



The South African Chapter of  
the International  
Geosynthetic Society 

Established in 1983 and 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

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# GEOSYNTHETICS SPECIFICATION SAVERS

In South Africa we can consider ourselves lucky to have so many excellent professional engineers, suppliers and contractors in the lining industry with foresight. This however is no guarantee that an incident of unacceptable performance will not occur. Although regulatory standards in the Second edition of Minimum Requirements for Waste Disposal by Landfill (1998) require an HDPE geomembrane of specified thickness, it is the Responsible Person who is required to provide for the detail specification of inter alia the geosynthetic and soil components. Since the distribution of the 3rd edition in 2005 it has become common practice for designers to specify geomembrane compliance with GRI GM13 standards. Is this, however, an adequate precaution for geomembrane linings in High Hazard containment facilities, or should we be using a moderately stricter standard and accreditation process for such applications?

*You are welcome to provide comment to the Editor.*

# HDPE Geomembrane Failures Return - in Asia

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It has come to our attention that there have been some significant Rapid Crack Propagation (RCP) stress-cracking (SC) failures of high-density polyethylene (HDPE) geomembranes in Asia. These failures seem to reproduce the RCP "shattering" failures experienced in North America in the late 1980s.

Failures of this sort have seldom been found since the 1980s. Extensive research and testing in North America and Europe have provided the geomembrane manufacturing industry the tools to eliminate these problems. Until these new cases from Asia came to light, failures like this had not been occurring.

The author believes that these recent failures are, in fact, a result of an isolated group of manufacturers not adhering to current material standards; and that these failures are not due to the development of any new and unexpected phenomena.

For instance, one can see a clear connection between a photo that I-CORP has from Asia this year (Photo 1) and a 1980s cracking problem in the USA (Photo 2). The USA site was a surface water runoff pond in Boise, Idaho that cracked during a rapid (...continued)

HYDRAULICS AND COASTAL APPLICATIONS



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decrease in temperature. The failure initiated at an overheated section of a fusion seam that had been overlain by an extrusion bead.

The second pair of photographs shows an Asian failure (Photo 3) compared to a more recent SC failure along and close to a seam in an unreinforced PP geomembrane on the slopes of a wastewater treatment plant (WWTP) pond (Photo 4).

The similarities are striking.

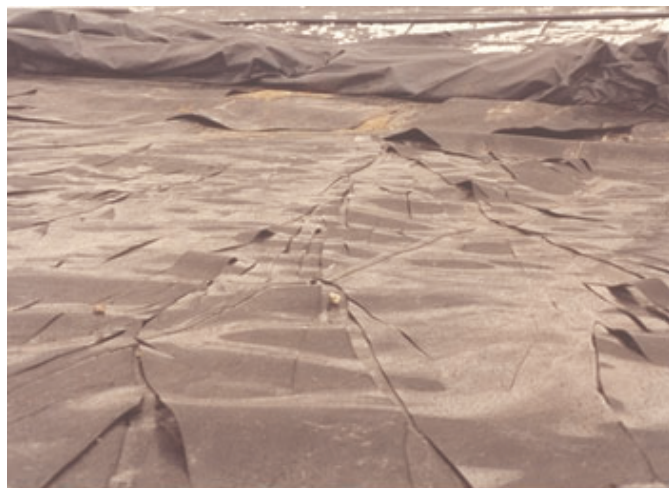


Photo 1, HDPE geomembrane failure in Asia, 2010.

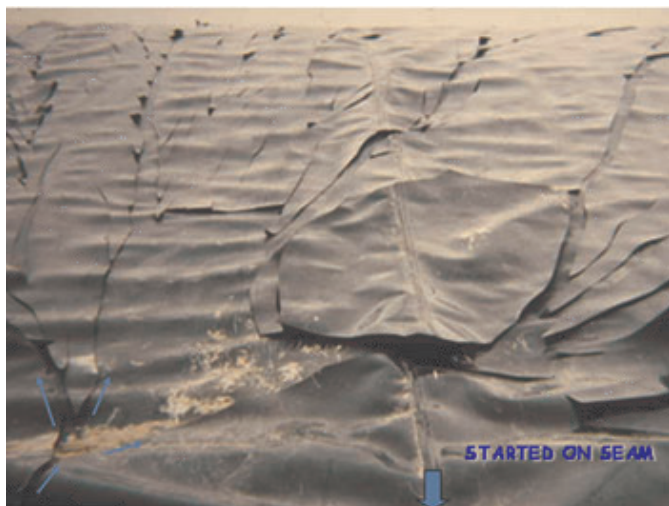


Photo 2, HDPE failure in the USA, 1980s.

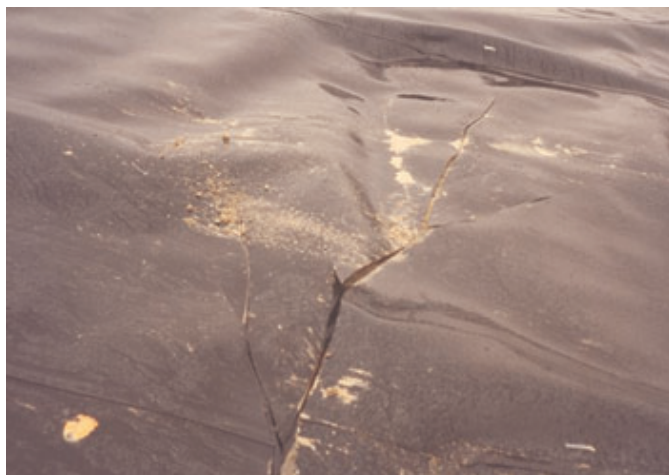


Photo 3, HDPE geomembrane failure in Asia, 2010.



Photo 4, PP failure in USA, circa 1993.

Suggestions from Asia are that the causes of these failures are local manufacturers using recycled HDPE; insufficient carbon black in the formulations; insufficient OIT (under 10 minutes); or poor resins.

The RCP shattering is spectacular but is typically initiated at Slow Crack Growth (SCG) stress cracks when they achieve a critical geometry and growth rate, such as might be caused by contraction stresses during rapidly decreasing temperatures. If the SCG can be identified and repaired during routine visual inspections, the RCP can be avoided.

However, the primary solution is to use a virgin HDPE resin with good stress-cracking resistance and with adequate thermal and photo-oxidation resistances. The GRI.GM13 standard for smooth and textured HDPE geomembranes, used internationally, requires 2% to 3% carbon black for UV protection, stress cracking resistance exceeding 300 hr in the notched constant tensile load test (ASTM D5397) and OIT times exceeding 100 min (standard OIT) and 400 min (High Pressure OIT).

Note that the ASTM D1693 bent strip stress-cracking test is no longer used.

With these simple measures in place, SCG and RCP stress-cracking failures will be absolutely minimized and will not reflect badly on geomembrane liner technology.

These cases of failure are not common, but they must be shared if we are to prevent them from further occurrences. It is unfortunate that pride often prevents the assimilation of "lessons learned" from previous failures or that our international communication efforts are not as successful as they should be.



# Prez Sez

Well 2010 is upon us and the first quarter is history!

I trust that the year has brought much favour upon all your endeavours.

The World Cup 2010 seemed such a distant event and yet suddenly it is now just over 30 days away.

The infrastructural development in the big centres surrounding the new and refurbished stadia is hopefully rushing to completion. One concern I have is that there appears to be no real delivery on public transport to and from the venues. It would appear that park and ride plans are to be implemented and the precincts around the stadia will be kept clear for access by these and related modes of transport.

The question remains: Will all those supporters arrive for the matches?

The civil engineering industry appears to be doing OK but some contractors do not share the optimism of others.

In my previous Prez Sez (GIGSA Newsletter, November 2009) I quoted Iraj Abedian, CEO of Pan African Investment and Research Services, from his input to the workshop on the Impact of the Global Economic Crisis on the Consulting Engineering Industry. He said construction was booming not only in South Africa but also China, Dubai and Sydney. I was in Dubai recently and was amazed at the number of partially completed high rise buildings adorned with inactive tower cranes due to the economic crunch that has hit that Emirate. The contractors have elected to keep the tower cranes in place and maintain a staff compliment in a confident effort to weather the storm. In the short term this is cheaper than disassembling the cranes, returning them to the hirer and paying off labour. It is estimated in some quarters that the once extremely vibrant and economically active Dubai will only start turning in two years. The Burj Khalifa is a case in point where the flagship of buildings was to be the world's highest man-made structure and Dubai's standard to the world, called the Burj Dubai. Alas funds dried up and the project was rescued by the Abu Dhabi royal family and the building renamed to honour Sheikh Khalifa, the current President

of the UAE and emir of Abu Dhabi and reportedly the third wealthiest royal in the world.

This raises the question whether our construction activity will dry up as well unless of course the R800 billion Government spend over the next two to three years is allocated timeously and effectively. At the moment we see much infrastructure development in SANRAL's Freeway Improvement programme in and around Gauteng. What happens when these too come to an end?

The roads industry is quite proactive with SANRAL and SAFCEC liaising regularly to discuss matters relating to budget allocations, projects, standards, legislation and skills. A recent regional meeting in Cape Town revealed some points of interest that are pertinent to the delivery of Government spend:

- The National Finance Minister has said that revenue receipts for the 2010 Budget year are significantly down and SAFCEC members have confirmed that tender prices have declined by circa 20%, enabling more contracts to be let within SANRAL's available budget. Furthermore the PPI indicates that escalation will be 0 to very low for the foreseeable future, also releasing budget commitments that can be converted into additional projects.
- Capacity in the industry has grown significantly over the past few years, and current pricing levels appear unsustainable, with some recent tenders being under cost. There could be "casualties" in the future.
- A concern is that insufficient skills are available to address the excessive "demand spike" associated with the 2010 infrastructure.
- The challenge to Government is to provide sustainability to ensure that suitably resourced capacity can be invested in.

These points explain the state of flux in the industry as we head for the post World Cup era.

The geosynthetics industry is inextricably linked to these "barometers". (...continued)



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This raises another concerning development where the Competition Commission has recommended that four major oil companies involved in the supply of bitumen pay penalties for price fixing. The Southern African Bitumen Association (SABITA) as the representative body of the suppliers and other members is obviously involved. This recent probe into the bitumen suppliers (Business Report, Headline Story, Friday, 5 March, 2010) just brings the issue of price fixing and the current investigations Competition Commission closer to home.

As a representative body GIGSA must always be cognisant of its obligation to its members. It is imperative that GIGSA members adhere to the code of ethics and practice free and fair competition. "All members of the GIGSA have the obligation and responsibility to follow the aims of the Society and to be guided by a high standard of ethics, personal integrity and professional conduct".

There will always be an element of friction around when competitors are represented in a society like GIGSA but I have always been impressed with the decorum shown at committee meetings and functions by our supplier members, most of who are valued Benefactor members. The way they have pulled together for the good of the industry is commendable and was recently demonstrated by the very successful GeoAfrica conference.

I still remain positive for the future of our industry and we hope to keep our members more than content with a programme of activities to further the cause of geosynthetics in civil engineering.

Geosynthetic Greetings,  
**Garth James**  
 President

garth@kaytech.co.za



**Election of IGS Officers & Council Members 2010**

The IGS bylaws require that an election for President, Vice President and eight (8) council seats be organized in 2010. In September 2008, the IGS Council confirmed the election would be organized by electronic ballot in 2010.

The call for candidates was published in IGS News, Vol. 25 No 1, March 2009 and Vol. 25 No 2, July 2009. The call for candidates was made with the deadline for submission of candidacy set as 31 October 2009. A list of candidates including two (2) candidates for President, one (1) candidate for Vice President and twenty three (23) candidates for council was published in the IGS News, Vol. 25, No 3, November 2009.

Since at the date of closure of nominations there was only one candidate for Vice President, the sole candidate Russell Jones, has been declared elected by acclamation.

The following candidate, **Jorge Zornberg**, will become President of the IGS on May 26, 2010.

The following eight candidates will become IGS Council members, effective May 26, 2010.

- |                        |                             |
|------------------------|-----------------------------|
| <b>Sam Allen</b>       | <b>Eric Blond</b>           |
| <b>John Cowland</b>    | <b>Neil Dixon</b>           |
| <b>Peter Legg</b>      | <b>Jun Otani</b>            |
| <b>Elizabeth Peggs</b> | <b>Nathalie Touze-Foltz</b> |

**Welcome to our new GIGSA members**

- |                         |                              |
|-------------------------|------------------------------|
| Mr Jorge Martinho       | Maccaferri S.A (Pty) Ltd     |
| Mr Adriano Gilli        | Maccaferri S.A (Pty) Ltd     |
| Mr Edoardo Zannoni      | Maccaferri S.A (Pty) Ltd     |
| Mr Brendon Jewaskiewitz | Envitech Solutions (Pty) Ltd |
| Ms Belinda Mills        | Envitech Solutions (Pty) Ltd |
| Mr Ngula Kalili         | Reinforced Earth (Pty) Ltd   |
| Mr Vladimir Vadron      | Reinforced Earth (Pty) Ltd   |
| Mr Malcolm Currie       | Reinforced Earth (Pty) Ltd   |
| Mr Peter Dimaio         | Anchor Lining Systems        |
| Mrs Kara-Noel Eltze     | Du Pont Southern Africa      |
| Mr Stanley Whiting      | Rho-Tech                     |
| Mrs Samantha Manival    | Kaytech Engineered Fabrics   |
| Mrs Mari Marais         | Kaytech Engineered Fabrics   |
| Mr Vamil Ramdhani       | Kaytech Engineered Fabrics   |
| Mr Juan Geldenhuys      | Juan Geldenhuys              |
| Mr Thabo Nzo            | Knight Piesold               |



# 2009 GIGSA Calendar of Events

DATE	EVENT	VENUE
12 May 2010	GIGSA Meeting	9am Jones & Wagener - Rivonia
23-27 May 2010	9th Int Conference on Geosynthetics	Sofitel Jequitimar - Guaruja - Brazil
11 August 2010	GIGSA Meeting	9am PSV Holdings
4-8 October 2010	WasteCon 2010	Emperors Palace Convention Centre - Kempton Park
10 November 2010	GIGSA AGM	Awaiting confirmation 9am
18-21 June 2011	15 <sup>th</sup> African Regional Conference on Soil Mechanics and Geotechnical Engineering	Mozambique - Maputo

## GIGSA Committee News

### EDUCATION

Contact: Jabulile Msiza e-mail: [jabulile@jaws.co.za](mailto:jabulile@jaws.co.za)

A financial talk on the economic situation and future development in S.A by Nedbank's Economist, Dennis Dykes, will take place on 12<sup>th</sup> May 2010 at 12:30 at Jones & Wagener, Rivonia.

Sam Allen's CQA Seminar on Geosynthetics is provisionally booked for 6 & 7<sup>th</sup> September 2010 in Jhb as 1 1/2 day class on geomembranes, geogrids and geotextiles and a 1 day site visit.

### GIGSA ANNUAL REPORT

GIGSA's annual report to the IGS was

submitted on 31<sup>st</sup> January 2010. It is available to all GIGSA members on request .

### IGS STUDENT AWARDS

Nominations for the IGS Student award will only apply in the year of the IGS Regional conferences. Besides the \$1,000 IGS prize, there is the Rand equivalent of \$1,000 sponsored by GIGSA to assist the winner in attending an IGS regional conference on Geosynthetics. The next regional conferences are in 2011: GeoFrontiers in March 2011 and EuroGeo 5 in September 2011.

# "WANTED"

## Western Cape GIGSA Representative

If you are interested and would like to know more about what the portfolio involves, please contact Peter Hardie at [peterh@englining.co.za](mailto:peterh@englining.co.za) or on 082 448 3324.



**Shakira Sattar**  
GIGSA Newsletter Editor

Send your comments and suggestions for the GIGSA newsletter to the Editor at: [shakira@sattarconsulting.co.za](mailto:shakira@sattarconsulting.co.za)



# Geosynthetic Soil Reinforcement —Polymeric geocomposites for hydraulic retaining walls

By: Joseph Meadows, e-mail: [Joseph.meadows@maccaferri.co.za](mailto:Joseph.meadows@maccaferri.co.za)

The concept of using rigid materials to build structures is centuries old, tried and tested, conservative, substantiated, researched and scientific. These are all exact words that comfort and satisfy the designer.

But a world without composite and modified materials is inconceivable, as is the reluctance to apply environmentally appropriate solutions. Consequently designers and their clients have an obligation to use the rigid/ composite/modified and environmentally appropriate materials to their and future generations best advantage.

Soil reinforcement solutions for structures, are numerous and oblige the designer and client to exercise the same rigorous examination of the quality, performance and limits of application. One such material that has suffered the examination and has generated a comparatively short history of successful application is the materials made from polymeric materials.

PARAWEB™ consists of discrete bundles of closely packed high strength synthetic fibres, lying parallel to each other, encased in a tough and durable polymeric sheath which takes the form of a flat web. It can be used as a soil reinforcement in a variety of different combinations. Paraweb has a strength range of 30-100 kN in single strip and the Paralink-grid has a range from 100 - 1350 kN. (See [www.linearcomposites.com](http://www.linearcomposites.com))

Shown below are two examples of what might be described as composite structures. With the use of steel and concrete forming a discrete panel, combined with layers of Polymeric reinforcement and soil and filter fabric as the moisture and soil migration barrier, these structures serving, within hydraulic conditions were built and perform as designed.

False bridge abutment at Diep Rivier which maintained its integrity during a flood while under construction.



Photo by Andre De Villiers



Photo by Andre De Villiers



Photo by Joseph Meadows

Retaining Wall at Kragga Kamma in Port Elizabeth which sustained the normal rainfall river flow conditions while under construction. The wall has sufficient scour protection for normal flow and is able to cope with 1 in 100 year flooding.



Photo by Gustin Esau



Photo by Moragh Dann



Photo by Moragh Dann



# Defending Durban's beaches

By: Samantha Manival, e-mail: [samantha@kaytech.co.za](mailto:samantha@kaytech.co.za)

## Introduction

The stunning Durban promenade stretches from the Port's northern breakwater to the mouth of the Umgeni River. It provides kilometres of uninterrupted, breathtaking sea views, restaurants and many other amenities. Over the past few years the Durban coastline was affected by severe storms. The storms destabilized the coast and caused significant coastal erosion and unprecedented damage to coastal property. Consequently coastal erosion will continue until a new equilibrium can be established.

## Project Description

eThekweni Municipality had to come up with a solution to protect the promenade, in the event of a similar storm as experienced in March 2007, where the beach was depleted and a second line of defence needed.

The Durban Port Authority frequently dredges the harbour mouth and together with eThekweni, uses this sand to replenish the beaches. However the sand that is pumped onto the beach is eventually lost to the sea as the currents move the material up along the coast and back off shore. A second line of defence was to create a seawall using Kaytech's EnviroRock™ Geocontainers®. These bags provide a temporary holding measure until such time as the sand is dredged and pumped back onto the beach and the natural beach profile re-established.

## Design Methodology

Marco Pauselli of GAP Consulting was appointed to design the protection for the promenade. The protection was based on a two-fold approach: ongoing beach nourishment and protection by large sand bags.

Kaytech's geocontainers have proved integral in work on repairing the beaches after the March 2007 storms in KZN. In addition, they have proved their effectiveness in two major groynes constructed to help restore Langebaan's beaches after severe storm damage. These measures have been successful further afield in Australia and in many other parts of the world.

A further benefit is that these solutions fit hand in glove with the Department of Environmental Affairs' requirement for "soft solutions" wherever possible. The design entailed the use of 3.5 ton to 4 ton geocontainers. The wall was constructed using a double layer of these containers (i.e. one bag behind the other) for the full height of the protection at a slope of 1:1. In addition, provision was made for a flexible front toe that protrudes out from the main structure, commonly referred to as a "Dutch toe" or "self healing toe" for scour mitigation.

The financial constraints of the client had to be considered, therefore, the area immediately in front and some distance either side of buildings was protected with a double layer of geocontainers whilst the remainder of the promenade was protected with a single layer and a two meter high RockGrid® PC 100/100 geogrid wrap around wall.

## Products Used

The geogrid referred to is a high tensile strength composite polyester grid combined with a lightweight, needlepunched, nonwoven, polyester geotextile that provides excellent reinforcing characteristics and ensures minimum deformation in the structure. As a composite reinforcing grid, the geotextile component provides sufficient drainage capacity within its plane, i.e. transmissivity, enabling it to reduce pore pressure build-up in the reinforced soil, thereby improving the internal shear resistance and overall stability of the structure.

EnviroRock® geocontainers are specifically designed for the projects where they are used, and manufactured from a robust, durable nonwoven staple-fibre polypropylene material which is UV stabilized and abrasion resistant making it well suited to coastal erosion control applications. The systems, designed with input from Kaytech, are effective, and an aesthetic solution that assimilates well into the environment.

## Conclusion

Research presented in recently published conference papers has shown that correctly-designed measures of this type are stable against wave attack. The research conducted by Kaytech and its technology partners has resulted in an excellent suite of geocontainer solutions that have proven to be effective in beach erosion protection. The use of these materials has protected the integrity and beauty of our shoreline, and the stunning beaches along the Durban Promenade are shining examples. (...continued)





Photo 1: Aerial View of the Durban Promenade



Photo 2: Single Layer of EnviroRock™ with RockGrid® PC wrap around wall



Photo 3: Double layer EnviroRock™ Wall





**The GIGSA newsletter publishes themed content on a quarterly basis. Make sure that you get your submissions in before the deadlines indicated below:**

**Deadlines for Submissions**

Publication Date	Theme	Submission Deadline
May 2010	Hydraulic and Coastal Applications	Current Edition
June 2010	Testing, Analysis, Design & Quality	1 June
September 2010	Reinforcement & Stabilisation	1 September
December 2010	Environmental Protection including Waste Containment	1 November

*\*If you require theme descriptions, please contact the Editor*



**9<sup>th</sup> International Conference on Geosynthetics**

International Conference on Geosynthetics  
Brazil, 23 - 27<sup>th</sup> May 2010

**Registration**

Register now through [www.9icg-brazil2010.info](http://www.9icg-brazil2010.info)


Conference registration can be completed through the event website up to **7 May 2010**, or directly at the office desk from **23 to 27 May 2010**.

Two modalities of conference registration are available: Full Registration or Day Registration.

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