gigsa

The South African Chapter of the International Geosynthetics Society

Dedicated to the Scientific and Engineering Development of Geosynthetics and Associated Technologies

A newsletter of the Geosynthetics Interest Group of South Africa
In Association with the South African Institution of Civil Engineering

September 2003

Where people or company or product names are underlined, these are Internet and e-mail links in the electronic version of this newsletter.

President's Comment

For those who were not aware, the GIGSA newsletter is distributed nationally through organizations other than GIGSA, as well as internationally via the IGS web site. We have received a number of compliments on the content and standard of the newsletter, and I wish to congratulate and publicly thank Peter Davies for the time and effort he puts into producing our newsletter. Peter is also always keen to receive articles of interest (geosynthetics of course!), for inclusion in the newsletter.

Welcome to Paul Baxter of Geotextiles Africa and Peter Hardie of Engineered Linings, who were both co-opted onto the committee at our last meeting to represent the Western Cape. This was necessary, as our previous Western Cape representative, Philip Addis, recently moved back to Gauteng (he tells me that we have far better weather up here!).

Following our most recent committee meeting, there are a number of exciting issues to report on. Firstly, GIGSA has been invited to the inaugural project steering committee meeting for the revision of the current DWAF Minimum Requirements series. In addition, various GIGSA members have been asked to participate in the two stakeholder workshops being on 30 September and 1 October 2003. Between us, I am sure that we will have a meaningful say on anything pertaining to the use of geosynthetics in the 3rd Edition of the Minimum Requirements.

Following the success of the recent training seminars on Geosynthetic Reinforced Soils organized by Garth James, there has been a call for the adoption of BS8006 as the official Code of Practice for South Africa. GIGSA is represented on the committee tasked with investigating this.

Your committee is also currently investigating the establishment of a GIGSA website, that will "piggy-back" on the IGS website. This website will greatly enhance GIGSA's exposure both locally and internationally, and create a vehicle for networking and promoting geosynthetic solutions.

And now, keeping the best news for last, the committee resolved at its last meeting to launch a GIGSA bursary for geosynthetics research and post-graduate studies. The bursary will be for an amount of R20 000, and will be awarded to a suitable post-graduate student studying towards an MSc, M Eng, PhD or M Tech in the field of geosynthetics. The selection of the successful bursar will be at the sole discretion of the GIGSA committee. Interested applicants should contact me for further information.

Kind regards,

Peter Legg ..... peter@jbawaste.co.za

PRINTER: A joke in poor taste. A printer consists of three main parts...the case, the jammed paper tray and the blinking red light.

GIGSA Benefactors

Engineered Linings ♦ Kaytech ♦ Aquatan ♦Geotextiles Africa ♦ SRK Consulting ♦ Jones & Wagener
DuPont SA ♦ Gundle API ♦ Land Rehabilitation Systems ♦ I-Corp International ♦Gast International SA

Why So Many Failures?

Report-Back on the GIGSA-SAICE Seminar: BS 8006 and Beyond! Reinforcing soils and fills using geosynthetics.

For some time the need has been identified to address the issue of failures of geosynthetic reinforced walls and steep slopes for whatever reason, be it bad practice in design, construction or even perception.

As a result of this need and after a meeting between representatives of GIGSA and the Geotechnical Division of SAICE a joint venture between these parties was set up to drive a series of seminars into the main centres of the country.

The months of May and June therefore became very hectic and busy for 4 gentlemen who volunteered their services to prepare notes and conduct a series of lectures on the subject of geosynthetic reinforced soil structures.

The "travelling circus" was quickly set up and briefed to impart as much knowledge as possible to the delegates who attended these seminars on the following aspects of design:

- The inimitable Alan Parrock of ARQ covered the finer points of designing geosynthetic reinforced structures. He highlighted the many things that an engineer must do as well as some that he should avoid. He stressed the behaviour of soils in these structures and illustrated this well through case studies that covered design, installation and even failures.
- Garth James of Kaytech tortured the delegates through an in depth study of the geosynthetic products most likely to be used in these structures and regaled the delegates with polymeric science involved in their manufacture with particular reference to their stress/strain properties. The presentation concluded with the behaviour of these polymeric reinforcement elements with the soil.
- Marco Pauselli of African Gabions was faced with the task of presenting an overview of the BS 8006 British Code of Practice for Strengthened/reinforced soils and other fills. This he did with great effect paying detailed attention to the design approach to reinforced walls and slopes.
- Taco Voogt, representing the CMA, in amongst all this frenzied, technical activity, found some time to present an outline of the CMA Code of Practice for Gravity Concrete Retaining Block Walls.

This series of seminars was fast tracked to beat the July school holidays and all participants, including the committee members and the seminar organiser, Lesley Stephenson, are to be congratulated for their efforts in making the exercise a great success.

The original plan was to kick-start the seminars in Swaziland, a dry run so to speak. But alas, the timing was too tight for them and they postponed the seminar. This left the speakers with the unenviable task of doing the first run at the Gauteng seminar, to 65 delegates on 4 June 2003.

The KZN leg followed on 11 June in the relaxed surroundings of the Assagay Hotel where 42 delegates attended a seminar that was concluded with some lively debate.

Port Elizabeth on 25 June was most enlightening because the speakers were taken for a tour of the Coega Port development by none other than Messrs Peter Day and Nico Vermeulen, of Geotechnical Division fame. 32 delegates attended the seminar, which was well hosted by PE Technikon. Many thanks are extended to Prof. Kobus van Wyk, his staff and students for their help.

The next day the Fairest Cape exhibited most hospitable weather and 25 delegates were treated to a well-practiced series of lectures. The only drawback was trying to seek out the venue for the drinks and snacks afterwards on the campus of the University of Stellenbosch's Business School. By the time it was found, the party of delegates had been whittled down to a party of 10 hard liners.

At these seminars, a unanimous motion was passed by the delegates, to adopt BS 8006 as a Code of Practice for South Africa. A committee set up by the Chairman of the Geotechnical division of SAICE, Dr. Nico Vermeulen, will assist SANBS (formerly the SABS) in formulating this code for South African conditions (whether it be in the form of a "front end" or minor changes within the Code itself). Alan Parrock is the GIGSA representative on this committee, which also comprises representatives from industry and consulting engineers.

All in all, over 150 engineers, aspiring engineers, contractors and suppliers attended these seminars giving them the inside track on designing geosynthetic reinforced soils and fills. They also have the edge over those who did not make it with particular regard to the use of BS 8006.

Well done again to all those who participated, helped, assisted, prepared and presented. It was a great success and might even be revived to travel to distant venues to further the cause of geosynthetic reinforced soil structures.

In particular, we would like to thank the sponsors of the seminar series: They were African Gabions, Concor Technicrete, Geotrac-Tensar, Geotextiles Africa, Kaytech, Reinforced Earth, Foundation & Slope Stability Engineering, and Terraforce.

The Swaziland seminar is yet to take place but late September has been suggested. Spare notes are available and should anyone require a copy for the (cheap today) price of R 150 they can contact Lesley Stephenson (stephensonl@ebe.wits.ac.za) or Garth James (ktechgmj@kaymac.co.za)

REFERENCE MANUAL: Object that raises the monitor to eye level. Also used to compensate for that short table leg

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Composite Primary Liner For Bellville South Landfill

The construction of two lined cells and a leachate detention pond have recently been completed at the Bellville South Landfill site. Bellville South is classified as a G:L:B$^+$ site and currently receives 1400 tons of waste per day. It is scheduled to close in September 2006. The cells cover an area of approximately 5 hectares and will be filled to a height of 35m. The most notable aspect of the design is the use of a composite primary liner consisting of a protective 300g/m^2 nonwoven needle punched geotextile, a 1.0mm HDPE geomembrane and a 4 000 g/m^2 GCL. The design is thus in excess of the Minimum Requirements due to the lack of an attenuation layer caused by the shallow water table (1 to 2m below the surface) that forms part of the Cape Flats aquifer. Due to the freely available sand on site, it was more economical to construct the leak detection layer with slotted pipes laid in a 150mm thick sand layer than any geosynthetic alternative. The use of LLDPE as the secondary liner was for its greater flexibility and resistance to stress cracking. The lining design is shown in Figure 1.

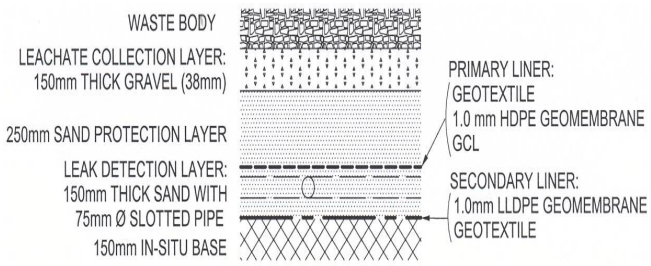

Figure 1: Liner Design for Cells 1 & 2

The leachate detention pond has no secondary liner and the primary liner consists of a protective 300 g/m^2 geotextile, 1.5mm HDPE geomembrane and 4000 g/m^2 GCL. On top of the primary liner a 100 mm thick cellular soil confinement system with cement stabilised sand infill has been installed. This layer will prevent any wind damage and with the pressure relief valves, uplift due to hydrostatic pressures will be avoided. The necessity of the subsurface drainage system beneath the pond has been highlighted by the current flow rate of approximately 1,5 l/s into the subsurface pump station. Initially the pond will act as a retention facility, but a leachate pump station and rising main to the sewerage works are planned and once constructed, the pond will serve as a temporary detention facility.

Figure 2: Construction of subsurface drainage pump station for leachate pond

Figure 3: LLDPE liner at central drain of Cell 1

Client: City of Cape Town CMC Administration
Total Cost: R 9,5 million (excl. VAT)
Contract Length: 26 weeks
Contractor: Aquatan (Pty) Ltd
Consultant: Jeffares and Green (Pty) Ltd

For further Information contact:

John Coetzee, Jeffares and Green (Pty) Ltd
Tel 021 532 0940 coetzeej@jgi.co.za

Programming today is a race between software engineers striving to build bigger and better idiot-proof programs, and the Universe trying to produce bigger and better idiots. So far, the Universe is winning.

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Comment From Overseas

The following message was received from the USA, in response to an article that appeared in the June 2003 GIGSA Newsletter:

----- Original Message -----
From: "Bob Trauger" bob.trauger@cetco.com
To: ktechpld@kaymac.co.za
Cc: rdrayton@aquatan.co.za
Sent: Tuesday, July 01, 2003 10:39 PM
Subject: Letter to the Editor, GIGSA Newsletter

Dear Mr. Davies:

Rod Drayton was kind enough to forward me the recent GIGSA newsletter, which contained an article about GCLs written by Scott Lucas. I would like to address one particular statement in his article; perhaps you would see fit that my comments could be included in a future edition of the newsletter.

Mr. Lucas makes some valid points regarding the confusion in GCL specifications. We have similar experiences where several exceptions and corrections were required. However, it should be noted that most practising engineers have not had any formal education of training on the design and application of geosynthetics. This, combined with the fact that GCL testing standards are still evolving, inevitably requires that geosynthetics suppliers assume a strong supporting role in technical assistance for the engineer.

However, I have serious reservations about another issue raised by Mr. Lucas. Specifically, Mr. Lucas states that "an interface will fail long before the GCL does internally." He reiterates this same point at the conclusion of the article. All readers of this statement should be aware that, at best, this is a dangerous generalization, and at worst, a fatal design assumption. The critical interface in a liner system can certainly be internally within the GCL, especially in conditions of high normal stress. It would be regrettable engineering mistake to assume that internal GCL failure cannot happen as Mr. Lucas asserts. A proper design and specification will involve verification that all liner system interfaces will meet required design parameters at the maximum normal load anticipated for the application.

Thanks for your kind attention to this matter and please contact me if you have any question about my reactions to Mr. Lucas's article.

Sincerely,
Bob Trauger, P.E., Vice President
CETCO International Group

And this is the response from Canada . . .

----- Original Message -----
From: "Scott Lucas" slucas@gseworld.com
To: "Peter Davies" ktechpld@kaymac.co.za

Sent: Friday, July 04, 2003 4:48 AM
Subject: RE: Letter to the Editor, GIGSA Newsletter

Thank-you, Peter. This is not the first statement on this issue that I have received. I would like a week to put together a proper response to this, but as usual, time precludes this. This is why such articles are written - so that others can offer their opinions and a proper statement can be made. My stance is,

1. The "reinforced" type of GCL can be designed such that it is not going to fail internally before the interfaces.

2. The shear box testing, as every civil engineer is learned in, is not properly designed for geosynthetics. "More debate required".

3. The test is flawed for geosynthetics and interpretation of the test results are incorrectly read. However, there will be other papers written on this subject, which I am publishing.

4. The weakest area for synthetics is the geocomposite and the geomembrane and/ or the soils and other interfaces (which I can also show).

This is definitely a good debate.....when is the next publication?

As to Bob's other comments: this paper was meant merely to inform those interested in GCL's that there are test methods established for GCL's and that the GCL has matured to that that fact.

Thank-you for passing this on.

Scott Lucas, Vice President
Bentofix Technologies Inc. Barrie, Canada.

Editor's Comment:

The issue of geosynthetic interfaces is very well covered in a great many peer-reviewed papers, published in international conferences over a considerable period. Not the least of these publications is the series revolving around the USEPA's "Cincinnati" full-scale field trials.

Engineers designing structures that will incorporate multiple geosynthetic components are urged not just to study the literature, but also to commission test programmes using the candidate product interfaces and working conditions anticipated on their projects. Interested parties may contact me for copies of selected references.

Further debate on geosynthetic interfaces, for publication in this newsletter, is invited. We would like to hear about local experiences.

Experience is a wonderful thing. It enables you to recognize a mistake when you make it again.

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Technical Forum – 28 May 2003

GIGSA (Geosynthetic Interest Group of South Africa) together with the LIG (Landfill Interest Group) – Central Branch organised a site visit to the Rietfontein landfill site in Springs, Gauteng on 28 May 2003. Thirty excited participants interested in waste, even from as far afield as the Pretoria Technikon attended the event.

The Rietfontein landfill site is one of the few GLB+ landfills within the Gauteng region. It is owned by the Ekurhuleni Metropolitan Municipality (EMM) and operated by Enviroserv.

Daniel Kalombo of Sibanye Consulting Engineers, John Stiff of BKS and Tony Pieterse of EMM made presentations.

Photo 1: Participants listening to the presentations

Tony Pieterse gave a presentation on the current and future activities of the Ekurhuleni Metropolitan Municipality. The capital budget for 2003/2004 is R 49 million and the operational budget R38 million. Development work for the next financial year includes cell, leachate and an asphalt road development at Rietfontein, cell development at Weltevreden, development of the Nigel transfer station and depot, closure of the Tembisa site, and upgrading of the Rooikraal infrastructure. The EMM is also continuing its investigations into the viability of using methane gas as a fuel source.

BKS Consulting Engineers are responsible for all issues of a technical nature on the site, which includes operations and planning. John Stiff gave an introductory presentation on the history of the site and the future development phases planned for it. The underlying geology on which the site is founded was also briefly discussed as it affects the manner in which the site can be developed.

Sibanye Consulting Engineers were appointed as the design engineers for the current development, and Daniel Kalombo described the design principles followed and the change from a typical GLB+ liner system to the alternative liner system constructed in the new cell.

Photo 2: Compaction of the clay layer

Typically, the primary liner of a GLB+ site would consist of 4 No. 150mm compacted clay layers. However in this instance the primary liner consisted of a composite liner comprising a 200mm thick compacted clay layer, using clay available on site, followed by a 2.0mm thick HDPE geomembrane complying with the GRI-GM13 specification. The Geosynthetic Research Institute in the United States developed this specification specifically for HDPE geomembrane liners,

The area of the new cell is approximately 25 000 m^2 and the total life of the site is estimated at

Photo 3: Installation of HDPE geomembrane liner

approximately 33 years. It is expected that the alternative liner design will provide a better barrier against contamination of the ground water, than that provided for in the *Minimum Requirements*.

After completion of the presentations, all the participants visited the site to see the construction activities underway. At the time of the visit, the compacted clay layer had been completed and the geomembrane liner was in the process of being installed.

GIGSA would like to thank Engineered Linings (geomembrane installer) and Stefanutti & Bressan (earthworks contractor) for providing refreshments after the site visit.

New Range of Geogrids Introduced to South Africa

At the recent series of "*Why so many failures?"* seminars held around the country, Kaytech launched its newest range of reinforcement geogrids, ***Polyfelt Rock GX***®. Manufactured in Malaysia, the open grid structure is knitted from high tenacity polyester (PET) yarns and then saturated with a polymeric protective coating.

Dr. Loke Kean Hooi of Polyfelt Malaysia visited South Africa in June this year to train Kaytech's technical staff on the application of the range of Polyfelt Rock grids. During his time here, Dr Loke also spent time with key design engineers in Kwazulu-Natal and Gauteng explaining the technical benefits of the Rock range.

For the first time in South Africa, the engineer is now able to design with a reinforcing product that offers considerable benefit and value in terms of Rand per kN. This geogrid range offers higher strength at lower strain at more competitive prices than most other imported geogrids and is competitive with locally produced geogrids in terms of quality, performance and price.

Interesting structures have been built recently using the Rock GX geogrids where Kaytech's Technical Marketing Engineer, Manie Troskie, has been working closely with consulting engineers in designing flexible, concrete retaining block (CRB) walls and steep slopes.

In the North West Province, low cost housing projects are under construction in very remote areas. At the village of Mothutlung, home to more than 15 000 people, a sewer reticulation network has recently been constructed. This network feeds raw sewage into the newly constructed sewage treatment works designed by Golder Associates Africa (Pty) Ltd (formerly Wates, Meiring and Barnard), incorporating 2 biofilters.

Photo 1: View of the Mothutlung biofilter

These biofilters are 13.5 m in diameter and 3.2 m high. Loffëlstein segmental CRB product was used for the 70° facing of the Biofilters. To stabilize the front face, reinforcement geogrids in the form of the Polyfelt Rock GX with an ultimate biaxial strength of 35kN X 35kN was installed at the 8th, 14th and 16th block height levels and tied back beyond the potential slip failure surface.

Photo 2: Rock GX Geogrid in place

It was crucial during construction, that the layers of Rock GX were installed level with the top of the block and extended all the way to immediately behind the block facing. This effectively mobilizes maximum clamping force of the Rock GX between the blocks to prevent pullout failure from occurring which otherwise leads to unsightly bulging of the front face of the biofilter.

By following the correct installation procedures for the Rock GX the contractor (in this case Safcrete Construction), ensured the integrity of the design and the structure.

Polyfelt claim that Rock GX, with its low creep characteristics and high soil interaction and pullout strength is suitable for long-term (>100 years) reinforcement applications.

Further claims are that it is especially suited to the reinforcement of non-cohesive, coarse-grained soils in vertical and inclined soil walls with CRB or panel facings. Other ideal applications include earth retention structures, bridge abutments, sub-grade stabilisation, foundations, slope reinforcement in landfill lining systems and hydraulic construction.

Other recent structures using Rock GX include a 4 m high CRB wall in Rustenburg for a private home and a 5 m high, 11 m square block with a 70° CRB facing to elevate the pump house at a sewerage works in a Delmas township.

In conjunction with Pieter Oosthuizen of ARQ, Kaytech offered an alternative design using Rock GX in a flexible CRB wall for the Coca Cola Warehouse extension in Windhoek, Namibia.

Kaytech through Polyfelt has two other ranges of reinforcing fabrics available, namely:

- Rock PEC, a high strength composite geotextile combining high modulus PET yarns with a continuous filament needlepunched nonwoven for high in-plane drainage capacity and high installation survivability.
- Rock WX, a technical fabric knitted from uncoated high tenacity PET yarns designed to reinforce soil structures subject to high loads.

All these products have been tested by accredited geosynthetic testing laboratories and thus conform to the requirements of BS 8006. This is an important factor for a design engineer to consider, particularly in light of the developments mentioned elsewhere in this Newsletter under the heading of "*Why so Many Failures*?"

For more information, contact Garth James on ktechgmj@kaymac.co.za

Some Upcoming Events

IWMSA Landfill Interest Group, Western Cape Branch: 5th Biennial Seminar on Waste Management And Landfill.
University of Stellenbosch Business School, Bellville, Cape Town. 7 & 8 October 2003 More information from Jaqui Sterrenberg at jaquis@englining.co.za or Tel: +27 21 551 2430 / Fax: +27 21 552 5928. (For those who can't make it to *Sardinia 2003* in Cagliari, this is an excellent alternative, and a *must* for those wanting to know more about waste management in South Africa – ed).

"Two Rivers Conference".
North American Geosynthetics Society Conference in conjunction with the 56th national conference of the Canadian Geotechnical Society. 26 Sept. to 1 October, Winnipeg, Manitoba, Canada. More information at:
http://home.cc.umanitoba.ca/~cgsman/cgs2003/

"Sardinia 2003" Ninth International Waste Management And Landfill Symposium.
S. Margherita di Pula, Cagliari, Italy. 6 to10 October, 2003. More information at www.sardiniasymposium.it

"*The Involvement Of Geotechnical Engineering In Infrastructure Development In Africa"*
ISSMGE 13th African Regional Conference Marrakech, Morocco December 8-11, 2003. Organised by: Comité Marocain de Mécanique des Sols et des Roches. Local contact: Peter Day day@jaws.co.za / http://www.emi.ac.ma/~13CRA

3rd International Mining and Industrial Waste Management Conference.
17 – 19 February 2004. Under the auspices of the Geotechnical and Environmental Engineering Divisions of the South African Institution of Civil Engineering.
Contact: Leslie Stephenson l.stephenson@ee.wits.ac.za
"Geotechnical Engineering with Geosynthetics"

"EuroGeo 3". 3rd European Geosynthetics Conference.
Munich, 01-04 March 2004. Organised by the German Society of Geotechnics (DGGT) under the auspices of the International Geosynthetics Society (IGS). Munich, Germany. 1-4 March 2004. Contact: General Secretariat: Technische Universität München. eurogeo3@bv.tum.de / www.gb.bv.tum.de/eurogeo3

"GeoAsia 2004". Asian Regional Conference on Geosynthetics".
21 – 23 June 2004. Organised by Korean Chapter of the IGS, under the auspices of the IGS. Visit the web site at
http://www.kgss.or.kr/geoasia2004/index_e.htm

"8ICG-Yokohama". The *8th Quadrennial International Conference on Geosynthetics*. 18 – 22 September 2006. Organised by Japanese Chapter of the IGS, under the auspices of the IGS. Contact: Mr. Nobuo Kiyokawa at info@8icg-yokohama.org and visit the web site at http://www.8icg-yokohama.org/.



Recent entrants for the "International Man of the Year" Competition: Name your favourite! (Thanks to Brian Harrison for the images)

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