic topics. Previous experience in similar events is recommended or the inclusion of a professional conference organizer is advised.

GeoAfrica 2021 shall follow the “Guidelines of the International Geosynthetics Society Regarding Regional Conferences on Geosynthetics” available through the IGS Secretariat.

A call for proposal should be submitted not later than 7th September 2018 and the vote by the IGS Council will take place during the 11th International Conference on Geosynthetics to be held in Seoul, Korea in September 2018. Although not a requirement, presentations to the IGS Council are welcome but they do not necessarily influence the decision of the IGS Council in the award of the next GeoAfrica 2021 Conference.

Reported by

Edoardo Zannoni, IGS African Activities Chair



IGS Young Members

Young Members Committee – Photo Contest



The Young Members Committee of the IGS is holding the first ever photo competition solely for young members of the society. The competition seeks the best photos of geosynthetic materials or technologies, taken by a member of 36 years of age or younger.

During a 3-month submission period, ending on the 29th June, the competition received over 50 entries from members from all over the world. The standard was very high, showcasing the diverse mix of geosynthetic applications. Thank you to everyone that submitted entries.

8 photos were shortlisted for the final stage by a judging panel of leading industry figures comprising:

- Irene Inan, Immediate Past-Chair of the IGS Young Members Committee
- Chaido (Yuli) Doulala-Rigby, Chair of the IGS UK Chapter
- Chungsik Yoo, Chair of the 11th ICG organising committee

The winning photo will be selected by a public vote, which opened at the start of August 2018. The vote is accessible via the following link <https://www.surveymonkey.co.uk/r/YVCWT8Q>. Voting closes on the 31st August 2018.

The winning entry will be announced at the 11th ICG in Seoul, as well as on our social media pages: Make sure you follow our accounts for the latest information:

LinkedIn: www.Linkedin.com/company/IGS-YMC.

Facebook: www.Facebook.com/YoungIGS/.

Recognising Wikipedia Contributions

The Young Members committee have been encouraging young IGS members to enhance geosynthetic-related Wikipedia pages and improve the accuracy of information available.

Since the last newsletter there have been several significant contributions from young members, including the creation of a new page by Sarper Demirdogen from the University of South Florida, summarising the work of the great Jean-Pierre Giroud. You can visit his page at: https://en.wikipedia.org/wiki/Jean-Pierre_Giroud.

The committee greatly appreciates the efforts so far, but they'd like to encourage further contributions. Whether or not you seek recognition for your work, you can make the committee aware by recording your Wikipedia user name on the below form:

https://docs.google.com/forms/d/e/1FAIpQLSdbqawwwAFYeIWleZoKxuZXSEZLGudkOpdqa6eigo5I_T-zqA/view-form. The form is set up to be anonymous, unless you would like to be recognised by name.

Reported by

Ian Scotland, Communications officer of the Young Members Committee.

Technical Committees IGS-TC

The **International Geosynthetics Society** hosted two high-level, two-day geotechnical engineering workshops 4 – 7 June 2018 in Munich, Germany: 1st GeoReinforcement and 1st GeoBarrier. Each workshop was divided into 4 hot topics that were presented and discussed very lively for mostly half the time of each session half day each. The presentations are available as pdf-files only for the participants.

These events, with their international speakers, attendees, and engineering issues, were a great success and provided the most advanced IGS Technical Committee-led workshops to date. The format will be continued.

And for sure not only the technical aspects, but also the social contacts made the events a success and the participants happy!



Beergarden evening event for TC-R



Beerhall evening event for TC-B



Organization team for TC-R and TC-B workshops



Continuing discussions during lunch break

1st GeoReinforcement Workshop Munich, Germany, 4 – 5 June 2018



The International Geosynthetic Society Technical Committee on Reinforcement (TC-R) hosted its 1st GeoReinforcement Workshop 4 – 5 June 2018 in Munich, Germany and had 90 participants from all around the world.

This open event for researchers, designers, consultants, manufacturers, industry insiders and any interested group addressed considerations of technical consensus versus continuing technical needs, educational efforts, and potential publications.

The two day workshop allowed a lot of discussions in the following topics and the selected chairmen served as facilitators to foster discussion and interaction.

- Facings of Walls and Steep Slopes (Chair: Ian Fraser, *United Kingdom*)
- Use of Recycled and Amended Marginal Backfills in MSE and Reinforced Embankments/Slopes (Chair: John Sankey, *USA*)
- Design of Load-carrying MSE Bridge Abutments (Chair: Jorge Zornberg, *USA*)
- Reinforced Veneer Stability (Chair: Pietro Rimoldi, *Italy*)

PDF files of the presentations are available for the participants only and are distributed for most sessions already. Following are short summaries of some sessions from the June 2018 IGS TC-Reinforcement Workshop prepared by the session chairs – many thanks for their effort in organizing and finalizing their session in this outstanding way! The missing summary will be prepared for the next issues of IGS News.

*Reported by
Gerhard Bräu, TC-R Chairman*

Facing of Walls and Steep Slopes

Ian Fraser highlighted the importance of the performance of facings from the end user's perspective. It was noted that, other than satisfactory performance of the required engineering function like soil retention and load bearing, the end user's principle concern is the appearance of the structure which is almost entirely judged on the facing. Examples were shown of the variety of facing types available and illustrations of the choice of facing to suit application, environment and design life.



Chairmen of the TC-R workshop sessions

Left to right: Gerhard Braeu, Jorge Zornberg, John Sankey, Pietro Rimoldi, Ian Fraser

Reinforcement Loads and Facing Connection Capacity in Reinforced Soil Walls: Measured vs Predicted?

Richard J. Bathurst - GeoEngineering Centre at Queen's-RMC, Canada

Richard Bathurst concentrated on modular block walls and polymeric geosynthetics and started by presenting a wide range of connection types available in the market and posed the question 'Are connections and connection strengths really important?' to which his answer was definitely yes. Methods for prediction of connection strength were presented and Richard Bathurst then focused significantly more time discussing actual connection strengths measured in both field and full scale laboratory situations, including face connection failures. Down-drag related to poor construction practice was cited. Methods and research in connection capacity testing were extensively discussed leading to conclusion that connection capacity cannot be predicted in the absence of full-scale testing. Finally, Richard Bathurst addressed connection creep and associated research taking the view that creep calculated from the geosynthetic alone was generally a safe worst-case assumption.

Stress Conditions and Connection Requirements of Reinforced Soil Block Walls including the German EBGEO Perspective

Lars Vollmert - BBG Bauberatung Geokunststoffe

Lars Vollmert reminded us of the need for both ULS and SLS design consideration and noted that most facing issues clearly fell under SLS. He then presented the effect that a range of facing types from rigid (eg full height panels) to flexible (eg wraparound) have on the stress conditions close to the face. There followed a discussion on the comparison of measured lateral stress near the facing compared with active earth pressure with the conclusion that the former is invariably much lower and that the consideration of active earth is effectively invalid. Lars Vollmert discussed the EBGEO approach to the calculation of earth pressure and then shared some measured stress data on both flexible and rigid facings. There was a consideration of geosynthetic stiffness in addition to facing stiffness and lastly Lars Vollmert suggested that reduced lateral stresses allows for simplified connections and construction techniques.

Incorporation of Connection Strength in the Design of Reinforced Soil Modular Block Walls including Seismic Considerations

Mike Dobie – Tensar International

Mike Dobie focused on modular block wall connections and stated clearly from the outset that connection type and strength was normally very important but was critical in seismic areas. Mike Dobie then demonstrated how the 2 Part Wedge design method could very effectively take account of connection strength in an "appropriate" way. He outlined a representation of the 'envelope of available resistance' for each reinforcement layer and described the importance of the hinge height of the facing and how this could be calculated. Mike Dobie then overlaid the seismic considerations and in particular demonstrated the critical situation developed under upward seismic acceleration. In conclusion Mike strongly advocated the adoption of the 2 Part Wedge design method.



Lecturer a TC-R workshop session "Facing"

Left to right: Richard Bathurst, Mike Dobie, Yassine Bennani, Ian Fraser, Philippe Delmas, Lars Vollmert, Gerhard Braeu

Flexible Reinforced Soil Structure Facings and associated Design Considerations

Philippe Delmas - Conservatoire National des Arts et Métiers

Philippe Delmas provided many examples of successful flexibly faced soil structures of significant height (>20m) from around the world and illustrated a range of facing types. The importance of appropriate facing type selection and construction detailing was emphasised. The criticality of the correct construction procedures was also highlighted. It was clear that flexible facing structures had the advantage of visibility thereby providing an opportunity to learn via the observation of their behaviour over time. It was generally concluded that many of these structures had extremely well and some had significantly outperformed expectations in respect of facing deformation and durability.

Facing and Connection Considerations for Concrete Wall Systems

Yassine Bennani – Terre Armee

Yassine Bennani focused on concrete panel walls and he highlighted a range of connection types and design considerations including flexibility, strength and adequate drainage. In terms of flexibility the design, the capacity for any connection to accommodate, the contrast between potential down-drag due to infill settlement and the compressibility of the facing was discussed. Yassine Bennani emphasized the need to avoid such settlement via good construction practice but nevertheless design to accommodate was deemed prudent. In particular the design of suitable panel bearing pads was discussed together with potential adjustment of the reinforcement strip placement. Finally Yassine Bennani shared some panel connection capacity test procedures and results.

Impromptu Presentations

Four impromptu presentations were given. The first by Jay McKelvey (Earth Engineering Incorporated) discussed and reinforced soil and soil nailed hybrid face in a very visible location at the Pocono Raceway, USA. Colin Jones (Newcastle University) presented a case study from China which demonstrated some limitations of segmental block facings used with large structures if great care is not taken. Jorge Zornberg (University of Texas) discussed the distribution of facing connection loads with height and the settlement induced connection load failure pattern. Lastly Satish Naik (Best Geotechnics Pvt Ltd) shared his experience of constructing a 40m high reinforced soil slope in a remote location in India using a soil bag vegetated facing.

Discussion

Following the impromptu presentations there was a lively discussion for over 30 mins. Topics raised included stress conditions behind the face and in the fill, creep limited strength to the split of responsibility between the manufacturer, designer and the contractor and the consequent need for continuity. The importance of connection strength and flexibility, adequate drainage and good construction practice was emphasized. It was clear that it was key to adopt a holistic approach that matched the nature of the structure and facing to the available fill material, sophistication of the construction practices and application. So in summary, a range of tried and tested reliable solutions are available but they rely on making a number of the correct choices based on the individual circumstances – ‘horses for courses’.

Reported by

Ian Fraser, TCS Geotechnics

Use of Recycled and Amended Marginal Backfills in MSE and Reinforced Embankments/Slopes

The session was the second of the day presented during the IGS Reinforcement Workshop held in Munich, Germany on June 4 and 5, 2018. John Sankey of Terre Armee/Reinforced Earth chaired the session composed of 5 main presentations and 6 impromptu presentations. At the start, Chungsik Yoo of Sungkyunkwan University in Korea made a brief announcement on the forthcoming 11th International Conference on Geosynthetics to be held in Seoul, Korea between September 16 to 21, 2018.

John Sankey provided the first presentation of the session titled “Overview of Reinforced Structure Design, Applications and Uses with Recycled and Amended Backfills”. The presentation first described the main components of MSE and reinforced fill embankments, followed by a more detailed listing of materials that have been considered for the main component, which is select backfill. Materials addressed included foundry sands, fly ash, bottom ash, recycled asphalt, recycled concrete, ferrous slag, recycled tires, lime amended soils, cement amended soils and others. The main considerations for use of recycled and amended backfills are their compatibility with the geosynthetic or steel reinforcement, strength characteristics and in place density. Simple use of recycled and amended backfills was also noted to not necessarily be an immediate determination of sustainability value depending on means used to process the materials and transportation requirements.

Chaido (Yuli) Doulala-Rigby of Tensar International Limited followed with a presentations titled “Use of Polymeric Geogrids in Structures with Non-Standard Reinforced Fills”. Her talk also gave a further history of MSE walls and embankments reinforced by geogrids. She followed with an overview of non-standard reinforced fills with selection criteria, design considerations and benefits indicated. Specific case studies were cited. Backfill materials addressed in the talk included pulverized fuel ash, landfill waste, chalk, expanded polystyrene, lightweight expanded clay aggregate.

The third presentation of the session was delivered by Robert Lozano of the Reinforced Earth Company on the subject of “Treated Marginal Soils in MSE Structures”. The talk first defined the basis of lime and cement treated marginal soil as using a soil stabilizer with a high pH environment that creates a pozzolonic reaction and results in a monolithic block. Specialized equipment is needed for preparation, which in itself must be considered with respect to

the presence of reinforcements for MSE wall applications. The creation of a monolithic block makes for use of a wider range of marginal soils, but the MSE wall is less flexible and the high pH environment needs evaluated for reinforcement compatibility purposes. Attention needs to be paid to effects on wall fascia connections, environment, filtration/drainage and long term repair needs.

Oliver Detert of Huesker Synthetic presented the fourth topic of the afternoon on "Construction and Long Term Experiences with Marginal Fill in GRS Walls". The talk started with an overview of Geosynthetic Reinforced Soil (GRS) walls and the cautionary needs when using marginal backfills. A good listing of the physical definition of marginal fills was described including recycled materials, contaminated granular soils, cohesive soils and mixtures of the aforementioned. The challenges of marginal fill placement with cement treatment and compatibility in a GRS structure were then discussed. Focus was given to the issue of hydrolysis of PET reinforcements when using cement stabilization. The talk concluded with project applications.

The fifth and final full length presentation was delivered by Castorina Silva Vieira from the University of Porto on "Use of Mixed Construction & Demolition Recycled Materials in Geosynthetic Reinforced Structures". A discussion was first given on the outlook of construction and demolition waste use prepared by the European Commission, which addresses growth, environmental considerations and generation. This then led to considerations of recycled construction and demolition waste in geosynthetic reinforced structures including GRS walls and embankments. Studies have been directed toward characterization of the waste, characterization of the geosynthetics used, characterization of interfaces and numerical modeling. Full scale research on GRS walls was addressed along with damage trials in embankments. The talk concluded with outcomes of physical and leachate generation evaluations.

After the main presentations were given, six (6) impromptu audience participation presentations were given as follows:

- "Ground Improvement with Electro-Osmosis for Soil Nailing" by Colin Jones, Electrokinetic Ltd
- "Clay Fills – Comments on Drainage" by Michael Dobie, Tensar
- "Red Soil Backfill for Double-Sided MSE Walls" by Dandung Sri Harnianto, Geoforce Indonesia
- "Geosynthetics as Support for Tunnel Muck" by Guilia Lugli, Maccaferri
- "Reinforcement of Marginal Soils Using Geosynthetics with In-Plane Drainage Capabilities", Jorge Zornberg, University of Texas
- "A GRS Wall Failure" by Chungsik Yoo of Sungkyunkwan University

Two to three questions were taken from the audience for each of the full length presentations and impromptu presentations. In the last 20 minutes of the session, the main presenters were asked to the stage to answer further questions from the audience in round table fashion. The session was concluded with thanks to the presenters and audience.

Reported by

John Sankey, Terre Armee/Reinforced Earth

Reinforced Veneer Stability

The fourth session of the GeoReinforcement Workshop took place in the afternoon of 5th June 2018, for discussing the topic "Reinforced Veneer Stability".

The Session Chairman, Pietro Rimoldi, introduced this session by explaining that the topic was different from previous sessions, which were dealing with reinforced soil walls (RSW); in fact, RSW foundation is horizontal, the stability depends mainly on the horizontal soil thrust, and different failure mechanisms may occur with many potential failure surfaces; while reinforced veneers stay on an inclined plane and the failure occurs only by sliding along the inclined plane; the reinforcing geosynthetic, placed below the veneer soil at the interface with the failure plane, can provide the required tensile forces only if it is properly anchored at the top of the slope.

Anyway veneer stability is equally challenging as wall stability, and it may even require much stronger reinforcement, as shown in the following comparison example:

Hence the economical value of the reinforcement required for a veneer can be even higher than for a RSW.

Therefore the topic of reinforced veneer stability has been addressed through five invited presentations, followed by extensive discussion with the audience.



Lecturer a TC-R workshop session "Recycled and marginal backfill"

Left to right: Castorina Silva Vieira, Robert Locano, Yuli Doukala-Rigby, Oliver Detert, John Sankey, Gerhard Braeu

The first presentation was delivered by George Koerner (Geosynthetic Institute) on “General approach to veneer stability, testing and monitoring”:

- the basic principles of veneer stability were introduced, with the distinction between the stabilizing and destabilizing forces acting on the veneer block, which is usually divided in two parts: the top part which is prone to sliding down due the self weight of the soil veneer and other loads; the bottom part, which is buttressing against the top part and provide resistance to sliding by friction and passive resistance;
- stability analyses require: proper testing of the friction properties at the interface between the veneer soil and the inclined surface, often made up of a geomembrane or another low friction material; wide width tensile tests on the reinforcing geosynthetics, pullout and connection tests for designing the top anchorage;
- the presence of water in the veneer soil, due to rainfall and/or runoff from upstream, can dramatically reduce the Factor of Safety of the veneer: hence water shall be properly drained and/or considered in stability analyses;
- the consequences of a veneer failure may be dramatic for persons and constructions downstream, hence a proper monitoring program should always be designed, where both conventional and recent instrumentation (like Lidar) can be employed for surveying of the surface displacements and early alerts.



Lecturer a TC-R workshop session “Veneer Stability”

Left to right: Gerhard Braeu, Jorge Zornberg, George Koerner, Jay McKelvey, Felix Jacobs, Pietro Rimoldi

The second presentation was delivered by Jorge G. Zornberg (The University of Texas at Austin) on “Selection of design alternatives for water and seismic actions on reinforced veneer stability”:

- There are few design alternatives for steep veneer slopes:
 - Unreinforced veneer
 - Uniaxial reinforcements along the slope
 - Fiber reinforcement
 - Uniaxial reinforcements placed horizontally
- Design shall consider extreme loadings:
 - Seismic loads
 - Seepage conditions
- Preliminary design consideration can be drawn by focusing on infinite slope configuration, and with the consistent definition of the Factor of Safety (FS):

$$FS = (\text{Available soil shear strength}) / (\text{Soil shear stress required for equilibrium})$$
- Final Remarks:
 - Innovative approaches have been recently implemented involving the use of reinforcements in landfill and mining projects
 - Care shall be used, when comparing alternatives, about the definition of the Factor of Safety
 - Seepage forces and seismic loads can be accounted for using approaches similar to those used for unreinforced slope analysis
 - Solutions are available for analysis of unreinforced, slope parallel-reinforced, horizontally-reinforced, and fiber-reinforced veneers
 - Increased total height (or length) of the slope does not affect detrimentally the efficiency of horizontally-reinforced and fiber-reinforced slopes
 - Solutions for analysis of reinforced veneers can easily incorporate the effect of seepage forces and seismic loads
 - The yield acceleration used in displacement based seismic evaluations is significantly increased with the use of reinforcement
 - Excellent field performance has been reported in recent case histories.

The third presentation was delivered by Jay McKelvey (Earth Engineering Inc.) on “Effects of equipment on veneer stability”:

- The stability of the veneer is heavily influenced by the movement of equipment up and down the slope;
- Based on Giroud and Beech (1989) analytical approach for the two-wedge analysis, it is possible to introduce equipment loads in the stability equations, both for tracked equipment, rubber tire equipment, and compaction equipment;
- Dynamic loads produced by acceleration and deceleration of equipment can be introduced as well in stability equations;
- It is possible to design a taper cover soil, rather than a constant thickness veneer, to reduce the loads.

The fourth presentation was delivered by Pietro Rimoldi (Consultant) on "Semi-probabilistic approach to veneer stability according to EuroCodes":

- The existing methods for veneer stability (like Koerner and Soong, 1998) can be revised and adapted to the semi-probabilistic method in Ultimate Limit State (ULS) conditions, according to EuroCodes.
- In the semi-probabilistic approach in Ultimate Limit State (ULS) conditions, according to EuroCodes, loads are amplified by Amplification Factors, while resistances are reduced by Reduction Factors. The analysis of forces in the free body diagrams of the active and passive wedges allows to calculate the active and passive inter-wedge forces, E_a and E_p . The stability check is satisfied if: $FS = (E_p / E_a) \geq \gamma_R$ where FS is the Factor of Safety and γ_R is the partial factor R_1 or R_2 required by the EuroCode norms for sliding analysis.
- Design equations for calculating FS have been derived for the following conditions:
 - Only gravitational forces in static conditions
 - Veneer reinforcement with high strength geosynthetics
 - Tracked construction equipment forces
 - Seismic forces
 - Horizontal seepage buildup and parallel-to-slope seepage buildup;
- The stability of the veneer cover shall be analyzed in the following Ultimate Limit State (ULS) conditions:
 - At the end of veneer construction, with equipment moving down the slope, in static conditions, without seismic actions nor seepage forces applied; being a short term analysis, if reinforcement is used, the Reduction Factors for creep, chemical and biological damages shall be set equal to 1.0.
 - At the end of the design life, in static conditions, without seismic actions but with seepage forces applied, either for horizontal seepage buildup or parallel-to-slope seepage buildup; being a long term analysis, if reinforcement is used, all the Reduction Factors (for installation damage, creep, chemical and biological damage) shall be applied.
 - At the end of the design life, in seismic conditions, with seismic actions and seepage forces applied, either for horizontal seepage buildup or parallel-to-slope seepage buildup; the vertical seismic acceleration shall be considered both as downward (+Kv) and upward (-Kv), while the horizontal seismic acceleration shall always be considered as outward; being a long term analysis in seismic conditions, if reinforcement is used, the Reduction Factors for installation damage, chemical and biological damage shall be applied, while the Reduction Factor for creep shall be set equal to 1.0.
- A practical example of stability calculations according to Eurocodes have been shown.

The fifth presentation was delivered by Felix Jacobs (IGB Ingenieurgesellschaft mbH, Kiel) on "EBGEO approach to veneer stability":

- The topic discussed here is the specifically the resistance of anchor trenches at the top of the veneer slope;
- The proof of anchorage is: Effect of actions from slope $E_D \leq$ Resistance of anchor trench R_D
- The EBGEO 2010 / 2011 approach requires an interaction model for the resistance of anchor trenches, developed using pullout tests, model tests and instrumented field tests; moreover, the tensile stiffness of reinforcement, geogrid junction strength, and serviceability limit states have been considered;
- The possible design approaches include the detailed model and the modified EBGEO 2010 / 2011 approach;
- The Model Factor value has been validated for various geogrid types.

The five presentations were followed by a long and interesting discussion, where the presenters and all the audience debated about several specific topics, including the best way of testing the friction properties at the interface below the veneer (direct shear test and inclined plane test were compared), the influence of water and equipment on stability, how to consider the seismic action and the seismic displacements.

The interest and attention gained by this topic at the GeoReinforcement Workshop has shown that reinforced veneer stability deserves research and developments by the geosynthetics technical community.

Reported by

Pietro Rimoldi, Session Chairman

1st GeoBarrier Workshop

Munich, Germany, 6 – 7 June 2018



The IGS Technical Committee on Barrier Systems (TC-B) hosted its 1st GeoBarrier Workshop in Munich, Germany on June 6 - 7, 2018 and had 69 participants from all around the world.

This open event for researchers, designers, consultants, manufacturers, industry insiders and any interested group addressed considerations of technical consensus versus continuing technical needs, educational efforts, and potential publications.

The two day workshop allowed a lot of discussions in the following topics and the selected chairmen served as facilitators to foster discussion and interaction.

- Geomembrane Durability (chairman: George Koerner, USA)
- Geomembrane protection (chairman: Richard Brachman, Canada)
- GCL hydration and controlling factors (chairman: Malek Bouazza, Australia)
- Standard protocols for Construction/Installation Quality Assurance and Quality Control (chairman: Kerry Rowe, Canada and Boyd Ramsey, USA)

Following is a short summary of the Sessions from the June 2018 IGS TC-Barrier Workshop

Geomembrane Durability chaired by George Koerner, Session Chair and Director of the Geosynthetic Institute (GSI), Folsom, USA

The IGS welcomed over 69 civil and geotechnical engineering professionals from around the world to the TC-B workshop. This unique gathering combines high-level presentations from leading practitioners in the field with significant audience discussion time, enabling participants to share project experience, exchange technical concerns and solutions and network with colleagues who influence diverse applications (projects) containing geosynthetics.

GSI's involvement over the two days was significant. GSI's task at the event was to chair the opening morning session of the TC-B workshop on durability. The agenda was stacked with heavy hitting presenters from Germany, the USA and Canada.

Andreas Woehlecke started us off with an overview of the German regulation for geosynthetic used in waste disposal. The BAM mandates that only a relatively thick 2.5 mm HDPE be used in liner systems in Germany. The geomembrane is used in a single composite configuration and can only be made via the wide mouth die case process. It needs to be a monolithic layer of HDPE and cannot be a blended or layered material. The agency's perspectives on geomembrane durability, service life and end of life is that all materials used in lining system need to exhibit 100 year performance.

Helmut Zanzinger of SKZ was the next speaker in the session. He discussed an autoclave exposure technique to accelerate incubation for Arrhenius modeling. This worked tied in nicely to the first presentation and answered the question of how the Germans verify 100 year performance of materials.

Sam Allen of TRI Environmental was next and thru the audience a major curve ball. He went against convention and discussed other materials than monolithic HDPE geomembranes. He delved into all kinds of issues (sampling, testing, seaming etc.) with multi-component (layered) geomembrane durability. He left the session with the question: There are many different geomembrane formulations that exhibit fantastic physical, mechanical, hydraulic and endurance properties, why don't we consider broadening our options for containment.

Kerry Rowe of Queen's University ended the presentation portion of the session with a discussion on antioxidant depletion. He challenged the validity of both the standard and high-pressure DSC tests by contrasting predicted performance with actual field verifications. Much of his findings showed that performance is application specific where extreme environmental conditions will challenge commodity materials but can be managed by high performance geomembranes.

With the conclusion of the presentation phase of the session the discussion began. In true workshop fashion we opened the floor to 90 minutes of exchange. The Questions & Answers were fast and furious. Some of the better examples are listed below;

- Should we restrict the co-monomer used in the manufacturer of HDPE (octane, heptane, butane etc.)?
- What are the risks if a GM fails?



Chairmen of TC-B workshop sessions
Left to right: Richard Brachman, Malek Bouazza, Boyd Ramsey, Kerry Rowe, (front line) George Koerner, Kent von Maubeuge



Lecturer a TC-B workshop session "Durability"
Left to right: Kent von Maubeuge, Sam Allen, Helmut Zanzinger, Kerry Rowe, Andreas Woehlecke, George Koerner

- Should we insist that the GM exhibit isotropic behavior?
- Should we be making application specific materials (i.e. covers/liners, landfills, brine ponds, high chlorine)
- Do all GM pass a TCLP (Toxicity Characteristic Leaching Potential) test?
- Can someone explain how the anti-oxidant (AO) package diffuses throughout the polymer cross section of a geomembrane with time?
- How do geomembrane seams age? Are they as durable as the parent material?
- What is the durability of textured versus smooth geomembrane?
- What is the effect on durability of CaCO₃ or talc in the geomembrane formulation?

In all, the session was exciting and fun. The audience was great and energized the panel to stretch and give many suggestions for going forward and improving geomembranes.

Richard Brachman, Session Chair and Professor, Queen's University, Canada reports from his session:

The session on Geomembrane Protection reviewed and reflected on where practice is today, and presented findings from recent research to stimulate discussion with the overall goal of advancing practice and guiding future research.

Geomembrane protection chaired by Richard Brachman (Queen's University, Canada)

Richard Brachman began the session with an overview of the engineering mechanics of geomembrane deformations from coarse gravel. He emphasized that the geomembrane is part of a system, meaning that long-term deformations of one or more components of the system can lead to additional deformation of another. Proper consideration of engineering mechanics was encouraged to understand limitations of past empirical approximations; resolve why some tests show no long-term rupture, while others do; and select an appropriate protection layer to ensure long-term environmental protection.

Kerry Rowe (Queen's University, Canada) spoke on "Why we need to limit long-term strains". He presented recently published work (Abdelaal et al. 2014, Ewais et al. 2014) along with additional new findings from an on-going, two-decade-long effort to resolve the issue of whether a polyethylene geomembrane can rupture from sustained local gravel indentations. Kerry Rowe presented data that confirms the end-of-life mechanism for landfill geomembranes involves: i) consumption of protective antioxidants, ii) polymer oxidation, iii) decrease in stress crack resistance, and iv) brittle rupture when combined with sufficiently large sustained tensions from local gravel deformations. His presentation highlighted the importance of considering the effects of modelling the system as it really exists (including the compacted clay or GCL that can deform with time below a geomembrane), chemical interaction, and temperature if one is to realistically represent the overall system interactions.

George Koerner (Geosynthetic Institute, USA) presented "Preventing puncture: A US approach". A review of the original experiments (Narejo et al. 1996) used to derive an equation for the mass of nonwoven geotextile required to prevent geomembrane puncture (Koerner et al. 1996) was presented. These short-term experiments were not intended to limit geomembrane strains to a certain level, but

rather to find the external pressure required to cause the geomembrane to puncture for a given protrusion height and mass of geotextile, predominately based on hydrostatic pressure testing with truncated cones (Koerner et al. 2010). Findings from four, 10-year-long hydrostatic pressure tests with truncated cones conducted at 22°C (Koerner et al. 2010) were then summarized. There was no puncture with 12-mm-high protrusions at pressures of 430 and 580 kPa, while one puncture occurred for a 38-mm-high protrusion at 52 kPa. The findings were used to update the long-term factor in the puncture equation.

Ulrich Sehrbrock (ICP, Germany) presented "Limiting strain: The German Approach". He described that the geomembrane is loaded under vertical pressure with project specific gravel above the geomembrane and a rubber layer beneath the geomembrane (provisions also exist to site specific materials beneath the geomembrane). There are specific requirements for test pressure, temperature and time. Indentations in the geomembrane are recorded by placing a thin, deformable metal sheet beneath the geomembrane. A measure of geomembrane strain is then calculated from the measured indentations. The geotextile protection layer is deemed acceptable if that calculated strain is limited to 0.25%. From his own professional experience, he noted that specifying coarse (16/32 mm) gravel with rounded particles can lead to sharp-edged grains from particle breakage, that need to be considered in the protection layer testing. Last, he commented on the beneficial effects of using sand a protection layer to limit geomembrane indentations.

Richard Brachman gave the final presentation titled "Why allowable strain depends on how it's measured and calculated". In terms of how strain is calculated, he showed how consideration of average vs. maximum membrane strain,



Lecturer a TC-B workshop session "Protection"

Left to right: Richard Brachman, George Koerner, Kerry Rowe, Ulrich Sehrbrock, Kent von Maubeuge

neglecting bending strains, or neglecting large-displacement effects lead to underestimates of actual geomembrane strain (Eldesouky and Brachman 2018). He clarified that the German method of strain calculation results in an average membrane strain along the indentation and explained that this value is limited to 0.25% with the intent that the maximum extreme fibre strain (considering bending) is below a long-term target of 3% strain, as detailed by Seeger and Müller (2003). In terms of test conditions, he showed how the type of subgrade (none, rubber, clay layer), clay compressibility, temperature and time impacted the strains resulting from the test and presented a new screening method (Brachman et al. 2018) to help select protection layers to limit long-term strains to target allowable limits.

The discussion session was productive and involved debate on why the Abdelaal et al. (2017) and Ewais et al. (2014) studies resulted in brittle rupture, while that of Koerner et al. (2010) did not, and discussion on: how test boundary conditions (boundary friction, flexible vs. rigid load) effect the measured results, construction issues related to placement of a sand protection layer, the extent to which whether wrinkles impact geomembrane protection, consideration of different/new materials for applications other than landfill bottom liners, the chemical resistance of polyester vs polypropylene nonwoven geotextiles, and allowable strain limits.

GCL Hydration and Controlling Factors chaired by Malek Bouazza (Monash University, Australia)

Malek Bouazza presented about myths and facts about GCL hydration and informed about conditions in field and how the bentonite hydrates but as hydrates less if the subsoil has a similar suction capacity as the bentonite.

Kerry Rowe then explained how well GCLs hydrate and self-heal as well as factors and effects. It was clear that a GCL under a geomembrane with no confining stress there might be concerns with a GCL. Particularly granular bentonite GCLs seemed to show in the investigated test plot a higher shrinkage and downhill erosion effect than powder bentonite. However, it was mentioned that covered geomembrane/GCL solutions will very likely prevent any of the above mentioned issues.

Craig Benson (University of Wisconsin-Madison) went then in Detail into the topic “Hydration, Swelling, and Hydraulic Conductivity of Bentonite-Polymer Composite GCLs for Aggressive Leachates” and showed lab tests with polymer modified bentonites but also mentioned that there is still a lot to do on research, such as detecting the amount of polymer used as well as classifying the polymer type.

Gemmina Di Emidio (Ghent University, Belgium) then introduced research from her work at the University with a special produced polymer-bentonite composition. The topic was “Wet and dry ageing of modified bentonites for GCLs under aggressive conditions”



Lecturer a TC-B workshop session “Hydration”

Left to right: Gemmina Di Emidio, Craig Benson, Kerry Rowe, Malek Bouazza, Kent von Maubeuge

Standard protocols for Construction/Installation Quality Assurance and Quality Control chaired by Kerry Rowe (Canada) and Boyd Ramsey (USA)

The fourth session focused on installation and installation related issues; problems that were either caused by or could be mitigated and reduced by the use of experienced knowledgeable installation staff and management. Wrinkles were a key topic: both wrinkle management and the effect and relationship between wrinkles and leakage rates. Regulation and more specifically regulation with enforcement were discussed and emphasized as an important factor in leak prevention and groundwater protection. Electric leak location surveys were another critical and highly effective leakage rate reduction tool with Abigail Gilson Beck’s documentation on the clear numerical relationship between electrical leak surveys and leakage rates being highlighted. Perhaps most important were multiple requests within the session and the surveys to host a focused seminar on geosynthetic installation, perhaps in conjunction with the International Association of Geosynthetic Installers.

Eventhough it was the end of the last day of the workshops (for some it was the second day but for others it was the fourth workshop day as they also joined the workshop on TC-Reinforcement) all participants had a heavily discussion over 90 minute. The Questions & Answers brought up the following topics, which are listed in no particular order:

- Global improvement in communications with environmental regulatory bodies. IGS to a national EPA for example.
- Germany/BAM has published a welding manual – utilize or promote globally?
- A description of how to best manage unconfined geosynthetic clay liner materials in the field (and avoid panel separation if at all possible).
- Promote the credentialing and regimented qualification of welders and installers (with or without IAGI?)
- Conduct a seminar focused on geosynthetic installation.
- How to best support the expansion of the requirement for electric leak location surveys.
- How to best support the required planning and construction details to support electric leak location surveys.
- Create a duplicate of the video shown by Kerry Rowe illustrating wrinkle leakage and head effects.
- How to best support a requirement to require electronic data management of geosynthetic installations.
- How to promote the agglomeration and utilization of “big data” sets for welding, interface friction tests, or other purposes.



Lecturer a TC-B workshop session “Quality”
Left to right: Sam Allen Boyd Ramsey, Kerry Rowe, Piet Meyer

Again, we would like to thank all involved people, including the chairmen, the speakers, the participants, the University helpers on site, and Dagmar Bräu as well as Terry Ann Paulo our IGS Secretariat Manager.

Reported by

Kent von Maubeuge, (Chairman TC-Barrier Systems and Corporate Committee)

Reports of Conferences with IGS Auspices

5th International Conference on the Use of Geofom Blocks in Construction Applications Kyrenia, Northern Cyprus, May 9 - 11 2018

The 5th International Conference on the Use of Geofom Blocks in Construction Applications (EPS2018) was held in Kyrenia, Northern Cyprus on May 9 - 11 2018. A total of 149 delegates including researchers, consultants, block molders, contractors, practitioners, raw material and machine producers, from 23 different countries were attended to EPS2018.

The proceedings of EPS2018 is dedicated to Geir Refsdal and Tor Erik Frydenlund who were the pioneers of the development of geofom technology. They have implemented the use of geofom as a lightweight fill material in Norway and also involve in the dissemination of the technology to other countries.

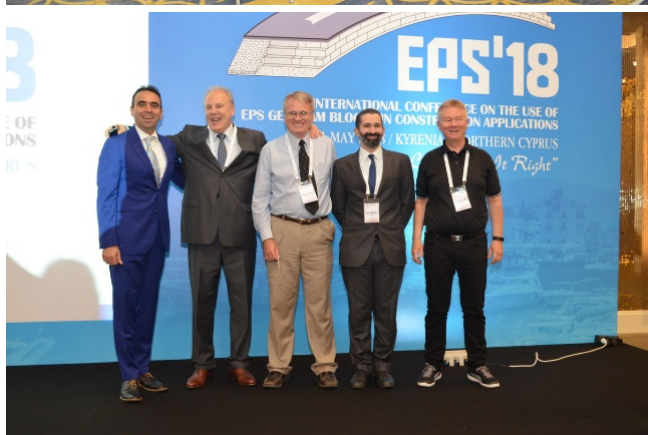
Conference has started with the opening lecture by Geir Refsdal. Geir has highlighted how the idea of using EPS blocks emerged and the lessons learned from the first application of the technology at the Flom Bridge site in the opening lecture of the EPS2018. The key note lecture by Tor Erik Frydenlund titled “Geofom Blocks in Civil Engineering Applications” summarized the state of art regarding the various applications of the geofom technology.

The conference program consisted of the combination of technical papers and panel discussions regarding the use, new development and implementation of geofom technology. After the opening and keynote lectures, construction applications of geofom, present use of geofom technology, material properties and modelling, new concepts and special topics of the geofom applications were discussed in a total of seven technical sessions. In addition, EPS technology development in emerging markets and future direction of geofom applications were discussed in two separate panel discussions. Panels were moderated by Steven Bartlett (University of Utah, USA) and David Arellano (University of Memphis, USA). Tolga Özer (Okan University, Turkey), Libero Piscitelli (Surf Crest, Italy), Ryan Berg (Ryan R. Berg & Associates, Inc., USA), Milan Duškov (InfraDelft BV, Holland) and Todd Bergstrom (AFM Corporation, USA) were served as panelists.

The themes of the conference comprised of discussions about the recent developments and future trends of the geofom technology and its construction applications. Therefore, EPS2018 was not only offered benefit to the delegates representing countries where the geofom is a mature technology but also offered significant technology

awareness to the delegates who were just met with the geofoam applications. EPS2018 also offered social opportunities including welcome reception, gala dinner and exhibition area for the delegates.

EPS2018 contributed to the development of the geofoam applications after Oslo (EPS1985), Tokyo (EPS1996), Salt Lake City (EPS2001) and Oslo (EPS2011) conferences. It was decided to hold the next conference in 2023 to celebrate the 50th anniversary of the first geofoam application.



Reported by
Tolga Özer, Associate Professor, IGS Member, Okan University, Istanbul, Turkey

Visit the IGS Website:

www.geosyntheticssociety.org

**IGS MEMBERSHIP REQUIRES ELECTRONIC COMMUNICATION –
PLEASE ENSURE WE HAVE YOUR CURRENT E-MAIL ADDRESS!**

Announcement of the International Conference of IGS

11th ICG International Conference on Geosynthetics Geosynthetics: Innovative Solutions for Sustainable Development Seoul, Korea, 16 – 21 September 2018



On behalf of the Organizing Committee, it is my great honor and pleasure to invite you to the 11th International Conference on Geosynthetics (11ICG), which will be held in Seoul, Korea from September 16 to 21, 2018.

The Korean Geosynthetics Society (KGSS) will have the privilege of hosting 11ICG in Korea, and plans to go to great lengths to ensure the conference surpasses all expectations. The 11ICG will provide all participants a firm platform for a meaningful academic, professional, social and cultural experience. The theme of the 11ICG is “Geosynthetics: Innovative Solutions for Sustainable Development,” and will cover diverse disciplines of geosynthetics from fundamentals to applications.

With the vision of making a multidisciplinary conference for the geosynthetics industry and engineers, we plan to offer special events as well as a very dynamic and stimulating array of scientific and practical engineering programs. At 11ICG, academia and industry will gather in force to not only show their best, but to share valuable ideas and develop new friendships.

11ICG will provide a comprehensive overview of the most recent developments in the field of geosynthetics, the latest technologies and applications, and a unique and extensive technical exhibition. With fascinating ancient traditions and ultramodern lifestyle, the city of Seoul will surely be the center of many unforgettable moments.

We look forward to welcoming you in Seoul, Korea!

Sincerely yours,

Prof. Chungsik Yoo
Chair, Organizing Committee of 11ICG
Vice President, International Geosynthetics Society
President, Korean Geosynthetics Society

Theme and Topics

- Geosynthetics: Innovative Solutions for Sustainable Development
- Geosynthetic Barriers
- Geosynthetics in Filtration, Drainage and Erosion Control
- Reinforced Walls and Slopes
- Ground Improvement using Geosynthetics
- Roads, Railways and other Transportation Applications
- Soil-Geosynthetic Interaction

- Hydraulic Applications
- Innovative Uses and New Developments
- Case Histories
- Durability and Long Term Performance
- Physical and Numerical Analysis
- Geosynthetic Properties and Testing
- Quality Control and Quality Assurance
- Design Approaches and other Applications

	SEP. 16 (SUN)	SEP. 17 (MON)	SEP. 18 (TUE)	SEP. 19 (WED)	SEP. 20 (THU)	SEP. 21 (FRI)
09:00	SHORT COURSE 1	OPENING CEREMONY	PARALLEL SESSIONS	PARALLEL SESSIONS	PARALLEL SESSIONS	TECHNICAL VISIT & CULTURAL TOUR
10:00	SHORT COURSE 2	BREAK / EXHIBITION OPENING	PARALLEL SESSIONS	PARALLEL SESSIONS	PARALLEL SESSIONS	
	BREAK	WELCOME LECTURE	BREAK	BREAK	BREAK	
11:00	SHORT COURSE 1	KEYNOTE LECTURE 1	PARALLEL SESSIONS	PARALLEL SESSIONS	PARALLEL SESSIONS	
	SHORT COURSE 2	LUNCH	LUNCH	LUNCH	LUNCH	
12:00	LUNCH	KEYNOTE LECTURE 2	PARALLEL SESSIONS	PARALLEL SESSIONS	PARALLEL SESSIONS	
	REGISTRATION & EXHIBITION & E-SESSION (09:00-17:30)	KEYNOTE LECTURE 3	BREAK	GENERAL ASSEMBLY / IGS AWARD	CLOSING CEREMONY	
13:00	SHORT COURSE 1	BREAK	PARALLEL SESSIONS			
	SHORT COURSE 2	KEYNOTE LECTURE 4	BREAK			
14:00	BREAK	KEYNOTE LECTURE 5	PARALLEL SESSIONS			
	SHORT COURSE 1					
	SHORT COURSE 2					
15:00	PRESTIGIOUS LECTURE					
	REGISTRATION & EXHIBITION & E-SESSION (09:00-17:30)					
16:00	WELCOME RECEPTION					
17:00						
18:00						
19:00						
20:00						

Invited Speakers

Giroud Lecture



Global Crisis: A Geosynthetics Solution

Dr. Nathalie Touze-Foltz

(Antony Regional Center, National Research Institute of Science and Technology for Environment and Agriculture (IRSTEA), France)

Prestigious Lecture



Geosynthetic-Reinforcement Technology in Railway Applications- from Walls to Bridges

Prof. Fumio Tatsuoka

(Tokyo University of Science, Japan)

Past President, International Geosynthetics Society)

Keynote Lecture



Geosynthetic Liners: Conceptions and Misconceptions

Prof. R. Kerry Rowe

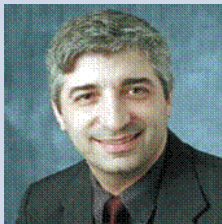
(GeoEngineering Centre at Queen's-RMC, Queen's University, Kingston, ON, Canada)



Reinforcement with Geosynthetics – How They Work in Soil

Prof. Martin Ziegler

(Geotechnical Engineering and Institute of Foundation Engineering, Soil Mechanics, Rock Mechanics and Waterways Construction, RWTH Aachen University, Germany)



Geosynthetics in Roadways: Advances with Significant Impact in Sustainable Development

Prof. Jorge G. Zornberg (The University of Texas at Austin, USA)



Global Challenges, Geosynthetic Solutions and Counting Carbon

Prof. Neil Dixon

(School of Civil and Building Engineering Loughborough University, UK)



Geosynthetics for Natural Disaster Prevention and Mitigation-Japanese Challenge-

Prof. Jiro Kuwano

(Saitama University, Japan)

Short Courses

Basal Reinforced Piled Embankments - Dr. S.J.M. van Eekelen

Geosynthetic-Stabilized Roads - JP Giroud

Training Lecture

Pavement Structures Reinforced with Geosynthetics - *Krystyna Kazimierowicz-Frankowska*

Geosynthetic Reinforced Embankments on Soft Foundations - Robert D Holtz

Design and Construction of Very High Tiered Reinforced Soil Retaining Walls in Difficult Conditions - *Rajagopal Karpurapu*

Designing with Geosynthetic Clay Liners - *A. (Malek) Bouazza*

Special Session

Stabilisation Function of Geosynthetics

Organizer: Jacek Kawalec

Geosynthetics for Countermeasures against Nuclide Contamination

Organizer: Takeshi Katsumi

Electrokinetic Geosynthetics and Electro-osmosis

Organizer: Yan-feng Zhuang

Innovative Materials & Technologies for the Sustainable City

Organizer: Kyu-Nam Jin

Discussion Sessions

Wrinkles, Bridging, Uplift and Ballasting during Liner Installation

Organizer: Ian D. Peggs

IGS Technical Committee Sessions

Drainage and Filtration for Reinforced Soil Walls

Organizer: Pietro Rimoldi (IGS TC Hydraulic Applications)

Geosynthetic Barriers – Current Hot Topics

Organizer: Kent P. von Maubeuge (IGS TC Barrier Systems)

New design and research approaches for fundamental geosynthetic – soil reinforcement applications

Organizer: Gerhard Bräu (IGS TC Soil Reinforcement)

Online Registration: www.11icg-seoul.org

Conference Venue

Coex, Korea World Trade Center, 513, Yeongdong-daero, Gangnam-gu, Seoul 06164, Korea

Phone: + 82-2-6000-0114, Website: www.coex.co.kr

Tour Program

Additionally there will be arranged some special Half-/Full-Day Tours as well as Pre/Post-Conference Tours and Special Evening Programs by a third-party travel agency as optional programs. For more information visit <http://www.11icg-seoul.org/>

Announcements of Conferences under the Auspices of IGS

GeoMEast 2018 International Congress and Exhibition Cairo, Egypt, 24 – 28 November 2018

On behalf of the Organizing Committee, we are pleased to invite you to attend the GeoMEast 2018 International Congress and Exhibition to be held in Cairo, Egypt from November 24 to 28, 2018 at the Historical Marriott Mena House. It will be the largest Middle East's Geotechnical, Structural, Geosynthetics and Construction Congress in 2018. The GeoMEast 2018 is managed by SSIGE and cosponsored by many professional organizations including TRB, ASCE, ICE, CSCE, ISSMGE, IGS, GMA of IFAI, DFI, IAEG, ARMA, ASTM, IABSE, ACI, ISHMII, ICC and other international organizations.

Recent rapid construction in Egypt and the Middle East has provided great opportunities for bridge, pavement, ge-

otechnical, geological, tunnel and all engineers to use their knowledge and talents to solve many challenging problems involving highways, bridge structures, pavements, materials, ground improvements, slopes, excavations, dams, canals and tunnels with innovative solutions and cutting-edge technologies.

GeoMEast 2018 will provide a showcase for recent developments and advancements in design, construction, and safety Inspections of transportation Infrastructures and offer a forum to discuss and debate future directions for the 21st century. Conference topics cover a broad array of contemporary issues for professionals involved in bridge, pavement, Geomechanics, geo-environmental, geotechnical, geosciences, geophysics, tunnel, water structures, railway and emerging techniques for safety inspections. You will have the opportunity to meet colleagues from all over the world for technical, scientific, and commercial discussions.

The proceedings of GeoMEast 2018 will be published in some Edited Books in SUCI Book Series by Springer-DE, which will be indexed in EI and submitted for inclusion in ISI "Thomson Reuters". In addition, some journal special issues will be published in some prestigious journals from selected best papers of the conference, however, authors need to expand and include materials that are at least 50:75% different than the accepted papers in the proceedings.

GeoMEast 2018 will provide some awards; such as: best paper awards, best presenter awards, best student presenter awards, industrial project, and others.

The 2nd Robert Koerner distinguished Lecture speaker in 2018 is Kent von Maubeuge and the title of the presentation is „Geosynthetic barriers in regulations and recommendations in line with the new ISO design guide?“

The program will include Podium Presentations, Poster Presentations, Keynote, Honors and Official Lectures, Workshops, Courses, Awards, Technical Meetings, and Technical and Social Tours.

Courses:

- Design of Piled Foundations
- Computer Methods and Constitutive Modeling in Geomechanics
- Introduction to Geotechnical Design using Geosynthetics
- Introduction to Geomembranes
- 2D and 3D Slope Stability Analysis

Workshops

- Tips from a Springer Nature Editor
- QA/QC Methods for Deep Foundations
- Design of Helical Piles
- Civil Structural Health Monitoring
- TC211 and TC102 Joint Workshop
- Geosynthetics Engineering

Are you interested in delivering a short course or workshop as a part of the GeoMEast 2018? You can send an email to:

info@geomeast2018.org.

Simultaneous translation may be provided during the conference in Arabic, English, French, German, Russian and any other required languages.

For more Information:

Contact us via: info@geomeast2018.org

And visit our website: www.geomeast2018.org

Reported by

Dr. Eng. Hany Farouk Shehata; CEO, SSIGE, Organizing committee, General Secretariat

Geosynthetics Conference

Houston TX, USA, 10 -13 February 2019

Calling all **Civil, Environmental & Geotechnical Engineers & Academics**: Hundreds of geotechnical professionals come together to write, peer review, publish and present the latest research and case studies. This is your opportunity to be part of one of the industry's most respected events, Geosynthetics 2019.

This conference will be supported by IFAI and IGS North America and under auspices of IGS

IGS-NA Sponsorship of Geosynthetics 2019 in Houston, TX

The North American Chapter of the International Geosynthetics Society (IGS-NA) is sponsoring the next edition of the long-running "Geosynthetics" conference series, which will be held from February 10 - 13, 2019 at the Marriott Marquis, Houston, TX, USA. IGS-NA encourages its members and affiliates to submit technical papers and participate actively in the trade show.

More information can be found at the Industrial Fabrics Association International website ifai.com

For more Information visit the website: geosyntheticsconference.com

News from the IGS Chapters and the Membership

News Announcements of the North American IGS Chapter IGS-NA Award / Invitation for Nominations – 2019 Geosynthetics Houston

IGS-NA Establishes Service Award

The North American Chapter of the International Geosynthetics Society (IGS-NA) has established an **Excellence in Service Award** to recognize members who have shown outstanding leadership and dedication to the objectives of the North American Chapter of the International Geosynthetic Society (IGS-NA) or the geosynthetics industry. Award recipients must be an IGS-NA member in good standing, or have been an IGS-NA Member at the time the services to be recognized were performed. Recipients may be individuals (one or more than one), corporations, or students

Those considered for the award shall have excelled with regard to one or more of the following criteria:

- Provided leadership in advancing geosynthetics education and research,
- Created opportunities to collect, evaluate and disseminate knowledge on all matters relevant to geosynthetics, and their application,
- Organization of technical conferences, seminars, and workshops,
- Advanced training of current users of geosynthetics,
- Advancement of the science and technology of geosynthetics and their applications
- Training future users of geosynthetics,
- Training geosynthetic educators,
- Promotion of geosynthetics as part of engineering curricula,
- Targeting impactful new Members of IGS-NA,
- Better communication with Members of IGS-NA,
- Enhanced partnerships with associated organizations.

The first edition of the award(s) will be presented at the Geosynthetics 2019 Conference in Houston, TX. Nominations for award recipients may be made at any time by IGS-NA members or the IGS-NA Board of Directors with a deadline of October 1st, 2018. Please send your nominations to mbertuzzelli@minervatri.com

Hundreds of people and dozens of companies have contributed to the evolution and success of IGS-NA (formerly NAGS) over the past 30+ years. Thus, with the establishment of this award, we have an opportunity to recognize a great number of deserving and outstanding members, peers, and friends. IGS-NA members are encouraged to submit nominations for people and corporations to be considered for the award.

IGS-NA 2018 Webinars

Over the last couple of months the IGS-NA held several technical webinars and we are looking forward to holding more of them this year. This past January Richard Thiel P.E. of Thiel Engineering presented Pond Liner System Design and Operation. Beth Wilbanks of TenCate Geosynthetics provided a technical understanding behind Minimum Average Roll Values (MARV) values in Geosynthetic Specifications in December of last year. Our first webinar last year was presented by Abigail Gilson M.S. P.E. of TRI Environmental which provided attendees with an Overview of Electrical Leak Location (ELL) Methods and their Applications. IGS-NA would like to thank our presenters for their time and hard work in presenting and sharing their expertise on behalf of our organization in promoting geosynthetics to the engineering community at large.

IGS-NA will continue to provide Webinars throughout 2018. Members receive one Free Webinar coupon on paying annual dues. Membership registration/renewal can be done at www.igs-na.org.

If you would like to provide a technical webinar on behalf of the IGS-NA please submit your proposal to a board member and/or directly to info@igs-na.org

Dr. R. Kerry Rowe, O.C. – Order of Canada Recipient.



**R.
Kerry
Rowe**

Founding Board Member of the IGS-NA, Dr. R. Kerry Rower appointed as an officer of the Order of Canada.

The Order of Canada recognizes outstanding achievement and dedication to the community and to Canada. Each recipient is a leader in their field and have contributed greatly to the betterment of the nation and beyond.

Dr. Rowe was recognized for his seminal contributions to the field of geoenvironmental engineering, notably for his pioneering research in waste barrier systems.

Created in 1967, the Order of Canada, is one of the country's highest civilian honours, and recognizes outstanding achievement, dedication to the community and service to the nation.

Educate the Educator Event – December 2017

IGS North America is very happy to report a very successful Educate the Educators (EtE) event held in Kingston Canada in December 2017, where we provided training and educational materials to 35 engineering Professors from across the United States and Canada to enable them to offer state-of-the-practice geosynthetics education to their students at their Universities. This is our second EtE event since relaunching the initiative in 2015. More news to come. Special thanks to our Diamond Event Sponsors: Cetco, GSE Environmental, Solmax and Tencate; and our Sapphire Event Sponsors: Argru, Huesker and ThraceLinq. IGS-NA would also like to recognise the 2015 EtE Sponsors. Remaining funds from the 2015 event were used to support the 2017 event as well. Thank you to GMA, Geosynthetics Institute, TenCate, ECTC, Presto Geosystemes, GSE, Huesker, ThraceLinq and TRI Environmental.



Educate the Educators Event at Queen's University, Kingston, Canada

*Reported by
Bruno Herlin, IGS-NA Correspondent for IGS News*

5th IGS UK Symposium - Use of Geosynthetics in Rail: Towards 2025 York, UK, 18 April 2018

The symposium was held on 18th April 2018 and was very successful. It took place in the historic York Rail Museum so at all time we were surrounded by vintage, full scale trains that were once fully operational but now immaculately preserved and displayed for everybody to admire, explore and enjoy. In total we had 15 speakers, sharing the latest research and examples of the use of geosynthetics in rail applications and representing Academia, Consultants, Contractors, British Rail Asset Owners and the majority of Geosynthetics' manufacturers. Our speakers travelled from Japan, the Czech Republic, Portugal, Italy, France, Germany, as well as from various parts of the UK.

Our Symposium attracted delegates covering the full spectrum of our industry including Academics, students, Consultants, Contractors, Rail and other Asset Owners and manufacturers. In total 128 delegates attended our Symposium. The objective of the Symposium was to share overseas experience with local UK practise on the use of geosynthetics in Rail and to raise awareness amongst the UK Rail Asset owners of how geosynthetics can be used in rail applications. Judging from the coffee break informal conversations as well as the 'formal' question & discussion time and the feedback we got post-event, we can confidently say that our objective was definitely achieved!



Audience of the 5th IGS UK Symposium



Scene from the venue at the historic York Rail Museum

8th IAGIG - Annual Conference of the Italian Young Geotechnical Engineers

Udine, Italy, 18 - 19 May 2018

The 8th edition of IAGIG (Annual Conference of Italian Young Geotechnical Engineers) was held in Udine, on 18 - 19 May 2018. The event aimed to gather young professionals from various fields of Geotechnical Engineering and to share knowledge and experience among young professionals as well as the academia.

IAGIG 2018 was organised by the Italian Geotechnical Association (AGI) and the board of Italian Professional Engineers of Udine with the support of the University of Udine and of support of AGI-IGS, the Italian Chapter of IGS.

More than 150 participants attended the conference with 23 oral presentations and 27 posters on different topics such as: geotechnical structures: monitoring and control, earthquake geotechnical engineering, environmental geotechnics, case histories and lessons learnt, in situ and laboratory tests, ground improvements and reinforcement methods, slope stability, engineering with geosynthetics.

At the end of the first day the attendees could round up in an informal-social dinner that was a nice moment to strengthen former collaborations and make new once as well as share further experiences.

IAGIG was a place for discussions on issues related to both practice and the latest research findings on geotechnical engineering and it encouraged exchanges of experiences and knowledge among the young geotechnical engineers. Some contributions were delivered by young Italian engineers working out of Italy and eager to share their recent professional experiences. This year's novelty was an additional session to present the activities of Italian members in other young groups of national and international geotechnical associations. Fabio Tradigo (YMPG of ISSMGE), Francesca Burali D'Arezzo (Gruppo Geotecnici Roma) and Laura Carbone (YMIGS) introduced the different groups, the main missions and activities and shared their personal motivation and experience to inspire other young members to be involved too.

Members of the Italian Chapter of IGS also contributed to the thematic sessions discussing the geosynthetic reinforcement on soft soils, geosynthetic reinforced walls and slope stabilization with geosynthetics. The short written report of each presentation or poster is shared in the IAGIG web-page (www.iagig.unisa.it).

The conference ended with a technical visit to the new Logistic Platform of Trieste Port where the young attendees had the opportunity to see the construction site at different construction stages.

Next edition of IAGIG will take place in May 2019.



The IAGIG 2018 attendees in the conference hall



Organizing and technical committee (from left to the right): Federico Fiorelli, Alberto Bisson; Laura Carbone, Francesca Ceccato, Diego Valusso, Raffaele Di Laora, Sara Amoroso, Gabriele Della Vecchia



Some of the attendees at the Logistic Platform of Trieste Port during the technical visit.

Reported by
Laura Carbone (YMIGS) and Sabatino Cuomo (IGS member).

2nd Technical Session on Geosynthetics - Geosynthetics Solutions for Soft Ground Reinforcement Lisbon, Portugal, 6th July 2018

The Portuguese Chapter of IGS has organized the 2nd Technical Session on Geosynthetics - Geosynthetics solutions for soft ground reinforcement - held on 6th July at the National Laboratory for Civil Engineering (LNEC), in Lisbon. The session was sponsored by Huesker and has included six keynote lectures given by specialists from Portugal



Audience



Opening ceremony

and Spain. A total of 54 participants, including designers, installers, producers, users, researchers and students, have attended this session. Based on practical cases, the event has promoted the dissemination of geosynthetics

solutions with the purpose of soft ground reinforcement. The session focused on the most adequate applications regarding innovation and recent advances on technologies design and construction.

Reported by

José Neves, IGS Portugal Secretary

XXIX Italian National Conference on Geosynthetics

Bologna, Italy, 18 October 2018

The Italian Chapter of the International Geosynthetic Society (AGI-IGS), in partnership with the Italian Geotechnical Society (AGI) and BolognaFiere-SAIE 2018, under the auspices of the National Engineers Council (CNI), the Association of Bologna's Engineers and the University of Bologna, organizes the *XXIX Italian National Conference on Geosynthetics*. This time the conference will be addressed to the presentation of the "A.G.I. guidelines for the use of geosynthetics in soil reinforcement: design of walls and steep slopes".

The organizing committee is composed by: Daniele Cazzuffi, Nicola Moraci, Giuseppe Cardile, Sabatino Cuomo, Guido Gottardi, Antonella Grossi and Claudio Soccodato.

The morning session will be coordinated by Daniele Cazzuffi (AGI-IGS President) and, through a series of invited lectures, will deal with the main principles on reinforced earth structures, the characterization of the design parameters and the methodologies of analysis both in static and seismic fields, according to the Italian design code and the current international standards and recommendations.

Nicola Moraci (AGI President) will coordinate the afternoon session, with invited lectures that will illustrate the numerical design approaches and examine comprehensively the practical aspects such as realization, testing and monitoring, passing through a design example that will show the correct application of the new national technical code (NTC2018) and the differences with the previous one.

Specifically, during the entire day, the invited lectures will be given by: Nicola Moraci ("*Operating and design principle of Reinforced Earth Retaining Walls and Reinforced Slopes*"), Giuseppe Cardile ("*The materials used for Reinforced Earth Works: a focus on their design characterisation*"), Marilene Pisano ("*The new Italian Technical Code for Constructions NTC2018 and international guidelines for design with geosynthetics*"), Giovanni Biondi and Paolo Carrubba ("*Static and seismic analysis methods for Reinforced Earth Retaining Walls and Reinforced Slopes*"), Claudio di Prisco ("*Numerical approach for design with geosynthetics*"), Piergiorgio Recalcatti and Pietro Rimoldi ("*NTC2018: a practical case design application. An overview on the main differences from the old Italian Technical Code for Constructions*"), Simone Carraro ("*Construction, acceptance and monitoring of Reinforced Earth Works*").

During this event, the AGI-IGS Award will be assigned to the best thesis, discussed after January 2016, focused on a theme related to the use of geosynthetics in the field of Geotechnical Engineering.

Reported by

Daniele Cazzuffi (AGI-IGS President) and Giuseppe Cardile (AGI-IGS Secretary)

12th Rencontres Géosynthétiques 2019

Nancy, France, 11 - 13 March 2019

The 12th French Speaking Conference on Geotextiles, Geomembranes and Related Products

Organised by the French Chapter of IGS every two years since 1993, The Rencontres Géosynthétiques are the reference French speaking event for geotextiles, geomembranes and related products. They cover the whole range of applications of these materials in civil engineering and environmental protection. From the 11th to the 13th of March 2019 in Nancy (France), this conference will welcome experts, engineers and technicians coming from all Europe and northern Africa. The twelfth edition of the Rencontres Géosynthétiques will be the occasion to make a state of the art on recommendations of use and installation and standards, through the presentation of practical cases of use. The Rencontres Géosynthétiques will be a unique opportunity for practitioners to meet and exchange. On the first day, some short courses will be given (in French) to those attendees less familiar with geosynthetics on what geosynthetics are, their basic properties and main uses in civil engineering and environmental protection.

More information can be found in <http://www.rencontresgeosynthetiques.org/index.html>

Reported by

Guillaume Stoltz, Assistant General Secretary of French Chapter of IGS

New Board of the Czech Chapter



from left: Martin Vanicek - head of technical group,
Petr Hubik - treasurer,
Zikmund Rakowski - president,
Dalibor Grepl - secretary

For more information
please visit www.igs.cz

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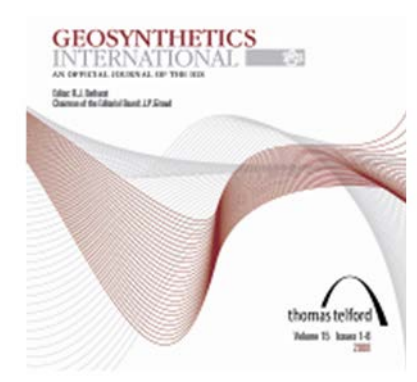
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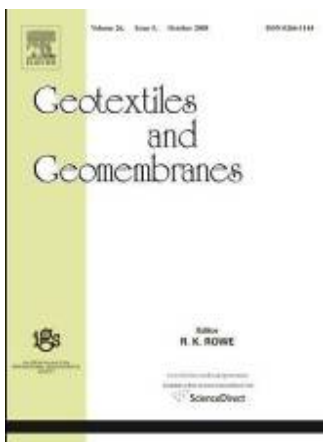
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With a distribution of more than 3000 samples/downloads of IGS News this is a good promotion of the geosynthetics technique and your company. We would be happy if this chance is used frequently.

Reported by

Gerhard Bräu, IGS News Editor

Landfill drainage and enhanced cover soil interface, Silent Valley Landfill, Ebbw Vale, Wales, U.K.



Project Description

Silent Valley, which runs up from the Welsh town of Ebbw Vale, was restored and turned into a nature reserve managed by the Blaenau Gwent County Council and Gwent Wildlife Trust. The once post-industrial mining valley, contaminated with metal recovery waste has been cleaned up and the upper valley turned into a modern domestic landfill facility which is capped off and landscaped to become part of the nature reserve. Silent Valley is now one of the most beautiful natural environments in Gwent.

Challenges

With the finished landfill profiles incorporating 80m long 1 in 2.5 slopes the challenge was to achieve a stable cap without any reprofiling or use of geogrid reinforcement.

The aim was to install a multi-layered synthetic cap comprising a 1mm LLDPE textured geomembrane with a drainage capability above the membrane and a gas venting capability below.

The challenge was to provide sufficient drainage capacity on both interfaces and adequate interface shear strength to withstand the dead load of the 0.5m cover soil and live load of the construction traffic

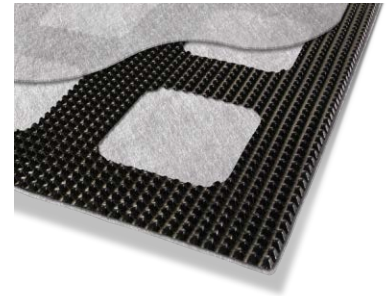


whilst placing the backfill material on this critical slope.

The required slope stability was not possible to achieve with standard geocomposites typically used for the landfill cap drainage. A geocomposite with enhanced performance was required for this 1 in 2.5 slope application.

Solution

Geocomposite drains have long been used as alternative to crushed stone. ABG is well known as a pioneer of cusped drainage and in 1995 was the first to introduce a 4.4m wide drainage composite suitable for wide scale use in environmental projects. Since then, many millions of sqm of Pozidrain have been used on landfill and mine capping projects to provide sub-surface drainage above and below the barrier to improve stability. It has become clear that the interface shear strength is of critical importance. As slopes have become ever more steep, geomembrane texture and spikes have improved the barrier/geocomposite interface shear strength to the extent that it is the cover soil to geocomposite interface that is often the limiting factor. ABG has invented and patented the Pozi G with a unique lattice core that has proven to give in excess of 20% improvement to the cover soil interface. Shown is an example project that used Pozi G on a 1:2.5 slope. Consideration of the interface friction was needed for the construction phase allowing for plant tracking up the slope to spread cover. Just like the original Pozidrain, Pozi G has MD and CMD flow which ABG believe is fundamental to true equivalence to crushed stone and for a realistic factor of safety. The ability for the water to flow in all directions equally guards against any possibility that a longitudinal flow channel is inadvertently compromised on site, as the water can simply detour around that zone and continue safely to the outlet pipe.



Further information

For more information about ABG Ltd., visit www.abg-geosynthetics.com or contact liz@abgltd.com

Detention Pond under the Freeway Overpass, Taichung, Taiwan (R.O.C.)



ACE Geosynthetics

Background

Numerous typhoons swept across Taiwan during 2012 and 2013 bringing along abundant rainfall, leading mud flow and flooding to rolling and pouring down along the west side of Dadu Mountain. The torrent was arbitrarily pouring along the main road of Taiwan Boulevard, Taichung City, causing severe inundation to Shalu District located on the west foot of Dadu Mountain. Frequent flooding not only afflicted residents but also further affected the local housing prices. Thus, Taiwanese government initiated to investigate and deal with the drainage problem of Shalu District so as to ensure the security of life and property of Shalu residents.

Problem (Tasks)

Causing the disasters of Shalu District usually resulted from (a) incomplete rehabilitation of partly creeks and rivers (b) earth and stone caused by collapsed slope of Dadu Mountain block the drainage system (c) unconnected upstream and downstream drainage paths (d) the drainage construction of Shalu District is unable to catch up the speed of regional development (e) because the construction projects on the foot of Dadu Mountain increase rapidly, making impervious areas and the surface runoff increased as well. In order to resolve flooding problem of this district, the government makes plans for drainage treatment on upstream slope while drainage improvement project on downstream urban area. This construction project included in the treatment plan uses the spare space between bridge piers under the Shalu overpass of the Freeway No.3 located on the slope of Dadu Mountain to construct a detention pond with 1,026m³ volume. The detention pond allows surface runoff to be stored temporarily within it and thus achieves the effect of flood storage; moreover, it is able to reduce flood peak flow produced by rainstorm or delay the arriving time of peak flow, and then decrease flooding condition of low-lying Shalu district downstream during rainy seasons.

ACE Solution

The geology of Dadu Mountain area is laterite on Toukoshan formation which is mainly composed of gravels with high permeability. Considering the influence of water conservation volume caused by water retention facility, landscape, economy and ecology, the construction utilize local materials, natural granular backfill to form mechanically stabilized earth (MSE) wall as the wall structure around the detention pond. The bottom of detention pond uses RC board of 30 cm thickness as back over to intercept floods on the southern side of detention pond. In addition, this case uses a single-stage reinforced slope with 7.5 m to 8.5 m height, and uses ACEGrid® GG geogrids with 220*110 kN/m tensile strength as reinforced material. Every 4 m vertical height of the reinforced slope lays out light gravel drainage layer of 20 cm thickness with horizontal and vertical ACEDrain S geocomposite drainage panels of 2 m spacing, so that the seepage water in the soil layer behind the slope enables to divert into the pond to release the water pressure and maintain the stability of the long-term reinforced slope. Moreover, the reinforced slope uses durable erosion control bags which are filled with in-situ selected soils and staked on the slope with ACEGrid® GG geogrids wrapping around, allowing the slope to have stable foundation for vegetation and to reach the effects of greening and ecological friendliness.



Result

The detention pond of this case which was finished in 2014 has been attacked by numerous typhoons until now, but it still shows an excellent ability for flood storage. Using mechanically stabilized earth (MSE) on this construction not only fulfills the basic demand of security and economy in civil engineering but also conforms to the current trends of carbon reduction and ecological sustainability pursued by engineering industry. As a result, the constructions of subsequent detention ponds in this district all imitate the design of this case. It is strongly believed that after other drainage improvement and flood detention projects are completed in the Shalu region, Taichung, the flooding status here, will be greatly improved with minimal impact on the environment.

Further Information

For more information about ACE Geosynthetics, visit www.geoace.com or contact sales@geoace.com.

Nuevo Aeropuerto Internation de la Ciudad de Mexico (NAICM) - Runway 3



Client: CARGI-PROPEN SA DE CV
Engineer: PARSONS & TASANA
Main Contractor: GACM
Subcontractor CETEAU BV / COFRA BV JV

Scope of works

- Production of more than 30 million linear meters of Prefabricated Vertical Drain (PVD) with record quantities delivered per week of 1 to 2 million linear meters.
- Implemented local PVD manufacturing facility where, in addition to the manufacturing in The Netherlands, the highly specified material was produced whilst meeting all the ISO standards demanded by the Client.
- Installed more than 30 million of PVD's with more than 10 rigs to depths ranging from 15 to 28 mt.



Early 2017, CeTeau BV is awarded by CARGI-PROPEN SA DE CV the contract for the manufacturing and installation of more than 28 million linear meters of Prefabricated Vertical Drain to be installed under the future RUNWAY 3 for the NAICM. Given the scope and available timeframe CeTeau teamed up Cofra BV.



The wick drain solution was chosen with the purpose of accelerating the rate of consolidation of the very soft soils present at the site. At one point during the work execution, more than 10 Rigs were deployed at the site for 8 months, working 24/7. Work was commenced in February 2017 and successfully completed in September 2017. Further to completion of the original contract, procurement and installation of additional PVD's has been re-



quested by the Client and continues as of March 2018. CeTeau is a world class PVD (wick drain) manufacturer with an annual capacity exceeding 150 million meter and Specialty Geo Contractor, it operates locally in Mexico through its Mexican Subsidiary, Mexican Wick Drain, SA de CV.



Further Information

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Sunich Reinforced Green Slope Project (Iran)



Objective

Sunich factory is one of the main production of fruit juices in Iran. At the moment, Phase 1 and Phase 2 of the FirouzkooH plant are in progress. Phase 1 involves the construction main factory production line. Phase 2 was landscaping and making storage areas. The project was constructed in mountainous area and there were different terrace levels for each factory building. The 1000 m section was proposed to be constructed with reinforced slope with green surfaces.

The Challenge

An integrated system consisting of PET Woven Geogrid (40 and 60 KN/m) was qualified for reinforcing (i) the bottom of the slopes for basal reinforcement (ii) in the reinforced slopes. Needle-punched nonwoven geotextiles weighing 300 g/m² were specified as cushions as filter layer in facing. At the surface level (in front of geogrid reinforced slope), a 10 cm Perforated textured Geocell was specified to separate the existing reinforced slope the surface layers of a typical 30 cm thick agricultural soil for plantation. Some water proofing with HDPE Geomembrane is used for waterproofing the foundations.



General View of The project

The Solution

Following the specifications of the design for reinforced slopes, Geosakht Geosynthetics provided needle-punched nonwoven geotextiles weighing 300 g/m² namely Hytex3 and PET Woven Geogrids namely GG40 and 60. Different slopes in height designed and covered with geotextile and Geocell cover. Finally, a green slope is constructed in a very harsh weather condition with using Geosynthetics materials.



Different Geosynthetics layers in a green reinforced slope



Covering the slope with vegetative soil

Further Information

For more information about Geosakht visit www.geosakht.com, or contact Rezaashgbousi@gmail.com

Kaytech Stabilises XtraSpace Storage Facility



In May 2017 Endecon Ubuntu Consulting Engineers contacted Kaytech for a solution on a differential settlement problem at a site in Centurion, Gauteng where a new branch of XtraSpace, a container storage facility, was to be constructed.

When Endecon engineers discovered dolomite pinnacles at a depth of 150 mm below the natural ground level, they realized that even once the Wad and weak soils were removed and replaced with higher quality fill material, differential settlement might still occur. As a mineral composed of calcium magnesium carbonate, dolomite provides a higher load bearing capacity than fill material. Since the containers would easily span any voids and settlement, the main concern was to adequately reinforce the access roads between the rows of containers.

After a site inspection, a Kaytech representative consulted with Tensar, the manufacturers of TriAx geogrids. A decision was made to crush a portion of the dolomite rocks and mix this with the in-situ material to create a G6 aggregate that would be included in the Tensar analysis to create a specific design for this project.

The rigid polypropylene triangular geometry of this geogrid, a significantly different structure compared to bi-axial geogrids, provides numerous advantages, including near uniform radial stiffness through 360°, and greater reduction in aggregate layer thickness. This reduces the quantity of natural aggregates required as well as the volume of material to be excavated.

The design generated included compaction of the in-situ material to 100 mm above the top of the dolomite peaks to serve as a “cushion layer”, covering this by simply unrolling a layer of Tensar TriAx TX160 geogrid. Prior to surfacing, two 150 mm layers of the G6 material were installed above the geogrid.

The triangular structure of the geogrid, in conjunction with increased rib thickness and junction efficiency, provides significantly improved aggregate confinement and interaction, leading to improved structural performance of the mechanically stabilised load-bearing sub-base. With tensile stiffness in three principal directions, this multi-directional product shows near isotropic properties.



Installation of first row complete



Platforms which will function as base for shipping containers

Further Information

For more information on Kaytech products and systems, visit www.kaytech.co.za

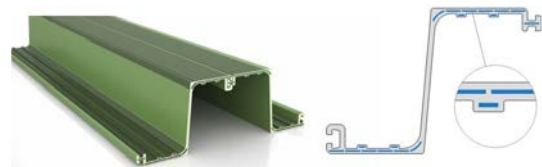
Hybrid Sheet Piling – Fiberglass Reinforced PVC Profiles



This case study shows how we introduced to the market new hybrid material to manufacture sheet piling that would bridge the gap between vinyl polychloride and steel. We present here how we conducted the research, developed the manufacturing line, followed by lab and field tests to ultimately introduce the patented product to the market.

Bridging the Gap

Sheet piling made of polyvinyl chloride is a long-lasting product of high resistance to corrosion, as well as the majority of chemical agents. In contrast to steel piling, profiles made of PVC are lightweight, which allows to make savings, as far as the transport and assembly costs are concerned. Aesthetic look is an additional advantage of PVC. On the other hand, the largest limitation of this type of sheet piling is their considerably lower resistance to bending, which limits the scope of application, especially in case of projects where long elements are used.



Hybrid sheet piling with fiberglass reinforcement

The above limitations made us conduct a comprehensive research aimed at improving the mechanical parameters of vinyl sheet piling and, at the same time, maintaining all advantages of PVC profiles. The Pietrucha Group R&D department has developed a technology of reinforcing PVC sheet piling with fiberglass in form of roving.

Step One - the Research

The initial stage of the research assumed the development of surface, layered model of a profile, with five variations as far as the fiberglass location was concerned. The fiberglass content did not exceed 10 percent of the total mass of the composite. In the next phase, the team conducted finite elements analysis. The results of the analysis helped to select the optimal location of fiberglass core, i.e. reinforcement of horizontal walls and corners of the profile. The next stages of the research included analysis of different reinforcement mass share. In addition, the team analysed further variations of the initial reinforcement location and validated the results of the finite element analysis with the numerical analysis of the 3D spatial model.

Step Two – the Tool

The research results helped to determine the optimal geometric and quantitative location of fiberglass reinforcement within the polymer matrix, so as to achieve the highest mechanical parameters of the profile. Then, the team moved on to design and assemble the extrusion tool for fiberglass reinforced GW700. The available technologies of PVC

reinforcement used for small profiles, such as window frames etc. were reviewed. In a consortium with the World's pioneer in fiberglass technology, we have adapted this solution to strengthen large scale profiles. A complete manufacturing line was assembled, equipped with tools that would enable coextrusion of profiles with fiberglass reinforcement

Step Three – Lab Tests

Then, the manufactured hybrid geotechnical profiles were tested at the Silesian Science and Technology Centre of Aviation Industry. The Silesian Centre specializes in testing the strength parameters of advanced geo-composites used in the aviation industry, inter alia, by Boeing. The static and fatigue analysis included 4-point bending of the profile using a specially designed testing unit. During the experiment the force and the material shift were monitored on a continuous basis. Thanks to the obtained results the Young Modulus and the flexural rigidity parameters of the product were calculated.

Step Four – Field Tests

Moreover, the results of bending tests have confirmed the improvement of the new hybrid material mechanical properties. The samples' stiffness parameter of the fiberglass reinforced vinyl sheet piling nearly doubled in comparison with sheet piling made solely of PVC. In order to confirm the results, and the ability of the hybrid material to bear constant tension, field tests were conducted. The tests were run in real-life conditions. The walls made of hybrid material were submerged in the ground and subjected to bending. The results of the field tests were repetitive and confirmed the lab assumptions.

Step Five – the New, Patented Product

Application of the innovative technology resulted in the creation of hybrid sheet piling made of fiberglass reinforced polyvinyl chloride. Thanks to comparable mechanical parameters, the new type of material occurs to be a strong competition to light steel piling. Furthermore, aesthetic look, resistance to corrosion and lower price are some of the additional advantages which make our product more attractive.



The static and fatigue tests included 4-point bending of the profile using a specially designed testing unit



Bending test for more realistic conditions

Further Information

For more information on Pietrucha visit www.polgrid.com or contact export@pietrucha.pl

Roadway Reinforcement Applications



Application	Subgrade Stabilization and Reinforcement	Job owner	Iberdrola Renewables, LLC
Location	Hertford, NC	Engineer	Barr Engineering
Product	Mirafi® RS-Series	Contractor	Wanzek Construction
Quantity	205,000 yd ² – RS380i 120,000 yd ² – RS580i	Date of Installation (m/y)	December 2015 – June 2017

THE CHALLENGE: What was the objective of project? What were the soil conditions for the project (CBR, type of soil, etc.)

The contractor was responsible for constructing over 66 miles of access roads for the 104 turbines in the first phase of the Desert Wind Farm project. Since these access roads were the only source of entry, they had to support construction traffic over soft, wet North Carolina farmland soil. They were used by aggregate and concrete trucks, delivery tractor trailers (with heavy turbine components) and for moving the cranes between the wind turbines. The original design specified geogrid with 10" of Dense Graded Aggregate (DGA). The subsurface investigation revealed that the

in-situ soils consisted of peat and organic clays with a CBR value as low as 0.7% and silty/clayey sands with a CBR value of less than 4.0%.

The end of 2015 and 2016 proved to be unusually wet times in costal NC. From the start of the project, the grading contractor had troubles with the roadways being too saturated. Multiple attempts at stabilizing the subgrade with geogrid were unsuccessful. The mud oozed through the apertures causing severe rutting and eventually the geogrid ruptured in multiple locations and wrapped around the truck axles.

The only way to stabilize the roads was to add additional stone. However, the aggregate imported by railcars was very expensive. The contractor tried cement stabilization as an alternative, however this method required too much cement and an excessively long curing time. This option was immediately ruled out for both time and cost reasons.

THE DESIGN: What were the recommendations of overcoming the challenge/objective? Were any other options considered or tried? Did the designer use MiraSpec and if so what was the unreinforced design vs. the reinforced design?

A site visit was made by one of TenCate's Engineering Business Managers to observe the subgrade and to perform field vane shear tests to determine the CBR values of the soils. The field vane shear tests confirmed that the soils were less than 1.0% in many locations. Designs were recommended after the engineer evaluated the subgrade soils along with the anticipated truck and crane loadings. The parties agreed to the need for a high modulus reinforcement product that would integrate (1) superior water flow characteristics to minimize pore water pressure build-up, (2) AASHTO M288 separation criteria to minimize fines contamination into the overlying aggregate. Three different design options using Mirafi® RS*i*-series were recommended to make the project more economically feasible.

THE CONSTRUCTION: Installation. Any special benefits our product provided to speed up or improve construction?

The contractor called the local TenCate distributor on a Saturday and asked to try the "orange fabric". The distributor brought 3 rolls of Mirafi® RS580*i* to the site that same day and the contractor was able to place 900' of roadway in 45 minutes. The contractor was so excited with the results, they bought the remaining rolls from the distributor's inventory on Monday and ordered another truckload at the same time. Depending on how soft and wet the subgrade was, the contractor used either Mirafi® RS380*i* or RS580*i* with approximately 10" of aggregate. Occasionally the contractor had to use a little more aggregate in some of the most extreme cases of saturated soils. The contractor successfully installed approximately 325,000 yd² of Mirafi® RS*i*-series.

THE PERFORMANCE: How did our material(s) make a difference? What was achieved? What was the cost savings/value proposition that the product allowed?

Due to the integration of the separation, reinforcement, filtration and confinement functions into a single product, Mirafi® RS380*i* and RS580*i* allowed the contractor to optimize overall costs while minimizing construction delays of the access roads over soft, saturated soils.

With the demand for renewable energy growing, TenCate Geosynthetics will continue to provide the highest quality geosynthetic solutions to create a safe and successful environment.



Further Information

For more information on Tencate Geosynthetics Americas visit www.tencate.com or contact J.McKay@TEN-CATE.COM

Securing Cavities Area by a very high Tensile Strength Geosynthetic Reinforcement



Problematic

The sinkholes present a major problem in roads construction and urban development. The classical solutions used to limit the risk of cavities collapse are: filling of the void, construction of concrete bridges across the cavity areas, reinforcement by masonry piles, etc. Even if these methods offer a durable solution for long term security and stability, they present several inconvenient and limitations, such as the need of important material quantities; high CO² emissions; need to localize the cavity and very high cost. Therefore, the use of a geosynthetic is a more attractive and economic solution.



Project Description

The project is located in Arras city (north of France) and concerns the securing of a public park built over an abandoned chalk quarry. The cavities are 6 m high, 3.5 m wide and located between 14 and 20 m in depth. The main risk consists of the occurrence of a sinkhole with significant diameter.

Solution “Very high tensile strength geosynthetic reinforcement”

Usually, the geosynthetic reinforcement solution is used to secure the infrastructures over cavity zones, in association with a high embankment and good granular material. This case study presents a real challenge; it is one of the few or may be the only project where the installed geosynthetic has a tensile strength higher than 1800 kN/m. This project presents other specific conditions, they concern the low thickness of the soil over the geosynthetic layer and the reuse of the local materials for the embankment. So, the geosynthetic design and the construction steps required to take into account particular hypotheses.

Design Method

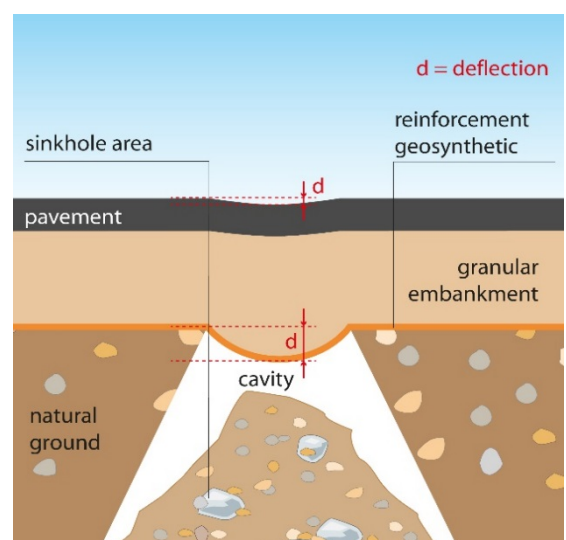
RAFAEL design method (issued from national French research project) is used with some simplifications: no arching effect; no shear strength of the collapsed soil column; specific expansion coefficient for SLS and ULS.

Geosynthetic Reinforcement

The choice of the geosynthetic is done according to several criteria: the characteristic tensile strength of the product, the nature of the polymer, application requirements. The product designed for this project is the geocomposite Geoter® FPET 1800. It is manufactured by warp knitting process combining woven geotextile with high tenacity polyester cables. It combines reinforcement, filtration and separation. It allows water flow during the service stage and prevents fill material going through the geosynthetic in case of cavity collapse.

Further Information

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Calendar of Events

Event	Location	Date	E-Mail, Website
China – Europe Conference on Geotechnical Engineering	Vienna, Austria	13 - 16 Aug 2018	geotech@boku.ac.at https://china-euro-geo.com/
69 th IEC Meeting & International Conference	Saskatoon, Canada	12 - 17 Aug 2018	http://www.icid2018.org icid@icid.org
26 th European Young Geotechnical Engineers Conference	Graz, Austria	11 - 14 Sep 2018	franz.tschuchnigg@tugraz.at http://soil.tugraz.at/eygec2018
7 th Annual World Congress of Advanced Materials-2018 (W.C.A.M)	Xiamen, China	13 – 15 Sep 2018	elsa@wcam-con.com http://www.bitcon-gress.com/wcam2018/default.asp
Urban Planning Below The Ground Level: Architecture And Geotechnics	Saint Petersburg, Russia	19 – 21 Sep 2018	georeconstruction@gmail.com http://tc207ssi.org
11th International Conference on Geosynthetics (11ICG)	Seoul South Korea	16 - 20 Sep 2018	secretariat@11icgseoul.org
International Symposium on Energy Geotechnics	Lausanne, Switzerland	26 - 28 Sep 2018	seg2018@epfl.ch http://seg2018.epfl.ch/
35 th Baugrundtagung (German Geotechnical Conference)	Stuttgart, Germany	26 - 28 Sep 2018	http://www.baugrundtagung.com/
XXIX Italian National Conference on Geosynthetics	Bologna, Italy	18 Oct 2018	
Geo-Expo 2018 Scientific and Expert Conference	Neum, Bosnia & Herzegovina	18 – 19 Oct-2018	geotehnika@geotehnika.ba http://www.geotehnika.ba
International Scientific-Technical Conference "Geotechnics of Belarus: Science and Practice"	Minsk, Republic of Belarus	23 - 26 Oct 2018	tamaraul@mail.ru geotechnika2018@gmail.com http://geotech.by
8 th International Symposium on Environmental Vibration and Transportation Geodynamics	Changsha, China	26 – 28 Oct 2018	ISEV2018@yahoo.com http://www.isev2018.cn/
8 th International Congress on Environmental Geotechnics	Hangzhou, China	28 Oct – 01 Nov 2018	batebate@zju.edu.cn or iceq2018@zju.edu.cn http://www.iceq2018.org
4 ^{ème} Colloque International Sols Non Saturés & Construction Durable UNSAT Oran 2018	Oran, Algeria	30 - 31 Oct 2018	unsatoran2018@gmail.com http://www.unsat-dz.org/index.php
16 th World Conference of the Associated Research Centers for the Urban Underground Space	Hong Kong	05 – 07 Nov 2018	tonyykho@cedd.gov.hk or enquiry@acuus2018.hk http://www.acuus2018.hk
6 th African Young Geotechnical Engineering Conference (6TH AYGEC)	Khartoum, Sudan	24 – 27 Nov 2018	aelsharief@hotmail.com or info@sssmge.org http://www.sssmge.org
GeoMEast 2018 International Congress and Exhibition	Cairo, Egypt	24 - 28 Nov 2018	hanyfarouk808@gmail.com http://www.geomeast2018.org/
Second JTC1 Workshop on Triggering and Propagation of Rapid Flow-Like Landslides	Hong Kong	03 - 05 Dec 2018	ceclarence@ust.hk
12 th Rencontres Géosynthétiques 2019	Nancy, France	11 – 13 Mar 2019	www.rencontresgeosynthetiques.org/index.html
13 th Australia New Zealand Conference On Geomechanics 2019	Perth, Australia	01 – 03 Apr 2019	anzgeomechanics2019@arinex.com.au http://geomechanics2019.com.au/
7 ICEGE 2019 - International Conference on Earthquake Geotechnical Engineering	Rome, Italy	17 - 20 Jun 2019	agi@associazionegeotecnica.it
ISDCG 2019 – 7 th International Symposium on Deformation Characteristics of Geomaterials	Glasgow, UK	26 – 28 Jun 2019	
ECSMGE 2019 – XVII European Conference on Soil Mechanics and Geotechnical Engineering	Reykjavik, Iceland	01 - 06 Sep 2019	has@road.is http://www.ecsmge-2019.com
3 rd International Conference "Challenges in Geotechnical Engineering" CGE-2019	Zielona Gora, Poland	10 – 13 Sep 2019	info@cgeconf.com http://www.cgeconf.com
3 rd International Conference on Information Technology in Geo-Engineering (3RD ICITG2019)	Guimarães, Portugal	29 Sep – 02 Oct 2019	3rd-icitg2019@civil.uminho.pt http://www.3rd-icitg2019.civil.uminho.pt/
XVII African Regional Conference on Soil Mechanics and Geotechnical Engineering	Cape Town, South Africa	07 - 10 Oct 2019	denis.kalumba@uct.ac.za
XVI Asian Regional Conference on Soil Mechanics and Geotechnical Engineering	Taipei, China	21 - 25 Oct 2019	secretariat@16arc.org http://www.16arc.org

Event	Location	Date	E-Mail, Website
XVI Panamerican Conference on Soil Mechanics and Geotechnical Engineering	Cancun, Quintana Roo, Mexico	18 - 22 Nov 2019	support@panamerican2019mexico.com http://panamerican2019mexico.com
14 th Baltic Sea Geotechnical Conference 2020	Helsinki, Finland	25 – 27 May 2020	leena.korkiala-tanttu@aalto.fi or ville.raassakka@ril.fi http://www.ril.fi/en/events/bsgc-2020.html
Nordic Geotechnical Meeting	Helsinki, Finland	27 - 29 May 2020	leena.korkiala-tanttu@aalto.fi ville.raassakka@ril.fi http://www.ril.fi/en/events/ngm-2020.html
TC204: Geotechnical Aspects of Underground Construction In Soft Ground - TC204 Cambridge 2020	Cambridge, United Kingdom	29 Jun – 01 Jul 2020	me254@cam.ac.uk
EuroGeo 7	Warsaw, Poland	06 – 09 Sep 2020	eurogeo7inpoland@gmail.com http://www.eurogeo7.org/
6 th International Conference on Geotechnical and Geophysical Site Characterization	Budapest, Hungary	07 – 11 Sep 2020	huszak@mail.bme.hu info@isc6-budapest.com http://www.isc6-budapest.com

Note:

The conference announcements are shown with different graphics due to their priority for IGS:

IGS Conference

Conference organized under the auspices of the IGS

Conference under the auspices or with the support of an IGS Chapter

The International Geosynthetics Society

OBJECTIVES OF THE IGS



The International Geosynthetics Society was formed with the following objectives:

- to collect, evaluate, and disseminate knowledge on all matters relevant to geotextiles, geomembranes, related products, and associated technologies;
- to improve communication and understanding regarding geotextiles, geomembranes, related products, and associated technologies, as well as their applications;
- to promote advancement of the state of the art of geotextiles, geomembranes, related products, and associated technologies; and
- to encourage, through its Members, the harmonization of test methods, and equipment and criteria for geotextiles, geomembranes, related products, and associated technologies.

WHY BECOME A MEMBER OF THE IGS?

First, to contribute to the development of our profession.

By becoming an IGS Member you can:

- help support the aims of the IGS, especially the development of geotextiles, geomembranes, related products, and associated technologies;
- contribute to the advancement of the art and science of geotextiles, geomembranes, related products, and their applications;
- provide a forum for designers, manufacturers, and users, where new ideas can be exchanged and contacts improved; and become increasingly informed, involved, and influential in the field of geotextiles, geomembranes, related products, and associated technologies.

Second, to enjoy the benefits.

The following benefits are now available to all IGS Members:

- the online IGS Membership Directory, updated in real time;
- the newsletter, IGS News, published three times per year;
- free electronic issues of Geosynthetics International and Geotextiles & Geomembranes;
- 19 IGS Mini Lecture Series are available online;
- information on test methods and standards;
- discount rates on the purchase of any future documents published by the IGS and on the registration cost of all international, regional, or national conferences organized by or under IGS auspices;
- preferential treatment at conferences organized by or under the auspices of the IGS; and the possibility of being granted an IGS award.

Please check whether there is a local IGS Chapter in your country (list at page 26)!

Join online at <http://www.geosyntheticssociety.org>