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We live in a world generally ruled by words on paper. Protocols, agreements, contracts, codes of conduct, codes of ethics – reams and reams of paper to be filled in, signed, and abided by.

But do we really live by the rule? Do we really stop to read the fine print? Everyday experience proves that the answer to this question is unfortunately ‘most likely not’. It would seem as if the intrinsic value systems according to which we are brought up nowadays have not only been diluted, but have regrettably also disappeared in many ways.

The world is certainly changing, yes, and value systems will of course adapt accordingly, but core ethics are not negotiable.

In the light of this, and in an attempt to re-focus ourselves regarding what our profession stands for, a new SAICE Code of Ethics was developed recently and has now been incorporated into our bylaws.

In this magazine a copy of the said new code is enclosed. We are presenting it in an attractive format that will hopefully encourage our members to:
- Read it
- Display it in their offices
- Tell non-members about it
- Inform communities, clients and employers that this is what they believe in and how they do business
- Include suitable clauses in contracts and letters of employment/appointment that clearly indicate expected behaviour in the world of civil engineering
- Mentor young people to inculcate a professional approach to their work

Our SAICE Code of Ethics is truly a matter of the mind and of the heart!

Over the next few months we intend to dedicate some energy and space to assist and encourage our members to LIVE our Code of Ethics. We also invite members to contribute anecdotes, stories and case studies of the good, the bad and the ugly, so that all of us can learn and move forward with this important aspect of our lives and of our profession.
TRAINING GROUND FOR MANAGEMENT

The foundation for John’s strategic abilities was laid at a youthful age in the military. The organisation and structure of the military, especially the emphasis on strategic detail, made it the ideal training ground for management. I was conscripted to the army straight after school in 1969, where I suffered basic training like most, and then went on to become unit quartermaster at the age of 21. As you move up the officer ranks you get valuable training in strategic skills. I think my experience as a young man, having to plan the logistics that went with moving men around in the field and keeping supplies flowing, gave me an excellent footing on which to expand later in life,’ he says.

Since commando service was a part-time activity, it ran parallel to his university career. He obtained his BSc degree in civil engineering at Natal University in 1972 and immediately went on to do a master’s under Professor Ken Knight. Like so many civil engineering students of that era, John was enormously inspired by Knight. ‘His academic approach to engineering motivated me to understand cause and effect relationships. I became acutely aware of the importance of understanding and describing the ways systems behaved, especially engineering systems, in terms of being able to solve problems,’ he says.

During his postgraduate years he also lectured in soil mechanics and foundation engineering. ‘I loved teaching, but it’s hard to describe exactly what gave me the immense satisfaction I derived from it. It was probably because I was able to impart knowledge to others and see young minds – though I wasn’t much older than they were – absorb it and become knowledgeable. It was also satisfying to see some of the students that I had taught become prominent figures in geotechnical engineering later on.’

To get a grasp of the contracting business, John joined Frankipile in 1975. ‘I was thrown in at the deep end of the rough and tough of engineering working as a site engineer on the Richards Bay iron and titanium project. At the time it was probably one of the biggest piling contracts in the country – more that 1,500 piles went into that site. Fortunately I was able to catch on fairly quickly to the needs to optimise the way in which work was done on a construction site in order to minimise costs. So I learnt a very simple lesson, but nevertheless the most important lesson in construction, namely how to plan ahead and do things efficiently in order to make the contract profitable and come on stream on time.’

Another project that he remembers well was the Umlaas canal bridge adjacent to Durban airport. ‘It was the first project in South Africa where we used reverse circulation drilling under slurry to form 1,2 m diameter piles down to depths of 40 m. It

One will find no special mention of achievement or award in John Wates’ professional résumé. ‘I find it difficult to talk about myself,’ he says. ‘I’m too restrained a person.’ But talk to present and former colleagues and it becomes evident that he is regarded as an expert strategist and an authority on waste management and environmental geotechnics, having been responsible for the design of numerous mine tailings storage facilities and industrial and domestic waste disposal sites. Lorraine Fourie spoke to John at the offices of Golder Associates Africa where he is business development director and is simultaneously keeping a sharp eye on the running of specialist waste, tailings and environmental projects
was a very unusual technique that had been introduced from Europe and Frankipile were the first to apply it,' he recalls.

**STEPPING INTO THE VOID**

John then took what he considers an immensely step into the void. In 1977 he enrolled for full-time MBA study at the University of Cape Town, ‘much against the advice of most of the people I knew, who thought I should stick to my career. In those years it was not so common a qualification as it is nowadays. It was a huge sacrifice because I had to stop working and depend on my wife to support me.’

John, of mixed Welsh, English and Irish stock from the Eastern Cape, had married his university sweetheart, Margo Braak from Pretoria, who traces her roots back to the early Dutch settlers. ‘She had completed her BCom and we got married in 1974 while I was still finishing my master’s. Fortunately we didn’t have any children yet when we went down to Cape Town, and she managed to get a job and helped me get through a very difficult year.’

‘After that I probably took one of the greatest decisions of my life. Of our class of about 72 approximately a third were engineers; and I was the only one to go back into engineering. I decided to combine the little bit of business training I’d got through the MBA with the background that I had through my MSc studies.’ He never looked back and considers it one of the best career decisions he has made. ‘I love engineering, there’s never a dull moment. It’s a creative and challenging profession and I’m very sad to see how very few young people take it up these days.’

John and Margo left Cape Town when he took up a position with Jones & Wagener Consulting Engineers in Johannesburg in 1978. ‘They had established that I had an MBA qualification and contacted me for a job in mine tailings engineering, which was a rare thing in those days. There weren’t very many tailings engineers around. In spite of being a geotechnical engineer, I had never heard of tailings, but I learnt quickly under the guidance of Fritz Wagener, who was a great mentor and taught me how to think about engineering problem solving. Within a couple of months I had designed my first tailings dam at Vaal Reefs gold mine. That was a great challenge because it happened while Fritz was overseas and I had to do it without his help.’

Recently John has had the opportunity to assess the work he did as a novice tailings engineer. ‘That very facility at Vaal Reefs has been decommissioned and is now being reprocessed, and I’ve had the opportunity to look at some of the structures we put in at the time and haven’t seen for so many years. I’m not physically involved, because it isn’t an engineering project, but Anglo American is still one of my clients and I get feedback on the reclamation. It’s so interesting to see the old structures that we built being exposed, and learn how they have performed. That’s another thing that makes engineering fascinating – to be involved over the full life cycle of a project and see whether your design actually stood up to the test, performing according to the way you thought it should have,’ he marvels.

Fritz Wagener remembers John as a person who always gave his best to his clients. During his seven years with them, John handled both tailings and geotechnical projects. ‘These two go together and it’s fascinating – to be involved over the full life cycle of a project and see whether your design actually stood up to the test, performing according to the way you thought it should have,’ he marvels.

**BUILDING A BUSINESS**

‘Well, I simply had to see whether I could branch out on my own and build a business from scratch. It was all about wanting to find out whether there was something else out there, some other challenge and excitement.’ This proved to be true. In 1986 John formed Wates and Wagner (with Johan Wagner), which in 1991 merged with Meiring and Barnard to become Wates, Meiring and Barnard, with John as managing director. ‘We became quite a substantial consulting practice, with a staff complement that has now grown to about 170 people, specialising in environmental sciences, geotechnical engineering, tailings and wastewater.

Reflecting on those early days, John says it’s difficult to build an organisation. ‘Its success lies in attracting the right people to consulting, because there are not so many of them around – people who are highly specialised, committed and good at their work. So I cottoned on to the idea of alliencing.’

In establishing work relationships with several other companies John found that they could deliver a better and broader service to clients. But these alliances had a second spin-off. ‘In time, many of the alliance partners found that they enjoyed working with like-minded people, so much so that they joined our organisation and helped to grow it. This is a technique that I reckon we have just about perfected.’

Many people try their hand at it, but to get it right you have to develop what I call an
abundance mentality. If you're going to work closely with another company you must be prepared to give something to get something back. It's the giving away that's difficult and I think that's why a lot of people fail. If an abundance mentality does not exist, with time one of the alliance partners tends to encroach on the territory of the other and in so doing violates the understanding of no competition. You've got to be strict about that; you've got to manage it internally. Everybody in the company must understand what the rules of the game are to make it work. We have been good at it because our communication around it has been good.'

VISIONARY AND STRATEGIST

A major accomplishment for John was the deal brokered with the international Golder Associates Group in 2002 to purchase the network of alliances he had helped build over the years, operating under the Wates, Meiring and Barnard Trust.

In consolidating the transaction, a sister company, Zitholele Consulting, was established to give effect to black economic empowerment. Zitholele was already part of our "family" through Solly Manyaka of major alliance partner Manyaka Greyling Meiring. Apart from serving the purpose of empowerment through enterprise formation, Zitholele is also a vehicle through which we can help grow and mentor young, up-and-coming black professionals,' John explains.

He regards it as one of the highlights of his life to have formed long and lasting relationships with key people who have worked in his organisation to this day and whom he can call his close colleagues and friends.

Such a friend and colleague of more than 15 years is Fred Sutherland, a managing director at Golder, who says John has been highly instrumental in building the company to where it is today. 'One of John's strongest points is that he has a very clear vision of where the industry is going and how a company such as ours should position itself. For instance, he saw the environmental market opening up before many others did, so he positioned us well to take advantage of it at an early stage. He's always been the strategist and has guided us as an entity.'

John himself admits to being peeved by lack of commitment. 'It gets to me if people don't grasp the opportunities that are given to them. But then, I believe in management by gentle persuasion and by setting an example in perseverance. I never give up. In fact, I have in my office a saying that I subscribe to: I CAN, which is derived from I Commit, Assume responsibility and Never give up.'

Being responsible for strategic and business development at Golder Africa, John is currently exploring prospects in Africa. 'We do business with most countries in Africa, specifically the major mining companies operating there. We have offices in all of the continents, which provide an opportunity for our people to broaden their experience. I am personally quite involved in South America, which I find particularly stimulating.'

On that continent he is applying his knowledge of tailings disposal to big copper projects in Chile. 'I've developed two areas of specialisation that are my particular passion,' he says. 'One is paste technology, which involves drying out mine tailings by filtering or thickening it to the consistency of toothpaste before pumping it under high pressure to disposal sites. Apart from saving water, which is a huge environmental benefit, the waste is rendered less threatening to the groundwater environment since seepage is either eliminated or much reduced. I was fortunate to have gained my experience through exposure to one of the first full-scale applications of paste in the world for gold tailings in Tanzania, where I've been the professional engineer of record for the mining company ever since.'

His other passion is his vision on sustainable development and how it's best applied through engineering projects. As chairman of the Golder Associates Sustainability Council he's been instrumental in developing an approach for the group that is applied worldwide through their offices in 47 countries. 'I have a team from around the world who work on understanding the concept of sustainable development and turning it into a practical notion that can be implemented throughout the organisation. We already offer sustainability services to many of our clients, in particular in the mining industry. So the techniques that we've developed are now being applied by a number of mining companies in the world,' he notes with satisfaction.

Within SAICE John was a founding member of the Environmental Division in the early 1990s and later also chairman and treasurer until he retired at the end of last year. 'I had been there for so long that I thought I must give some other people a chance,' he laughs. He'd also been with the Geotechnical Division for ten years, two of which were served as chairman and eight as editor of the division magazine Ground Profile. As a Fellow he remains involved in the activities of the Institution. 'I'm busy organising the fourth of a series of conferences on mining and industrial waste management for next year.' John believes that the Institution's role is very important for civil engineers and technicians. 'I would like to see SAICE strengthen its learned society role, because I believe it to be its most important purpose,' he says.
PASTE TECHNOLOGY IS now well accepted as both a reliable and cost-effective backfill method and an attractive tailings management option for surface disposal. A paste conference was held for the first time in Europe (Ireland) in April 2006. This was the ninth seminar in the successful series that has already attracted hundreds of vendors, consultants and mine operators from Chile, Australia, Canada and South Africa.

The use of paste technology for surface disposal is an extension of thickened tailings disposal developed 30 years ago by Robinsky in Canada. When he first suggested the placement of tailings with little or no bleed water, the equipment for the preparation and transportation of it was not yet available to realise his innovative design. Improvements in the technology have gathered pace and a number of manufacturers now market ‘paste’ thickeners that have achieved reasonable success across a wide variety of mineral wastes.

Historically, the relatively large portion of liquid in a slurry waste has demanded that its containment and recovery form the core of the design philosophy of almost every major mineral processing operation (ie, tailings impoundment). The advantages of removing water from a tailings disposal facility are many, not least the reduced environmental risk associated with the lack of transport medium to carry contaminants from the site in the event of a failure. For many years, it has been recognised that dewatering the waste stream brought with it many inherent advantages. These include:

- Increased recovery of expensive process minerals
- Increase in siting and operational flexibility of storage facilities, and
- Significant water conservation potential

In this article we offer an overview of the latest trends in paste technology as presented at the PASTE06 conference in Ireland.

PASTE06 CONFERENCE
Over 30 technical presentations were presented during the three-day seminar, all published in a hard-backed volume of proceedings. A plenary session from Euromines opened the conference and discussed the impact of increased regulatory scrutiny from an industry perspective. Keynote speakers included: Ted Lord of Syncrude, who talked about surface paste disposal experience in Canada; Dave Landriault of Golder Paste Technology.

The latest trends in paste technology
An overview

Text Jaco Snyman
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Michelle Theron
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Limited (Canada), who talked of his 25 year battle to have paste backfill accepted as a legitimate and cost-effective backfill method (he won, by the way!); and Peter Scales from the University of Melbourne, who talked about the thickening process.

The remaining papers presented at PASTE06 conference were grouped into four main subjects that covered the most important areas of paste technology. These consisted of:

- Thickening and rheology
- Transport
- Paste backfill
- Surface disposal

Various case studies were presented where high density thickened tailings were employed for surface disposal or are in an advanced stage of implementing the technology. It was demonstrated that the technology could be applied equally successful to new and old operations. At a number of operations, particularly in Canada, existing conventional tailings management operations have been successfully converted to high density thickened tailings operations. It also became apparent that surface disposal of paste is a viable alternative in hostile circumstances. Improvements in the understanding of post-deposition behaviour of thickened tailings on surface were made by means of extensive monitoring and testing that is occurring at some sites. The risks posed by potential liquefaction and instability by surface deposition of paste, were highlighted. Experienced gained over the past decade enable designers to recognise these risks at an early stage and design accordingly.

Cover systems constructed on potentially acid forming tailings facilities or waste rock dumps should act as a barrier to oxygen and water ingress to prevent acid mine drainage. The possibility of using a mixture of waste rock, tailings and slag to construct a high-quality barrier cover was investigated. Laboratory tests carried out on the material indicated that it could be a viable option. The preliminary results of large-scale lysimeters were positive and monitoring will continue for an additional seven years.

The successful application of paste technology as an underground backfill was also reported. Application of it as backfill material reduced number of seismic activities and prolonged the life of mine as the number of ore pillars is reduced. It should be noted that preventative maintenance is required to prevent plugs in boreholes.

Advances in thickener technology were discussed. Interesting developments in the ability to pump higher and higher yield stress materials using centrifugal pumps were reported.

Other attractions at the seminar included a short course on rheology and the surface disposal of paste and thickened tailings. A couple of interesting site visits was arranged that demonstrated both paste backfill and the surface disposal of paste. Finally, the organisers have to be congratulated on a fantastic social programme that allowed the conference attendees the opportunity to experience true Irish sounds and hospitality.

CLOSING REMARKS

Papers published and presented at PASTE06 indicated that paste technology could be successfully applied. Much progress has been made in the development and understanding of the technology.

NOTE

1 Paste can be defined as a single-phase combination of water and solids that has negligible excess water when left to rest.
Water is a scarce resource in South Africa, and also in Cape Town. For more than a century there have been periods of water restrictions followed by the development of new schemes to expand the city’s water supply, usually through the building of a dam. Until 1995 the focus was primarily on managing the supply of water with new schemes being developed to meet the growth in water demand.

Cape Town is a growing city of approximately 3.2 million people and it is expected that in the coming years it will continue to grow and to consume more water. Not only because we will have more people, but because the South African economy is also growing. Research that takes into account demographic shifts, including the impact of HIV/AIDS and migration of people to Cape Town, shows that demand is set to grow.

The City of Cape Town’s approach to water demand management is based on three broad principles, namely that water is a strategic, precious and scarce resource; that there should be no wastage of water; and that all water used should be measured and accounted for. The principle of measurement is critical to ensure that water is managed effectively as a strategic, precious and scarce resource.

The City of Cape Town recognises that if its inhabitants are to make use of their water resources in a sustainable manner, they will have to carefully manage growth in water demand and look at ways in which they can reduce demand, primarily by changing the behaviour of consumers of water and implementing projects that utilise an alternative water resource.

Some alternative water resources are the desalination of sea water, exploring deep aquifers, or the reuse of treated waste water – sewerage – to name but a few.

Two thirds of the city’s water consumption ends up in more than twenty treatment works across the city, from where the final effluent is discharged back into the environment. The opportunity of reusing the treated effluent has not yet been fully developed. The majority of golf courses in the city are using treated effluent for irrigation purposes. A limited number of industries are using treated effluent together with the irrigation of parks and sports fields. The total existing average daily summer reuse is 30 Mℓ per day (7% of the total waste water treated).

More than a year ago the city undertook a project to investigate the refurbishment and capacity investigations of the treated effluent systems at the various waste water treatment works. The project has been initiated with the purpose to increase availability of effluent to the present consumers and also encourage others to use it as alternative supply to meet their water needs.

Although the philosophy is nothing new and some schemes has existed for more than 40 years, it was never a formal council service and therefore never received a high priority. The investigation established that
the potential of treated effluent use could be expanded to 170 Mℓ per day (40% of the total summer wastewater treated per day) at an average total supply cost of below R2/kℓ. This equals 30% of the annual supply from the new Berg River Dam project.

The first extension was completed at the Bellville waste water treatment works and increased the available treated effluent by 4 Mℓ per day to 7,0 Mℓ per day. In the 2004/05 financial year a project was implemented which increased the reuse of effluent at the Parow and Kraaifontein wastewater treatment works from 1,2 Mℓ per day to 3,7 Mℓ per day. All the effluent used from the above works replaced potable drinking water.

**POTSDAM TREATED EFFLUENT SUPPLY AND STORAGE SCHEME**

A contract for the upgrading of the treated effluent supply from Potsdam was awarded in June 2005. The project is nearing completion and includes the following:

- A new intake chamber with floating skimmer
- Two new pump stations capable of ultimately pumping 1,600 kℓ per hour (40 Mℓ per day) to the storage reservoir
- A filtration plant removing all suspended solids up to 120 µm
- A 600 mm diameter bulk supply pipe
- A 40 Mℓ storage reservoir constructed of a earth embankment with HDPE liner and FPP floating cover

**Users and demand**

The project will increase the treated effluent used from Potsdam by 17 Mℓ per day up to 24 Mℓ per day. All 17 Mℓ per day will be replacing potable fresh water. A further 20 Mℓ per day will be made available for agricultural use.

The scheme also provides the bulk infrastructure for future extensions to other industrial users and residential developments in the area. A new development on the farm De Grendel will also utilise the treated effluent and install a dual water reticulation network for domestic irrigation.

All the above projects have orange colour-coded networks to ensure zero contamination risk and prevention of contamination by controlled splitter chamber connections and regular inspections (multi-barrier, multi-precaution approach). The City of Cape Town (Water Services) through a tender process employed BVi Consulting Engineers WC (Pty) Ltd and a Joint Venture between Peak Projects and PDR Construction for the civil construction and Tricom Africa for the mechanical and electrical installation respectively.

**THE FUTURE**

The feasibilities for further expansion and re-use schemes are being investigated at all other wastewater treatment works within the city. It is clear that the scope for further developments is promising.

<table>
<thead>
<tr>
<th>Some of the existing users</th>
<th>New users on scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milnerton Golf Course</td>
<td>Caltex Refinery</td>
</tr>
<tr>
<td>Theo Marais Sportsfields</td>
<td>Khynoch</td>
</tr>
<tr>
<td>Sappi Paper</td>
<td>Agricultural use</td>
</tr>
<tr>
<td>Schools in Milnerton and Table View</td>
<td>Public open spaces and Table View beachfront dunes</td>
</tr>
</tbody>
</table>
Remediation of water ingress to old gold workings linked to active mines

GROOTVLEI Proprietary Mines (Pty) Ltd is the last remaining operational gold mine in the East Rand Basin of the Witwatersrand gold fields. Mining in the East Rand Basin has been ongoing over the last 80 years, and the basin is now largely mined out.

The mine is located in Gauteng, some 25 km east of Johannesburg. Grootvlei Mine currently dewateres about 75 Mℓ/day from its workings in order to maintain access to underground reserves, with the pump station located at a depth of 740 m below surface. The water is treated to remove primarily iron and is then discharged into the Blesbokspruit, which flows over the East Rand Basin. This discharge is in line with the conditions of the existing water use license issued by the Department of Water Affairs and Forestry (DWAF).

Some of the water pumped from underground is believed to originate from surface water. A high proportion of the flow in the Blesbokspruit is the result of industrial discharges, primarily from four sewage treatment plants and a paper mill. An investigation was carried out to identify methods to reduce the volumes of water required to be pumped from underground, with the first phase of the recommended remediation works being carried out.

INGRESS INVESTIGATION

Numerous previous studies on the ingress of the water indicated that a significant proportion originated from surface water. In addition, a large proportion of the flow in the Blesbokspruit comprises industrial flows (some 205 Mℓ/day, compared with 68 Mℓ/day natural flows). It is therefore not unreasonable to assume that reducing the flow in the Blesbokspruit would significantly reduce the recharge to the East Rand Basin.

Based on this, a previous investigation suggested the construction of a canal, 35 km long, to remove the industrial flows from the river. The ingress volumes show strong seasonality, with summer inflow rates being almost double those in winter. The industrial flows, on the other hand, are largely constant. Field studies showed the presence of significant clay alluvium along the Blesbokspruit, which would be expected to limit recharge volumes from surface.
In addition, mining personnel indicated that inflows appear to be significantly higher in areas of shallow undermining than deeper areas. Removal of the industrial flows would also not reduce ponding over much of the catchment, since the ponding is attributed to areas where culverts and road structures have resulted in silting, as illustrated in figures 1 and 2.

This was seen as a major drawback of the canal proposal, in that after construction, significant problem areas would still remain in terms of surface recharge.

It was therefore decided to identify all recharge mechanisms and to quantify the contribution of each mechanism to the surface water ingress. From this it would be possible to identify, evaluate and cost a range of remedial options for reducing the volume of surface water recharge.

**Investigational work**

A conceptual groundwater model was required to gain an understanding of the primary mechanisms of ingress into the basin. The following assessments were carried out to enable the development of a model:

- **Basin geology** The geology of the basin and its influence on recharge to the workings was considered.
- **Seasonality of Ingress** Historical pumping, water level and rainfall data were obtained. The water level data were used to calculate storage volumes underground. Ingress volumes could then be calculated and the seasonality determined.
- **Photo survey** An aerial survey of the catchment was carried out over the length of the mining area to assess its status and the impact of newer developments such as roads, tailings dams and tailings reclamation activities.

- **Delineation of areas of shallow undermining** Observations by mining personnel indicated that any mining shallower than 300 m from surface is characterised by significantly increased groundwater inflows.
- **Alluvium survey** A hand auger survey was undertaken along the Blesbokspruit to assess the depth of alluvial clays. It was found that clays are present to depths of at least 1.5 m in most instances. In addition, there are extensive silt deposits of up to several metres depth at some culverts and bridges.
- **Flow measurements** Flow rates were measured underground at areas where inflows could be associated with shallow workings or a particular geological feature. Surface flow measurements were undertaken upstream and downstream of areas of potential ingress.
- **Isotope study** Measurement of nitrogen isotopes indicated that there is a link between the industrial discharge (primarily treated sewage water, thus high in nitrates) and the underground recharge.

**Conceptual modelling**

Ground water modelling usually implies analysis of groundwater flow volumes using two primary concepts, namely Darcy’s Law and the conservation of mass. Mathematical computations can then be undertaken to determine inflows or outflows within a particular environment.

Where this is not possible because of limited data, or a highly complex site, the problem can be simplified by considering broad areas or components for which a particular recharge or flow is assumed or determined from field data.

To a large degree, the second approach was followed. As with any
multi-parameter model, it is possible to simulate the observed results by assigning incorrect values to the various components. However, the conceptual model provides an indication of the likely contributions and the extent to which mitigation measures may be successful.

Each area of ingress was assessed, and the components of the groundwater balance are summarised in table 1.

**Main Reef outcrop where mining has extended to surface** Where the Main Reef outcrops on surface, surface and shallow mining has caused subsidence along the outcrop area (figure 3). Two main ingress mechanisms are associated with this feature – the first is via direct rainfall along the exposed outcrop, and the second mechanism occurs when surface outcrop areas intersect stream beds.

**Sub-outcrop where shallow undermining has taken place** The ingress to areas of mining shallower than 300 m was quantified using accessible areas where flows could be measured, and extrapolated to the remaining shallow areas.

**Structural features** Structural features tend to be the main conduit for recharge from the overlying dolomitic aquifer. One fault in particular, referred to by mine personnel as the ‘rain forest’, is situated below a dam (see figure 4). The flow along this fault has been measured and is estimated to contribute as much as 10 Mℓ/ day.

**Overlying dolomitic aquifer** Experience has shown that the base of the dolomites is generally very impermeable and inflow to the mine workings from the dolomitic aquifer is restricted to geological features linking the two. The inflow from the dolomites is, however, significant and is expected to be relatively constant, particularly where karstification has been accelerated in the exposed areas of dolomite around the Blesbokspruit.

**Modelling results**

The estimated recharge for each component is indicated in table 1. The model indicated that the primary sources of surface water

**Table 1 Groundwater recharge components**

<table>
<thead>
<tr>
<th>Recharge component</th>
<th>Average flow rate (Mℓ/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wet season</td>
</tr>
<tr>
<td>Catchment recharge into outcrop</td>
<td>42,00</td>
</tr>
<tr>
<td>Direct recharge via outcrop</td>
<td>2,53</td>
</tr>
<tr>
<td>Shallow undermining</td>
<td>24,29</td>
</tr>
<tr>
<td>Preferential recharge (geological structures)</td>
<td>10,38</td>
</tr>
<tr>
<td>Recharge via dolomitic aquifer</td>
<td>29,34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>108,54</strong></td>
</tr>
</tbody>
</table>
ingress are related to the outcrop and shallow undermining areas.

The modelling also calculated the ingress at West Pit, an area of shallow undermining, to be in the order of 12% of the average ingress from surface water. Should remedial works prevent all ingress at West Pit, the overall dewatering rate could be reduced by some 7%.

**Proposed remediation options**

Based on the outcome of the modelling, it was decided to focus the initial remediation measures on the outcrop areas and the areas of shallow undermining.

In the dry outcrop areas, the extent of faulting makes it difficult to plug the holings. However, much of this area is currently being re-mined opencast, and will be rehabilitated as part of the mining process.

There are a number of areas of shallow undermining adjacent to Grootvlei’s West Pit, an opencast pit next to the stream and wetland (figure 2). Underground mining in this area is extremely shallow, being only 7 m below surface in places, and significant underground seepage is experienced.

A large quantity of silt (mostly gold tailings) has been deposited upstream of a road culvert and appears to cover most of the footprint of the wetland. It was important to improve the drainage in this area to minimise the extent of ponding.

The strategy proposed for this area is to divert low flows around the wetland and to improve the drainage by opening up the downstream road and railway culverts, allowing the area to dry. This would be followed by removal of the tailings, and revegetation of the area. The rehabilitation of the West Pit area was therefore selected as the first phase of the remedial works.

**REMEDICATION AT WEST PIT**

The shallow mining adjacent to West Pit is covered by a wide wetland area that has been created by a combination of environmentally poor road and railway construction, flat slopes and tailings washing from old tailings dams into the stream.

**Scope of work**

Construction works involved the following (see figure 5):

- Construction of a weir across the wetland to direct the industrial flows and runoff up to the 1:5 year event into a low flow canal around the wetland
- The low flow canal is separated from the floodplain area by a berm and will direct these flows under the roadway via a new culvert
- The existing culvert will be opened up and the original stream will be reinstated, while the area of ponding will be allowed to dry out
- Once the area has drained, the exposed tailings will be removed
- The area will then be revegetated and maintained to prevent the growth of large stands of reeds
- Over the area with the highest risk of ingress, the low flow canal will be lined with concrete to minimise seepage

The end result is expected to be an open, grassed area which is shallow undermining, and this could reduce the required underground pumping rate by up to 7%. While the works will improve the flow past West Pit, the reduction in ponding is also partially dependent on the downstream areas being able to drain effectively. Regular maintenance on the downstream canal will however be required to keep it clear and maintain the flow.

**CONCLUSIONS**

The investigations indicated that a significant portion of the ingress to the Eastern Rand Basin originates from surface water. The main sources of this water appear to be ingress at the open holings and subsidence areas at the Main Reef outcrop, as well as from areas of shallow undermining.

The current rehabilitation will only address one area of shallow undermining, and this could reduce the required underground pumping rate by up to 7%. While the works will improve the flow past West Pit, the reduction in ponding is also partially dependent on the downstream areas being able to drain effectively. Regular maintenance on the downstream canal will however be required to keep it clear and maintain the flow.

**PROJECT TEAM**

Client: Grootvlei Mine, a subsidiary of Bema Gold SA
Consultant: Jones & Wagener (Pty) Ltd
Contractor: Trollope Mining Services (Pty) Ltd
UV-cured lining work offers solution to pipeline renovation at Farnham Station

THAMES WATER, the UK company responsible for sewer operations in London and the Thames Valley, needed to find a solution for a problematic drain located at Farnham railway station, Surrey. The drain in question, which ran beneath a rail crossing at the intersection of Waverley Lane and Station Hill near the Tilford Road junction, had repeatedly flooded, leading to major concerns for the company. After jetting clean the drain, a CCTV survey investigation revealed the cause of the flooding to be extensive root infiltration and a number of structural defects.

Owing to the town’s location in the southeast of England ‘commuter belt’, this makes it a very busy road during peak periods. Another difficulty was that the upstream manhole location was within the bounds of the level crossing serving the station at the Waverley Lane and Station Hill intersection. This required an interface with Network Rail to obtain access to facilitate the renovation work and manage flow control during the works. Works also had to be completed overnight so as not impact on the regular day-time services running through Farnham Station.

The complexities of the project resulted in a number of contracting companies approached by Thames Water declining the contract. However, DBI Environmental Services Ltd of Kemble, near Cirencester, Gloucestershire, confidently took up the challenge.

After careful consideration of the options available, it was decided that the drain should be lined using a UV-cured liner in order to stabilise its structural condition. The liner would also act as a root barrier to prevent future re-growth and subsequent new blockages.

LINING SOLUTION

In view of the circumstances of the site, DBI decided to line the drain using an ultraviolet light (UV) cured in place pipe (CIPP) as it had clear advantages over a hot-cured lining system.

The main advantages in relation to this particular project were:

- A greatly reduced site footprint compared to using hot cure lining technology, that is, no requirement for boilers, scaffold towers, circulating pumps or refrigerated trucks. From initial discussions with Network Rail, it was clear that a minimum amount of impact would be allowed on the level crossing. To erect a scaffold tower within the bounds of the level crossing would require a possession of the railway line, which would have taken several months planning with increased costs due to a large Network Rail presence.

- A greatly reduced curing time, estimated as being around 90 minutes for the UV cure process as opposed to around six hours for a hot cure liner. DBI was given only a six-hour window each night in which to carry out the works. Installation and curing would not have been achievable in this time using any of the available hot cure liners.

- There was no requirement for curing water and its associated disposal problems.

The liner used for the Farnham project was provided by SaerTEX multicom GmbH of Germany. Based on a glass-fibre material, the liner product utilises, and is impreg-
nated with, a photo-initiated polyester or vinylster resin. The liner is available for installations from 150 mm to 1 200 mm in diameter, with wall thicknesses from 3 mm to 12 mm, depending on structural requirements.

Once the liner is in place in the host pipeline, the resin is cured using a UV light train, which is passed through the inflated liner at a set speed. The speed of the light train is dependent on the liner diameter and the wall thickness used on any particular installation, but is normally between 0.58 minutes/metre (or 35 seconds/metre) and 1.5 minutes/metre. The light train for the project in Farnham was provided by specialist equipment manufacturer ProKasro GmbH of Germany.

DBI was able to procure both the liner product and the UV light source through the Saertex and ProKasro UK distribution agent CJ Kelly Associates Ltd. John Kelly of CJ Kelly worked closely with DBI and its installation crew throughout the planning and implementation phases of the work to ensure both the liner and the curing equipment were readily available as and when required given the tight schedules associated with the project.

As part of the installation process, the invert of the host pipe is pre-lined with a ‘glide foil’. This is designed to help the liner material winch smoothly into the host pipe during the initial installation stages.

INSTALLATION PROCESS
A typical installation process involves the following steps:
- Isolating the section of pipe in need of repair and de-watering it.
- High pressure jetting/cleaning to remove...
To solve the problem of the cables running from the cutting and lining rigs during the works, a system of pulleys was devised to ensure that they would run under the level crossing gates even if they were shut.

The Farnham drain before lining with root intrusions and pipe defects and after lining with all blockages removed and laterals reopened.

Debris and dirt that might affect the lining process

- CCTV inspection to establish fully any need for remedial intrusion removal such as roots or lateral pipe sections and to establish lateral positions for reopening later.
- Insertion of the ‘glide foil’ into the pipe invert to ease the liner installation.
- Winching the impregnated liner into the host pipe over the length to be lined.
- Insertion of the UV light train into the liner, sealing of the ends and inflation against the host pipe wall.
- Initiating the curing process, passing the light train through the length of the liner.
- Once curing is complete and the liner has cooled, opening of the ends of the liner to remove the light train and winch cables.
- Re-opening of laterals to complete the installation.

**PLANNING FOR FARNHAM**

DBi approached Network Rail to discuss and agree working arrangements on the level crossing. Subject to approval of site specific risk assessments and method statements, Network Rail stipulated a number of conditions within which the works had to be carried out:

- An appointed crossing guard was to be in attendance at all times, who would determine when DBi could work.
- No operatives or plant were permitted within the level crossing during train movements.
- No scheduled train movements were anticipated between 11:45 pm and 05:45 am, however this did not account for the movement of engineering trains, etc. DBi was therefore only permitted to place plant on the crossing for a brief period of time under the supervision of the crossing guard.

This meant that flow control would have to be achieved using tankers and that all lining plant had to be located outside of the level crossing area. Traffic management also had to take into account the location of the level crossing.

To solve the problem of the cables running from the cutting and lining rigs during the works, a system of pulleys was devised to ensure that they would run under the level crossing gates even if they were shut. The work was programmed to be carried out over three consecutive nights. From the site survey it was estimated that the lateral connections were of sufficient length that they could remain blocked off for up to 24 hours without affecting the properties that they served. To make sure local people were kept up to date and provided with information about the work, a leaflet drop was made.

**OPERATIONAL INSTALLATION**

The programme of works was completed over three nights.

**Night 1**

In the six hours available, all pre-installation preparation work was carried out. The drain was jetted from the downstream manhole and a CCTV survey carried out. The robotic rig was then positioned and utilised to remove any remaining roots, cut back the intruding lateral connections and smooth out any displaced joints. The position of the lateral connections was then plotted and recorded for reference during the re-opening operation. All preparation work was completed within the allocated time.

**Night 2**

The drain was jetted from the downstream manhole to ensure it was clean to install the liner. A final pre-lining CCTV survey was also carried out to ensure the drain was ready to line. The guide rollers were then installed and the glide foil pulled into position. The resin impregnated liner was then pulled into the drain with a winch and the downstream packer and end cap fitted along with the draw cord for the light train. The liner was then partially inflated using compressed air from an inlet in the packer. This allowed the light train to be inserted.

The liner ends were sealed with packers. The liner was then fully inflated to its correct pressure to ensure a close fit to the host pipe inner wall and the UV light train was pulled into position for the start of curing. The UV lights were switched on and curing commenced with continuous monitoring.

The curing process required the UV light train to be pulled through the resin impregnated liner at a steady rate of advance to ensure that the resins cured evenly and effectively. With the liner used at Farnham, comprising a 6 mm wall thickness Polyester UV resin impregnated material, the advance rate required for the light train was calculated at 56 seconds/metre.

Once curing was complete, the light train was turned off and allowed to cool inside the lined drain. When the monitoring sensors showed that the liner had cooled sufficiently, the packers were removed. The light train followed along with all other ancillary items. Again all work was completed within the allocated time.

**Night 3**

The robotic rig was positioned and all lateral connections re-opened. The ends of the liner were trimmed and a final flush and CCTV inspection were carried out. The duration of this work was just four hours.

**CLOSING REMARKS**

In relation to the Farnham work, Dr Steve Ovington, business development director for DBi, said: ‘This project has been a success on several fronts, not least the management of various stakeholder expectations. The asset owner, Thames Water, has been able to rehabilitate a drain which has given repeated problems. Network Rail, the owner of land and assets within which the drain is located, has incurred no damage to property and a minimum of disruption to its services. Domestic householders connected to the drain have experienced no interruption to their normal supply. All in all, the project has been well planned, managed and executed and DBi is proud of the efforts of our delivery team.’
Together with global stakeholders such as Eurobitume, EPA, the Asphalt Institute and NAPA, Sabita co-sponsored an international symposium held in Dresden in June this year, when expert scientists presented peer-reviewed papers on, inter alia, epidemiological and inhalation studies of bitumen fumes. Co-organised by the American Conference of Government Industrial Hygienists (ACGIH) and the Deutsche Forschungsgemeinschaft (DFG), it is believed this conference will assist the International Agency for Research into Cancer (IARC) to incorporate current knowledge into a monograph on bitumen fumes, expected to be issued in September this year.

The symposium outcomes, to be supported by a €2.2 million IARC study to examine the contribution of confounding factors such as past exposure of workers to coal tar fumes and vapours, and contributing lifestyle factors. It is anticipated that this study will corroborate the findings of past research, which has established that there is inadequate evidence that bitumens alone are carcinogenic to humans. Sabita will assess these findings and their impact on policy and practice in South Africa.

FOCUSING ON THE PRESERVATION OF THE ENVIRONMENT

This is a problem demanding immediate and urgent attention. It is inconceivable to an association like Sabita that professional engineers, perhaps members of SAICE, should continue to specify hazardous and unhealthy products for road construction when global conventional wisdom has led to the widespread substitution of this product with safe alternatives.

HSE is a key strategic cluster in the current business plan of the association, and operations in this arena are funded by dedicated allocations received from the primary producers of bitumen – the oil companies, said Piet Myburgh, chief executive officer of Sabita.

While industrial health and safety is largely a product of appropriate working procedures, preservation of the environment centres on the development and responsible use of environmentally friendly products. To foster broader acceptance and implementation of these principles, Sabita has launched several initiatives, the most prominent of which are discussed here.

DISCONTINUATION OF THE USE OF COAL TAR PRODUCTS

Commonly used until recent times for priming bases and precoating aggregates during road construction, the proven carcinogenic properties of coal tar products have resulted in their almost universal banning and replacement with bitumen-based alternatives. Bitumen is obtained from the distillation of crude petroleum oil imported to meet the country’s liquid fuel energy demands. At ambient temperatures bitumen is non-toxic, non-volatile and resistant to water and weathering, flexible, generally odourless, and serves as a good insulator and adhesive.

Coal tar, however, is a condensation by-product obtained from the gasification of coal. The carcinogenic hazards inherent in the use of coal tar products arise from the high concentrations of polycyclic aromatic hydrocarbons (PAHs) in both low and high temperature coal tar products. Identified as either acute or chronic, these hazards have been widely acknowledged since 1985.

Coal tar products also pose serious environmental hazards, both in their usage and in the disposal of wastes. Their leachability is far greater than that of bitumen, posing a higher threat to surface and ground water supplies, and to microbiological systems. This threat is heightened by the fact that coal tars contain compounds of substantially lower molecular weight than bitumen, including phenols and other aromatic compounds, many of which are liquid at ambient temperatures.

Myburgh noted that despite widespread awareness of the health and environmental hazards inherent in the use of coal tar products, and the fact that their use has been prohibited in countries throughout the world, none of South Africa’s 248 municipalities nor any of the six metropolitan councils have taken heed and precluded the use of coal tar binders in their built-up environments, where the exposure levels and therefore the concomitant risks are far higher than in the rural environment.

‘Currently, only the South African National Roads Agency (Sanral), the Provincial Administration Western Cape (PAWC) and the Gauteng Department of Public Transport, Roads and Works have heeded the call to ban the use of these products on their projects,’ said Myburgh.

He pointed out that cost-effective, non-toxic bitumen-based alternatives to coal tar products for road construction were readily available both for priming base layers and precoating surfacing chips.

Despite the intention of some provincial roads authorities to discontinue the use of coal tar products, Myburgh noted, these were still, in some cases, being specified by consulting engineers and preferred by contractors.

‘This is a problem demanding immediate and urgent attention,’ he said. ‘It is inconceivable to an association like Sabita that professional engineers, perhaps members of SAICE, should continue to specify hazardous and unhealthy products for road
construction when global conventional wisdom has led to the widespread substitution of this product with safe alternatives. We should like to encourage the civil engineering profession in South Africa to align itself to global best practice in this respect.

**BITUMEN WASTE DISPOSAL**

Mounting proof that bitumen presented minimal hazard to either users or the environment prompted Sabita during 2003/04 to conduct a campaign for penetration grade bitumen to be de-listed as a hazardous waste, and for waste disposal to be permitted at certain designated general landfill sites.

Sabita subsequently investigated the availability of suitable permitted waste disposal sites that would both encourage environmental responsibility and promote cost efficient waste disposal. Initially under the control of the Department of Water Affairs and Forestry (DWAF), responsibility for waste control has now shifted to the Department of the Environment and Tourism (DEAT), which has taken over the permitting role from DWAF as from 3 January 2006. A waste control section is in the process of being established for this purpose, and Sabita is maintaining contact with the relevant government authorities to resolve any outstanding issues.

A total of 21 sites have been approached with the view to allow permitting for the disposal of penetration grade bitumen. This includes eight in KwaZulu-Natal region, three in the Gauteng region, three in the Western Cape region, six in the Eastern Cape region and one in the Free State Region.

In a related initiative the minimal hazard presented to the environment by penetration grade bitumen compliant with SABS 307 resulted in its re-classification for road transportation. The inclusion of penetration grade bitumen in the requirements of transportation code UN 3257 aligns South Africa with international practice. This classification will ensure that the appropriate transportation emergency cards (Tremcards) are carried in the vehicle, thus ensuring appropriate action in the case of an incident.

‘Increasing pressure on resources – human, financial and natural – demands that sustainability be placed higher and higher on our governance agendas,’ Myburgh concluded. ‘This dictates that the activities of the bituminous products industry be directed at current needs, such as improved efficiency, without compromising the the quality of future resources.’
THERE IS A GLOBAL DRIVE towards finding sustainable, environmentally conscious solutions to water resource management problems such as the treatment of mine wastewater.

Population growth, industrial development and climate change are some of the forces placing increased pressure on already limited water resources, and the need for integrated water resource management (IWRM) has become urgent and critical.

This need is further highlighted by the requirements of the National Water Act (1997), which include that polluted water be treated before it enters any receiving water body.

In the mining industry one of the largest environmental problems and challenges is acid mine drainage (AMD) and brines. Since the environmental impact caused by AMD and brines can be severe, it creates liability for mines long after mine closure.

An option that has been both investigated and fairly well documented is the use of wetlands, whether artificial or natural, in the treatment of mine wastewater, yet there has been only a limited application of this technology thus far, both nationally and internationally.

This may be because the complex structure and function of wetland ecosystems is poorly understood, as is the variability of these systems, making wetlands difficult to manage and/or reconstruct for the purposes of wastewater treatment.

Since system modelling and systems thinking integrates so-called ‘hard’ sciences such as ecosystem structure and function and ‘soft’ sciences such as socio-political and management issues, it can be used successfully in integrated water resources management.

In applying systems modelling and systems thinking to wetlands, it may be possible to characterise the ecosystem structure and function in an integrated manner in order to construct a predictive systems model.

Once this has been done, the management and/or reconstruction of wetlands for the purposes of mine wastewater treatment may finally be within reach, providing a sustainable, cost-effective and environmentally conscious solution to wastewater treatment on mines.

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Integrated water resources management involving wetlands as wastewater treatment alternatives on mines
Liability of professional civil engineers 2

THIS IS THE SECOND article on ‘liability’ and has come about as a result of a concern expressed by one of our members in the civil engineering profession.

The member expressed the view that civil engineering professionals believe they are protected against personal liability for design errors when practising under a Propriety Limited (Pty Ltd) company, a Limited (Ltd) or public company or a Close Corporation (CC).

Why, in the opinion of the writer, this is considered irregular and although not prohibited by statute in the engineering profession, it is expressly prohibited in many other professions.

Furthermore, the writer would like to see the civil engineering design professionals brought into line with other professionals who bear huge responsibilities through the work they undertake, by changing the rules which govern civil engineering professionals by inserting an express prohibition to practise under a CC, (Pty) Ltd, or a Ltd company, and make it compulsory to have professional indemnity insurance for each individual before undertaking any design work.

THE CONCEPT OF A COMPANY

When a company is registered, in whatever form, this body takes on a separate legal personality and it acquires its own rights and liabilities. It is a legal person (legal persona) and is separate from its share holders and directors. The directors or members take care of the management of the company. The benefits of a company is that its separate existence is, by way of metaphor, conceived as a ‘veil’ separating the company from its members and concealing them from those who deal with it. This is often referred to as the ‘corporate veil’.

The separate legal personality of a company is a matter of substance, not a mere technicality, and therefore special or exceptional circumstances must exist before the court will ‘pierce’ the veil.¹

The term ‘veil piercing’ is used loosely to refer to looking behind the corporate veil and occurs when, for the purposes of this article, the directors or members are to be held personally liable for design errors or errors of judgment.

The courts are usually reluctant to pierce the corporate veil. The general rule is that a court will pierce the corporate veil only where special circumstances exist indicating that it is a mere façade concealing the true facts, that is, where the separate existence of the company is being used to perpetrate fraud, ‘fraud’ being used in a wide sense, for example to absolve a design professional of any personal liability. The separate existence of a company will not provide a design professional with any protection against personal liability nor will it constitute a defence should the design professional be faced with personal liability.

COMPANIES ACT² AND PERSONAL LIABILITY

So how does the Companies Act³ deal with persons such as design professionals who wish to form a company, benefit from a limited financial liability, not abuse the separate corporate identity and still remain personally liable for their own designs?

The answer is to be found in section 53(b) of the Companies Act,⁴ which reads that:

53 The memorandum of a company [may]
(b) in the case of a private company, pro-
vide that the directors and past direc-
tors shall be liable jointly and several-
ly, together with the company, for such
debts and liabilities of the company
as are or were contracted during their
periods of office, in which case the said
directors and past directors shall be so
liable.

The Close Corporations Act³ does not have a similar provision.

OTHER PROFESSIONS

Attorneys Act⁶

This Act provides as follows under section 23:

1. A private company may, notwithstanding anything to the contrary contained in this Act, conduct a practice if –
(a) such company is incorporated and registered as a private company under the Companies Act, 1973 (Act 61 of 1973), with a share capital, and its memorandum of association provides that all present and past directors of the company shall be liable jointly and severally with the company for the debts and liabilities of the company contracted during their periods of office …

This complies with the requirements of section 53(b) of the Companies Act. In the circumstances an attorney may not practice his profession under a (Pty) Ltd and, by interpretation, neither a CC. An attorney practising his profession under a private company is required to be an ‘incorporated’ company, usually abbreviated ‘Inc’ (Afrikaans, ‘Ingc’).

Public Accountants’ and Auditors’ Act⁶

This Act stipulates in section 21:

1. A public accountant may engage in public practice by himself or in partnership with other public accountants …

2. Persons registered in terms of this Act as accountants and auditors and engaged in public practice may in terms of the Companies Act, 1973 (Act No 61 of 1973), form a company to engage in public practice through its members, provided –
(a) the company is incorporated and registered as a company in terms of the Companies Act, 1973, with a share capital, and its memorandum of association provides that its directors and past directors shall be liable jointly and severally, together with the company, for its debts and liabilities contracted during their period of office …

Once again this section complies with the requirements of section 53(b) of the Companies Act. In the circumstances an accountant may only practise his or her profession under an ‘incorporated’ company.

Close corporations⁷

Section 65 of the Close Corporations Act provides that whenever a court is of the opinion that the use of that corporation, or any act by or on behalf of, constitutes a gross abuse of the juristic personality of that corporation as a separate entity, the court may declare that the corporation is to be deemed not to be a juristic person in respect of such rights, obligations or liabilities.
Engineering Profession Act

The Engineering Profession Act is, unfortunately, silent on the aspect of engineering design professionals practising as a juristic person.

Code of professional conduct

The Rules of Conduct for Registered Persons provides under ‘Rules of Conduct’:

2 Registered persons…

(s) must ensure that, while engaged as partners, directors or members of a private consulting practice operating under the style of a partnership, a company registered in terms of the Companies Act, 1973 (Act No 61 of 1973), or a close corporation registered in terms of the Close Corporation Act, 1984 (Act No 69 of 1984), and which performs engineering work of a nature generally performed in a consulting engineering practice, the control over the engineering work of the organisation is exercised, and the responsibility in respect of it is carried, by a registered person other than a person registered in terms of section 11(2)(b), 12(2)(b), 13(2)(b) or 14(3)(b) of the Act; and

(t) must, when requested by the council to do so, in writing provide the council with all the information available to them which may enable the council to determine which registered person was responsible for any act which the council considers PRIMA FACIE to be improper conduct.

With all due respect to the author of the above clauses, the writer is of the considered opinion that these two clauses are vague, cumbersome and ephemeral in effect.

It is proposed that these clauses be replaced by a clause that complies with section 53(b) of the Companies Act.

RECOMMENDATIONS

The writer is of the opinion that the ‘Rules of Conduct’ of the Code of Professional Conduct be amended to read:

(u) Juristic person may conduct a practice

(1) A private company may conduct a practice if –

(i) such a company is incorporated and registered as a private company under the Companies Act, 1973 (Act 61 of 1973), with a share capital, and its memorandum of association provides that all past and present directors of the company shall be liable, jointly and severally, with the debts and liabilities of the company contracted during their periods of office;

AND

(2) that each ‘registered person’, in his or her personal capacity, obtain professional indemnity insurance of a certain value, and will not be permitted to practice as a ‘registered person’ without such insurance and must furnish proof thereof prior to any engineering work being undertaken.

ABOUT THE AUTHOR

Emilé is an arbitrator, advocate of the high court, professional civil engineer and registered town planner. Members are cordially invited to submit topics of interest to Emilé at e.p.m@mweb.co.za

Notes

1 H S Cilliers et al, Entrepreneurial law, 2nd ed, Butterworths.
2 The Shipping Corp of India Ltd v Eudomon Corp Ltd 1994 (1) SA 550(A).
3 Companies Act (Act 61 of 1973), as amended.
4 Close Corporation Act (Act 69 of 1984).
5 Attorneys Act (Act 53 of 1979), as amended.
7 Close Corporation Act (Act 69 of 1984).
8 Engineering Professions Act (Act 46 of 2000).
9 Code of Professional Conduct in terms of section 42(6) of the Engineering Profession Act.
Update on broad-based black economic empowerment

One of the anticipated changes to the December 2005 Codes of Good Practice is the increase in the qualifying small enterprise turnover clause. The turnover figures set out in December were outdated and clearly there will be a review and increasing of those turnover figures.


That Act, however, is only the skeleton for BBBEE. The details around the implementation of the Act are contained in the Codes of Good Practice as issued by the Department of Trade and Industry.

The last Codes of Good Practice were released in December 2005 and these were subject to public comment until the end of March 2006. It is expected that these codes will be released by the DTi in August 2006. That will announce the final chapter in respect of the exact specifications regarding broad-based black economic empowerment implementation.

It is imperative that organisations get their house in order before this date, as it is well known what the final Codes of Good Practice will contain. One of the anticipated changes to the December 2005 Codes of Good Practice is the increase in the qualifying small enterprise turnover clause. The turnover figures set out in December were outdated and clearly there will be a review and increasing of those turnover figures.

It is also believed that the employee qualification in qualifying small enterprises will be dropped. Most categories contained employees below the 50-employee level and that qualification should be excluded.

It seems logical, in respect of corporate social spend and enterprise development, that the final codes will provide that both of these elements be measured in respect of net profit after tax. Remember: these are contributions to mainly black beneficiaries and contributions towards assisting black-owned business in respect of enterprise development.

There is a great amount of support for a phase-in period of two years. During this interim period organisations would have the choice of only measuring the management and ownership elements as opposed to the full measurement across all seven elements. The calculation will be the score out of those 30 points for ownership and management multiplied by a factor of 1.92. This will then be recognised as your broad-based black economic empowerment score for the first two years (should you elect to measure only those two elements).

It is also anticipated that the pension fund issue will be excluded from ownership. This will close the chapter on a lengthy debate in respect of pension fund ownership under the ownership 20 points.

Finally it would seem that the skills development element will still exclude your skills development levy contributions. The skills spend and measurement of skills development will be over and above your current 1% skills development levy.

INFO

Should you require any further explanation in respect of the Codes of Good Practice released in 2005, e-mail us at johnny@iafrica.com or johnb@global.adcorp.co.za

Jonathan Goldberg
CEO, Global Business Solutions
THE NATIONAL Innovation Competition (NIC) is aimed at promoting a culture of entrepreneurship through technology innovation among South Africa’s youth. It is run by the Innovation Fund of the Department of Science and Technology.

Students’ technological inventions are required to be of commercial value as demonstrated by submission of a detailed business plan. Government has identified the importance of technology innovation in contributing to the economy and the creation of wealth for the nation. The NIC in a small way is contributing to this important mandate by stimulating youth to think creatively, innovatively.

A combination of several factors raises the NIC to a higher level than that of many other competitions in this league:

- It is aimed at students registered at South African higher education institutions
- The focus is on technological innovations – not just a clever design
- It stimulates students to interrogate the commercial value of their projects, as business plans form the essence of the participation process
- The prize money is phenomenal compared to similar local competitions
- The winning team will be considered for participation in a similar competition at international level

The competition has the added advantage that it provides the opportunity for entries to be researched, developed, showcased and – ultimately – commercialised.

The roll-out is in two phases: the institutional phase and the national phase, where the best projects entered in a specific year are selected, showcased and supported/marketed.

Prize money in the national phase

- 1st prize: R300 000
- 2nd prize: R200 000
- 3rd prize: R150 000

Seventy five per cent of the prize money is used by students for the commercialisation of their business plan, the remaining 25% is allocated to the relevant department(s). The winners receive up to R100 000 to cover costs for travel to participate in international business plan competitions.

Winners for 2005

**Winner**

Wernich de Villiers, Line Trap Tester, University of Stellenbosch

Top honours went to Wernich de Villiers of the University of Stellenbosch. It is expected that his Line Trap Tester will have a substantial beneficial impact on the high voltage (HV) power line carrier (PLC) maintenance industry and will greatly benefit power utility companies. His research has spawned a South African company that uses this innovative technology packaged as a portable Line Trap Tester to do more effective and safe maintenance on HV PLC systems without requiring a power outage. This locally created technology, which is protected by a PCT patent, is currently being introduced to the world market.

**LAST YEAR’S NIC WINNERS**

- **First Prize** University of KwaZulu-Natal: Smart Bolt by Clinton Bemont & Jean-Marie Vugampore won R300 000. The 2004 winning idea is being tailored for usage on a suspension bridge currently under construction.
- **Second Prize** North West University: Intelligent Spark Plug by Paulus Kruger, Barend Visser, Gerard Moerdijk and Professor O C de Jager … Making good progress towards commercialisation of product
- **Third Prize** University of Pretoria: Tuberculosis Diagnostic Device by Pieter Very and Simon Thanyani
De Villiers received a cheque for R300 000 to add to the winnings he received for the institutional phase of the competition.

First runner(s) up
Gerrit Smith and Johannes Strauss, Solar Submersible Water Pump, University of Stellenbosch
Gerrit Smith and Johannes Strauss were awarded second place for their innovative Solar Submersible Water Pump, another entry from the University of Stellenbosch. Their objective is to develop a range of solar water pumps to cater for all possible customer needs, and simultaneously establish the strongest, most effective marketing, distribution and service network in South Africa. Their ultimate aim is to become the fastest growing solar pump manufacturer in the world and the market leader in South Africa within five years of production. Smith and Strauss received a cheque for R200 000 to further their research.

Second runner-up
Jean-Claude Malengret (team leader), Richard Parry and Tristan Phillips – Next Generation Personal Tracking Device, University of Cape Town
Third place went to a team from the University of Cape Town for their Next Generation Personal Tracking Device. Using proven technology in a 3 x 6 x 2 cm enclosure and with the support of an online server, the product allows a user to track anything via the internet with his/her own cell phone. Users can SMS or log on to this compact and affordable device via the internet and retrieve its location, speed, altitude, inclination and numerous other readings. The device runs on a cell phone battery for up to a week. It is rechargeable via a car cigarette lighter plug or DC adapter. The team received a sum of R150 000 to assist them in their research.
PRECAST CONCRETE manufacturers and construction industry professionals are anticipating new levels of excellence when the results of the major event in the precast concrete calendar for 2006 – the CMA Awards for Excellence competition – are announced. All entries for this year’s CMA Awards for Excellence competition were submitted at the end of May and the judging took place on 22 and 23 June.

Two panels of judges, each comprising five well-known professionals, were sourced from within the construction industry. They were chosen from more than 60 nominations made by CMA members.

The first group, which comprised architects Peter Kuhn, Hugh Fraser, Chen Sagnelli (KZN), and engineers Victor Booth and Don Midgley, judged the Masonry and Roof Tile entries. Engineers Doug Walton and Gaillard Rossouw, architect Dean Jacoby (Eastern Cape) landscape architect Neal Dunstan, and quantity surveyor Nomzamo Mlungu made up the second group, and they judged the Paving, Concrete Retaining Block (crb) Wall, Suspended Concrete Floor Slabs and Other Category entries.

The names of the award winners will be announced at four presentation events, three coastal regional award ceremonies and an inland regional and national ceremony. The three coastal ceremonies will take place on 26, 27 and 28 September in Cape Town, Port Alfred and Durban respectively, and the inland and national ceremony will be held at a gala banquet on 7 October at the Sandton Convention Centre in Johannesburg.

CMA director John Cairns says there are some truly outstanding examples of craftsmanship, design and applied precast concrete in this year’s competition.

“The Awards set the benchmark standards for the whole precast concrete industry.”
industry. In the two years since our last competition, CMA members have made considerable progress in producing high quality materials and systems for the construction of affordable housing and this is evident in this year’s competition. There are also several excellent entries in the luxury housing sector in the paving, roofing and masonry categories,’ notes Cairns.

The competition’s six categories comprise: Concrete Block Paving, Concrete Roof Tiles, Concrete Masonry; Concrete Retaining Block Walls; Suspended Concrete Floor Slabs; and Infrastructural and Other Concrete Products. These are further broken down into 28 sub-categories.

Three tiers of awards are presented, regional, national and four highly coveted Cathay Pigments trophies. Providing the entries have met the judges’ requirements, national awards will be presented to winners of each of 28 sub-categories. Regional awards will be presented to the winners of each sub-category by region and this will take place at three coastal award ceremonies and the gala banquet.

SOME AWARD ENTRIES

The photos comprise a selection of award entries from the Other Concrete Product, Concrete Block Paving and Other Concrete Product categories.
IN BRIEF

ISOTHERM GOES GREEN!

BRITS NONWOVEN has announced the re-engineering and new look of its flagship product, Isotherm Thermal Roof Insulation.

Isotherm – one of the most effective insulation products on the market – is made from 100% polyester. Isotherm and its derivative products, Isofoil Composite Insulation and Acoustisorb Sound Insulation, are now exclusively made using polymer from recycled PET bottles.

Every year 80 million PET bottles are collected from the waste heaps of our urban environments, recycled and processed into polymer. This polymer is then converted into Polyester fibre and used in the manufacture of Isotherm.

The new Isotherm was launched at a unique gala event at the Labia Theatre in June. Guests from the building and retail industry, government and media were treated to an evening that demonstrated via an informative short film how one man’s junk can become another man’s treasure. The green-themed cuisine and gifts which were created using throwaway plastic products drove this home.

The recycling of PET bottles will have a huge impact on the conservation of the South African environment. The objective is to collect and recycle as much as 40% of beverage PET by 2010.

The new Isotherm product will be available in retail outlets from 1 July.

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ACSA KICK-STARTS CONSTRUCTION OF NEW CENTRAL TERMINAL BUILDING

CONSTRUCTION OF THE R2 billion Central Terminal Building (CTB) project at Johannesburg International Airport (JIA) was officially announced by Ms Monhla Hlahla, ACSA’s CEO, at a sod-turning ceremony on 28 July.

Hlahla: ‘This project is vital for the 2010 World Cup, facilitation of the growing passenger traffic, improvement of service. It gives us an opportunity to further transform Johannesburg International into a world-class airport. The CTB is indeed a major step towards achieving that.’

The project is part of the R5, 2 billion infrastructure development budget for the entire ACSA network of airports. Of this budget, R3, 5 billion will be spent at JIA. The new CTB, which will link the existing Domestic and International terminal buildings, will also serve as one of the stations on the Gautrain route as well as provide the required additional international terminal building capacity in terms of holding lounges, airside commercial areas and boarding gates.

A completion date for the construction of the CTB was accelerated to the end of 2009 following the emergence of a number of crucial factors.

Firstly, after the announcement that South Africa was awarded the right to host the 2010 FIFA World Cup, plans were immediately put in place to prepare ACSA’s airports in time for the tournament.

Another factor which has contributed to this accelerated development is the new generation large aircraft, necessary for the processing of passengers. Hlahla explains: ‘The first operational version of this type of aircraft is the A380, which is expected to start flying here towards the latter half of 2008. Importantly, JIA has been identified by a number of airlines as a destination that will be served by this particular aircraft.’

The CTB will comprise a multi-level terminal building. Floor levels are planned to compliment the adjacent terminals and the roadway system. As a result, departure activity will be on the upper level and arrivals on the ground level, in keeping with the existing International and Domestic terminals operations. These main floor levels will be complemented by appropriate mezzanines for commercial or retail activities, as well as basements for services and baggage handling.

E-GO SOLUTIONS EXPANDS AFRICA OPERATIONS TO INCLUDE SATELLITE BROADBAND SOLUTIONS

INTERNATIONAL SATELLITE solutions provider e-go Solutions has announced a significant expansion into the African satellite communications market over the next few months.

With an initial focus on the mining and construction industries, e-go Solutions has introduced its high-speed broadband satellite solutions, BGAN (Broadband Global Area Network) and Broad-IP, at two seminars in Johannesburg in July.

BGAN is a mobile solution which is ideal as a ‘first in’ solution during the exploration phase of new sites. Using highly portable hardware users can deploy within minutes, connecting to voice and data services at broadband speeds of up to 492 kbps over a satellite connection, allowing data such as geological survey results to be sent directly to project headquarters.

Broad-IP is a fixed location solution which provides an alternative to VSAT communications currently available in Africa. Once a project site has been established Broad-IP facilitates broadband data speeds up to 2 MB along with up to four dedicated voice lines.

In Africa, e-go Solutions mining and construction customers using Broad-IP will benefit from individual service level agreements and low contention ratios (10:1 or less); lightning protection (for hardware), customs management (to ensure swift deployment of equipment or spares), minimal rain fade (to prevent connection loss in bad weather), and CIR (committed information rate) to prioritise VOIP communications and other business critical applications.

e-go Solutions provides a one stop shop for both BGAN and Broad-IP solutions, enabling customers to place their satellite data and voice requirements in the reliable hands of one company.

Specialising in services including procurement, integration and design, as well as installation and customer service, e-go Solutions promises an unrivalled quality of service tailored to the needs of the customer.

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SINKHOLE ADDS TO TRAFFIC BLUES

THE BEN SCHOEMAN HIGHWAY (N14) running southwards from Pretoria carries about 100 000 vehicles a day and even a minor disruption results in a snarl-up of epic proportions. If a mere fender bender can make you late for work, just imagine what a 25 m diameter sinkhole next to the freeway can do.

This is the problem that Vela VKE Pretoria has had to solve for Gauteng Roads (Gautrans). The first priority was the safety of the road users, so traffic was temporarily diverted onto the median of the road, while the geotechnical specialists did their work.

On closer inspection the ‘sinkhole’ was found to be not an open hole but a depressed area (technically known as a ‘doline’), with the central part having settled about 3 m. A series of percussional boreholes were hurriedly drilled around the doline to determine the extent of the problem and these soon revealed that very poor sub-surface conditions were present, with wad and voids extending to a great depth.

It was thus obvious that reinstating only the doline (which extended right up to the edge of the southbound carriageway) was not an option. The conditions under the highway would have to be investigated to ensure the safety of roadusers.

The client, Gautrans agreed with the consulting engineers’ proposal to proceed with a gravimetric survey. This entailed very accurate measurements taken of small variations in the gravity filled hole to reflect the bedrock profile, and was followed by further percussion drilling along the southbound carriageway. Though the drilling did encounter some ‘soft’ spots in this...
area, conditions were nowhere near as poor as around the sinkhole.

A contract worth R3.5 million has just been awarded to South Sand Civils to reinstate the doline and a section of the southbound carriageway and the contractor is expected to be on site by the end of July. The work will entail dynamic compaction, including driving in stone columns where conditions are particularly poor, and reconstruction of the road surface. The dynamic compaction process entails dropping a weight (generally 10 to 15 t) from about 15 m to improve the strength characteristics of the soils present.

Once the reinstatement has been completed, the traffic will be re-routed on to its original alignment. In addition to the dynamic compaction process, extensive remedial works will be undertaken to the drainage on the site, to prevent ingress of water into the ground. It was uncontrolled ingress next to the roadway that resulted in the doline in the first place, and a repeat of the damaging cause is to be avoided.

**PHD JOINS GOLDER**

FRED SUTHERLAND, MD of Golder’s African operations, has announced that Pulles Howard & De Lange have agreed to join Golder Associates. This follows an extended period of working together as well as intensive negotiations and a comprehensive due diligence.

Pulles Howard & De Lange (PHD) is a specialist 13-person company based in Johannesburg and established in 1993. The focus of PHD has always been to deliver high-quality services to the mining and industrial sectors and provide ground-breaking research for the Water Research Commission and the Department of Water Affairs and Forestry in South Africa. During their many years of operation, PHD has developed a strong reputation for undertaking leading-edge research and has pioneered a number of innovative approaches in South Africa. PHD is a world leader in the development of passive treatment technology for mine water.

William Pulles has built PHD over a number of years into a company of high-level specialist consultants in the fields of mine water treatment, geochemical assessment, mine closure planning and catchment management. PHD has always made use of a number of long-standing associations to supplement their resource base. One such associate has been Golder Associates Africa. Owing to identified synergies and common ethical and value systems, the two companies drew closer and have recently cooperated on a number of consulting and research projects.

It became obvious that the way forward for both companies was to merge their interests in order to unlock the hidden synergies. PHD has

**CHRYSO ADMIXTURES FOR MULTI-BILLION DOLLAR QATAR AIRPORT**

ADMIIXTURES PRODUCED BY Chryso are adding vital workability and fluidity to the concrete used for the construction of the new multi-billion-dollar Qatar airport.

Ian Owen, technical manager – chemicals, for Chryso’s Dubai agents, says two Chryso admixtures have been specified for the concrete mix for the new Doha International Airport which is being built on 18 km² of land reclaimed from the sea.

Owen, on a recent visit to Chryso South Africa, says Chrysoplast ME210 is being applied to extend the workability of the concrete for the airport project, with Chrysofluid ME505 adding fluidity to the mix. The chemicals were specified after extensive trials.

‘A total of 2 million cubic metres of concrete will be used for the construction of a new terminal building, two runways, a business park, and full airport infrastructure at Doha,’ said Owen.

Around $2.5 billion has been invested in the first phase of the project, with another $5bn earmarked for the second and third phases. Work has recently started on the scheduled for completion in 2008 (Phase 1), and 2015 for the complete project.

The main contractors are Bechtel Group Inc, which is also handling the design and engineering aspects. The airport is expected to carry about 12.5 million passengers per year by 2008 and 50 million per year in 2015. The present airport now handles about 4 million passengers per year.

The national airline, Qatar Airways, will relocate its headquarters and training facilities to the new Doha Airport, which is expected to become the new hub of this Middle East growth point.

www.chryso-online.com
 therefore agreed to join Golder Associates in South Africa as of 1 July 2006.

Fred Sutherland noted that the merger is a significant postive development for both companies as the combined profile in the mining industry will place us in a unique leadership position in terms of mine water treatment and management. The PHD resources will be deployed in a number of the divisions inside Golder Africa and will therefore provide a broad based expansion of our capabilities and skills. We look forward to the future with our expanded team and in anticipation of an increased capability to better serve our clients and build on the international reputation of Golder.

Clive Archer also focused on the key challenges faced the industry today. He said: ‘We will be required to adjust to the parameters as set out by government, which are designed to include and uplift all previously disadvantaged citizens of South Africa. We are expected to apply responsible policies to the future running of our businesses. These include the creation of a better working environment, enhanced education and training and equal opportunities. This will ultimately extend our economic base and provide a more balanced environment and better living conditions for all.’

Pierre Sanson
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Clay Brick Association predicts boom in building industry will continue

THE CLAY BRICK ASSOCIATION (CBA) has predicted that the boom being experienced in the building industry will continue for some time yet, in line with world trends.

David Matlou, the new president of the CBA, said: ‘We have an economy that has gone beyond its four-year cycle. Forecasts indicate that our economy is set for an extended growth rate, and we have no choice but to grow our economy in South Africa.

‘Therefore congratulate those members who have either increased capacity or invested in green fields projects. Failure to meet the ever-growing market demand for clay bricks would be very damaging for our industry.’

Clive Archer, outgoing president, agreed. ‘Our industry has continued to thrive in what must now be one of the most substantial and effective periods of growth that our wonderful country has ever experienced. Most of our members have experienced excellent trading conditions throughout.’

This growth mirrors what is happening globally. Guest speaker at the recent AGM, John Steele, of JC Steele and Sons, the largest producer of heavy clay manufacturing machinery in the United States, delivered an address on the state of the clay brick industry in the US. He pointed out that the US has been on a building spree for the past 16 years and the market is still strong. ‘Currently the industry produces 8–9 billion bricks a year,’ he said.

‘In 1977 people were predicting that there would not be another green field brick plant in their lifetime. They were wrong. People have been investing heavily for the last ten years in new plants, and our own family has built two new paver plants and two new brick plants in the last eight years.’

The disa Design Excellence Award scheme aims to recognise the achievements of South African product designers, while also encouraging local product design and manufacture and promoting international competitiveness of local products. This award scheme has established a proud tradition of promoting indigenous design.

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PRODUCT DESIGN AWARDS

SIXTEEN PRODUCTS RECEIVED disa Design Excellence Awards at a ceremony held in Midrand.

The awards scheme was presented by the SABS Design Institute. Amongst the products was the Terra Grader, aimed at the road maintenance market.

The Terra Grader is a gravel road maintenance machine that costs half the price of a conventional grader. Its features include fire fighting equipment, a water tanker, compaction roller and a ripper. A tractor is used to tow it. The designers are Luigi Quaroni and Johan Wessels.

In his speech, the Minister of Trade and Industry, Mr Mandisi Mpahlwa, said that there record of at least one year. The only other re-requirement is that is must have been designed in South Africa.

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UPDATE ON SAPPMA

THE SOUTH AFRICAN Plastic Pipe Manufacturers Association (SAPPMA) is a non-profit association of plastic pipe and raw material producers. Its major aim is to offer a service to the Industry in terms of matters related to product quality and standards as well as technical assistance to consulting engineers and customers. It acts as a representative voice for the majority of South African Pipe and Raw Material Manufacturers.

The association encourages engineers and customers to specify members’ products in the knowledge that members adhere to the standards laid down by the South African Bureau of Standards (SABS). To this end the association has a code of ethics to which all members voluntarily adhere and in which they undertake to comply with all the national standards laid down by the SABS. SAPPMA is in close contact with the SABS and an improved programme of ‘partnership’ is jointly being investigated at present.

Member companies of SAPPMA have recently agreed to embark on a campaign of ‘absolute quality’ in terms of manufactured products.

DEVELOPMENTS IN PORT ELIZABETH

WITH A BACKGROUND IN consumer science specialising in interior design, textile fashion and psychology, Ursula du Preez is a surprising newcomer to the civil engineering field.

This dynamic self-starter at Demeyer & Associates in Port Elizabeth has worked on many exciting projects, one of which included a R12 million Lovemore Heights security village development. ‘This upper class establishment with plots ranging between R2 to R4 million in value consisted of 163 erven. It was a multidisciplinary project that required massive earthwork calculations and services design,’ she explains.

One of the many factors affecting the design was the steep site, which proved to be quite a challenge. ‘The project architect had specific ideas about what would be aesthetically pleasing and...
we tried as far as possible to adjust the platforms to accommodate the design. In addition, we wanted to maximise the sea view from each plot.’

The estate, in Lovemore Heights on the western edge of Nelson Mandela Bay, proved to be a good project for Ursula to cut her teeth as it required much close interaction between client, engineer and contractor. ‘With so many aspects to consider, the amount of adjustments can be quite mind-boggling and it might be difficult for someone to understand that even a small change will affect the entire design. Fortunately we could rely on infrastructure design programs AllyCAD and Civil Designer to update the drawing and this helped tremendously,’ notes Ursula.

Besides the constant tweaking of the design there were also environmental considerations on the project. ‘The area had a few milkwood trees that were regarded as indigenous and we had to navigate our road and sewer designs around these. Fortunately we were able to accommodate these environmental constraints and the project has since been completed with residents occupying the completed homes.’

It seems that the more challenging the project, the more in her element Ursula is. The St Peter’s development is one such project that
would test the skill of any civil engineer. ‘The idea around this project was to develop an entertainment and residential area around the ruin of the former Anglican church of St Peters which stood as a beacon above the harbour. The development will look out over the upgraded harbour which will include a statue of Nelson Mandela.’

‘Like Lovemore Heights estate, the St Peters development was extremely steep and the terrain very rocky. The amount of earthworks attached to this project was also substantial and it was quite a job to calculate the desired cut and fill levels. Because you are working on a design of this magnitude you need to keep sight of the bigger picture which makes working with Civil Designer so great,’ she says.

The R60 million St Peters development is currently in its planning phase and will be completed over the next three to four years, thereby creating a boost for the region’s economy.

BIGEN AFRICA TO RELOCATE TO SA’S FIRST SCIENCE PARK

BIGEN AFRICA RECENTLY announced the relocation of its head office to a new building at the Innovation Hub in Pretoria. The company will take occupation of its new building in 2007. Construction has already started on the 6 560 m² land parcel taken up by the developer, WBHO Property Developments (Pty) Ltd. The new building will house around 250 people, and is the second commercial building at the Hub. It is adjacent to the Sappi Technology Centre.

According to Swart, the company’s steady growth over the past decade and expected growth for the future necessitated a new location for its head office. ‘The Innovation Hub presented itself as the ideal location, as we are not merely relocating, we are moving into the future. Our innovative approach to engineering makes us a suitable player in the melting pot of creative thought and innovative endeavour found at the Innovation Hub.’

Innovation Hub CEO Dr Neville Comins said that the presence of a significant and well-respected engineering activity would strengthen the technology mix at the Science Park, to the benefit of all the residents. ‘We look forward to growing interactions between our resident companies, a trend that is already bearing fruit in terms of the emerging innovative business projects and services.’

www.safrench.co.za
NEW OWNERSHIP INITIATIVE STRUCTURED FROM SOLID FOUNDATIONS

AS ONE OF THE LARGEST multi-disciplinary engineering consultants in South Africa, Arcus Gibb celebrates 50 years of technical excellence and completing the full circle to becoming a 100% employee-owned South African company with 67% of the shareholding owned by black employees.

CEO Richard Vries points out that the company has always been at the forefront of change. ‘In the early 1990s the company was part of the international LawGibb Group (now Jacobs), which provided many opportunities in skills transfer, working on mega projects and breaking into the SADC market as well as being the first South African engineering consultancy to be ISO 9001 accredited. In support of the changing environment in our country, we strategically aligned ourselves with Mvelaphanda in 2002 and became a wholly owned South African company.’

Arcus Gibb’s new broad-based ownership structure endorses the recently signed Construction Sector Charter. Richard states: “The restructuring of our ownership is in line with our transformation strategy and we are now an engineering consultancy owned and managed by its employees.”

The new owners, management and employees of Arcus Gibb have embraced the objectives and targets set out in the seven pillars of the newly signed Construction Sector Charter:

1. Employment Equity
2. Economic Empowerment
3. Socio-Economic Development
4. Infrastructure Development
5. Enterprise Development
6. Supply Chain Development
7. Transformation

‘The new owners, management and employees of Arcus Gibb have embraced the objectives and targets set out in the seven pillars of the newly signed Construction Sector Charter:’

CEO Richard Vries

CREATIVE CONCRETE IN TRANSPORT

CONCRETE HAS BECOME an integral part of the world’s transportation structures, Hugh Fraser, architectural consultant of the Cement & Concrete Institute (C&CI), told a group of information specialists who recently visited the C&CI in Midrand as part of the Engineering Information Exchange (EIE) programme.

‘It is, however, unfortunate that the authorities overseas seem more ready to accept creative architecture in transport structures than here in South Africa. Overseas countries, particularly in Europe, also allocate substantially larger budgets to the use of concrete in transport which means that the input of some of the world’s most imaginative designers can be obtained,’ Fraser stated.

He said that Switzerland and France, for example, could harness architectural creativity from design masters such as Calatrava even for railway stations, usually regarded as mundane structures in South Africa. ‘There are other examples worldwide. Eladio Dieste, the South American engineer/designer, for example, has managed to successfully combine the rational and the exploratory in a bus station that features both brick and concrete. South Africa still lags behind in such vision,’ Fraser said.

He was, however, impressed with the work on Johannesburg interchanges designed by Urban Solutions. ‘The new Baragwanath taxi rank is also impressive in how its design effectively contrasts the starkness of concrete with colourful tile work produced by locals. The concept of using public art in public buildings, including transport facilities, is to be commended,’ Fraser added.

Above: Creative concrete work at the TGV station, Saint-Exupéry Airport, Lyon, France
Civil Engineering

Construction Sector Charter and are committed to meeting the transformation agenda required for the sustainable development of South Africa and its people.

UPGRADING OF THE PRETORIA STATE THEATRE

The Pretoria State Theatre on the corner of Pretorius and Prinsloo streets in the Pretoria CBD belongs to the Gauteng provincial government and is operated by the State Theatre Company. The facility consists of an administration building with eleven floors and three basements, a 1 300-seat opera theatre, a 660 seat drama theatre, and four other, smaller theatres.

Since opening to the public in 1980, upgrading and maintenance of the building and equipment has not kept up with new legislation and improved technology. Also, some of the outside marble cladding became loose, posing a serious public safety risk. Vela VKE was requested in 1999 to do an investigation into the public safety of the building. The areas identified in need of attention were the loose marble on the façades, lack of disability facilities, and the fire detection and evacuation system.

Vela VKE was appointed in 2001 as the principal agent for these works and appointed several sub-consultants to fulfil the professional duties of the architect, quantity surveyor, mechanical, electrical and specialist structural engineer.

Currently all five phases of the project are in construction. These are: re-cladding of the marble façades; upgrading of disability facilities; upgrading of the fire detection and evacuation system; upgrading of the HVAC system; and improvement of the stage machinery equipment. The cost for the works is currently R43 million and the expected completion date is the end of 2007.
SELYWYN WAS A military engineer who left his mark on the Eastern Cape, but perhaps his greatest benefit to his adopted country was to recognise and nurture the latent skills of Andrew Geddes Bain and give him the opportunity to become a great pass-builder.

Selwyn was born in Gloucester on 27 May 1792, the seventh of eight children of Henry Charles Selwyn, a captain in the Royal Fusiliers, who later became Lieutenant-Governor of Montserrat.

Coming from a long line of soldiers, Selwyn entered the Royal Military Academy at Woolwich, from where he graduated as a second lieutenant in the Royal Engineers to his first posting at Dover in May 1811. As a full lieutenant he was posted to the island of Guernsey for 18 months, where he married, before being posted to the West Indies. From here he was posted to Ireland, where he spent nine years surveying and was promoted to captain.

In February 1834, Captain Selwyn was appointed commanding officer of the Royal Engineers on the eastern frontier of the Cape of Good Hope. He reached Grahamstown in July 1834, and scarcely five months after his arrival the 6th Frontier War broke out.

Colonel Henry Somerset put Selwyn and Lieutenant-Colonel England in charge of the defence of Grahamstown. This was accomplished by erecting barricades around Church Square, behind which hundreds of colonists fled for protection. The Xhosa invaders ravaged the whole of the Albany district until Lieutenant-Colonel Harry Smith drove off the attackers and restored order.

At the conclusion of the war in July 1835, Selwyn was instructed to prepare a plan of barracks and a fort for Grahamstown. The fort was constructed out of rubble stone masonry and lime mortar on Gunfire Hill, and was called Selwyn Battery. The Drosdy, the Cape Mounted Rifles barracks, Fort England, the Royal Engineers’ depot and the Provost, a military prison, were delivered sterling service in building and maintaining enviable rural roads in the Colony (later the Cape Province).

Three notable mountain passes were facilitated by Montagu. The pass over the Outeniquas which bears his name was completed in 1847, while a route into the Warm Bokkeveld was named Michell’s Pass in honour of the supervising engineer. Montagu himself approved the location of an unlikely route through the Limietberge and encouraged Andrew Bain to build the spectacular pass which bears his name.

Montagu is also credited with gaining approval for the construction of lighthouses on the Cape coast, and in 1843 instigated studies which led to the construction of Cape Town Harbour and other minor ports.

He took particular interest in the construction of the hard road across the Cape Flats, and was noted for his personal efforts to stabilise the shifting sand dunes which threatened to bury the road. When all else failed he introduced Australian wattles to the Cape, and this solved the problem. These trees proliferated to such an extent that they are now regarded as intrusive alien vegetation. Montagu the administrator presented a comprehensive report to the Roads Board. The 24 mile long road had cost £40 000, and 265 000 man days had been spent on its construction.

Montagu estimated that between 50 000 and 60 000 wagons and other vehicles used the road per annum, each saving between ten and twenty shillings per journey – without question, the road was cost effective!

Michell retired due to ill health caused by overwork, but
Montagu was not deterred. Despite his other administrative duties, he undertook two or three exhausting tours of inspection of the entire Colony, travelling on one occasion over 2,000 miles, and reporting at length on his findings. His recommendations included the opening up of Seven Weeks Poort, a road from the Longkloof through Toverwater Poort to Beaufort West, and – at long last in the opinion of the neglected eastern Cape – a proper road from Van Stadens River, via Port Elizabeth to Grahamstown, including the proper construction of Howison’s Poort, long a bone of contention.

From 1835 to 1837 he also supervised the construction of a series of eight Signal Towers, from Grahamstown to Fort Beaufort, to Fort Peddie, and to Bathurst, to warn the military of impending Xhosa invasion.

In February 1837, Selwyn appointed Andrew Geddes Bain as an assistant engineer, with the instruction to build a military road from Grahamstown to Beaufort, called the Queen’s Road, which included the Ecca Pass. Under Selwyn’s direction, Bain flourished, completed the work successfully and became an engineer in his own right.

Selwyn’s greatest achievement was the first multispan stone masonry arch bridge in South Africa, the Victoria Bridge over the Kat River at Fort Beaufort. The foundation stone was laid in November 1840 and the bridge completed in 1843. Inevitably there were numerous negative reports regarding overexpenditure. A second, all timber bridge was built over the Great Fish River at Fort Brown between 1840 and 1845.

Selwyn left the Cape on 12 July 1842 to be transferred to Exeter in the UK, and as a lieutenant-colonel to Canada, where he died on 12 December 1847, aged 55 years.

In a more just world he would surely have been suitably rewarded with a suitable decoration – far lesser men have received knighthoods. In fact, Michell and the railwayman Brounger would probably have been similarly recognised had they worked closer to the corridors of power.

Dennis Walters
Building and breaking bridges at Maropeng

ON THURSDAY, 27 July 2006, bridge building winners from SAICE branches countrywide, as well as three teams from Zimbabwe, made their way to Maropeng (a Setswana word meaning ‘returning to your place of origin’) in the Cradle of Humankind World Heritage Site, northwest of Krugersdorp, for the final stage of the competition.

The learners were curious about this rather different bridge building venue and, after a restful night in the learners’ accommodation on the wonderfully quiet hilltop where city lights do not diffuse the star-speckled sky, they eagerly gathered in the Tumulus. This unique building is designed to look like an ancient burial mound from the front, but upon exiting one looks back on a modern structure. The architecture is symbolic of the journey through the evolution of life.

After an informative presentation by a bridge engineer on the stresses and strains to be taken into account when designing bridges, the learners got down to the grueling business of planning and measuring, of cutting dowel sticks and of gluing them together to form sturdy bridge structures, all the while racing against the clock, because mid-afternoon was tools-down time.

Looking at the meticulously constructed bridges drying in these ancient surroundings later that afternoon, one could not help but marvel at how man has advanced technologically!

After having exchanged their daytime T-shirts and track suits for school uniforms, the teams gathered again in the Tumulus for an evening of nerve-racking testing of their bridges. Excitement mounted, hopes soared and some dreams were shattered as one team after the other brought their bridges forward for testing. The camaraderie that had developed among the various competing teams during their stay culminated in an evening of shared emotions.

WINNERS
The excited winning team, Hoër Tegniese Skool Daniel Pienaar from the SAICE Algoa Branch, scored 103,98 points. Second was Hoër Tegniese Skool Drostdy from the SAICE Western Cape Branch, with 98,47 points, with St Johns College of Zimbabwe third at 97,72 points. The entrants from the SAICE Durban Branch, Port Natal High School, who scored a sturdy 90,97 points, received a consolation prize. Our heartiest congratulations to these teams!

HISTORY
The annual SAICE Bridge Building Competition has its own interesting history, albeit not as ancient as that of the Maropeng exhibits! The fact that Port Natal High ended in the top four schools was symbolic, as the competition started off in 1991 when the SAICE Durban Branch, under chairmanship of Carlos Mendes, decided to implement a bridge building competition for schools. The competition was based on the ‘Young Engineer’ competition in Namibia, but was developed around the dual themes of building physical bridges and symbolic bridges between communities in order to build a new South Africa.

The first competition was held at the Civil Engineering Department of the University of Natal, utilising equipment made specially by their workshops. It was won by a team from Westville Boys’ High School when their bridge carried a load of 29,5 kg.

The competition has been held annually ever since by the Durban Branch, in order to achieve their aims of:

- Stimulating learners to enter the civil engineering profession
- Exposing learners, their parents and the general public to the profession of civil engineering
- Providing a fun-based, technologically challenging competition for learners
- Bringing together learners and teachers across the wide spectrum of schools in
a spirit of symbolic bridge and nation building
This first competition was videoed and an edited version shown by the new chair, Brian Downie, to SAICE Council in 1992, thus eliciting interest nationally. Following a further successful competition in 1992, the Durban Branch, as hosts of the 1993 SAICE National Congress, decided to hold an international bridge building event at that congress. Under the chairmanship of Brian Downie, convenor Phil Everitt managed to secure teams from Lesotho and Namibia, from the then independent territories of Transkei and Bophuthatswana, and from most of the SAICE branches.

Although the team from Zimbabwe was not able to attend, the international flavour was enhanced by visiting Rotary exchange scholars who provided two teams representing North and South America, and Australasia. Because of time constraints the rules were specially amended to provide for an innovative ‘build on the day’ competition with the testing taking place at the congress cocktail party that evening.

The event was a highlight of the congress and was won by Alexandra High School from Pietermaritzburg. It was with mixed feelings that the Durban Branch allowed this highly successful innovation to be taken over by SAICE National Office to become a feature of all further congresses, and later an annual event in its own right.

A necessary amendment to the rules, which still applies, was also initiated by the Durban Branch because the 1992 winners of the Durban Branch competition, St Henry’s Marist Bros College, had refined their previous design to win the 1993 branch competition with a staggering load of 150 kg. The Durban Branch then decided to keep the bridge building kits to the standardised 25 sticks of 3 mm nominal thickness, but to change the rules each year, extending spans and changing heights above and depths below roadbed, in order to encourage innovation and fresh designs.

There is little doubt that the annual bridge building competition has, since its inception, captured the imagination of learners and teachers who continue returning for more every year, hence the very successful 2006 gathering at Maropeng.
New standard for the design and construction of reinforced soils and fills now available

FOR THE FIRST TIME, all parties concerned with designing and constructing reinforced soils and fills will now have a standard that they can refer to for guidance. SANS 207, recently published, gives recommendations for the application of reinforcement techniques to soils and other fills, and also gives design guidelines for the reinforcement of soils. The full title of the new standard is SANS 207, The design and construction of reinforced soils and fills.

Dr Nico Vermeulen, of the Geotechnical Division of SAICE, answers the following questions regarding the new standard:

Q Why was SANS 207 written?
A The standard was drafted to address a particular lack of guidance in the civil engineering industry pertaining to the design of reinforced soil structures. Though manufacturers and suppliers do have pamphlets and basic design specifications, there was no national standard available. Arguably, the biggest need for the code arose from incidences recorded of failures of these structures from inadequate design.

Q On what is the standard based?
A The standard is based on the British Standard – BS 8006:1995, which was reviewed and revised, to allow for local South African conditions.

Q Who will need to use the standard?
A The standard will mostly be used by civil engineers for design purposes, but all parties concerned with these structures (including quantity surveyors) will find SANS 207 useful.

SANS 207 is written in a limit state format, and guidelines for safety margins are provided in terms of partial material factors and load factors for various applications and design lives.

The concepts and fundamental principles of reinforced soil are described in clause 5. Recommendations for the use of materials (where existing standards are available) are provided in clause 6. Where materials are used that are not covered by existing standards or where known materials are to be used in ways not covered by existing standards, clause 7 gives recommendations for the testing and approval of such materials.

Clauses 8 to 12 relate to design, construction and maintenance of walls and abutments, slopes and foundations. They include specific recommendations for the characterization of the soils to be used and other factors affecting the design and performance of the structures.
This branch is vibrant, has more to offer to the Western Cape members than they can perhaps handle, and is home to three tertiary institutions and (at least?) four campuses.

Our visit started off with a meeting with Paul Hodge of ReDR (Registered Engineers for Disaster Relief) who is leading the way to set up a local ‘chapter’. SAICE has already promised to cooperate and the next step is to discuss the business plan, a meeting in Johannesburg, and the election of a committee.

Next on the agenda was the branch committee and its agenda full of activities and lots of ideas. It has been a while since we were witness to such a rich menu of branch activities.

Next stop was the members’ event – and possibly for the first time ever, this was SAACE and SAICE, and in addition Dr Franklin Sonn as guest speaker. Sam delivered a speech that made everyone think and Webster explained the SAACE way forward.

Needless to say, Eskom contributed to the event by switching off just as Sam was switching on his presentation. The late setting of the sun in Cape Town saved the day for all of us – and Webster Ndodana could JUST see his notes at the end of the day.

Franklin Sonn used the no-show of lights to challenge the civil engineering professions by asking us: ‘Were the current skills shortages and breakdowns acceptable?’ He mentioned that there was a possible complacency within government about what was wrong – he said we all need to speak out and DO something. On the other hand he concluded, and so say all of us, there is NO PLACE like HOME@RSA.

Next morning it was a visit to CAPUT and facing 250 students. Fortunately this is not as intimidating as the first time we visited this institution of learning – and I believe Sam actually enjoyed it! The question and answer session was lively and thought provoking.

Then on to Stellenbosch University –

LIMPOPO

It is not a regular event for the SAICE team to fly to Polokwane in the first place. In the second place the flight was fruitless … Clouds and weather prescribed a return to Johannesburg after two quick fly-pasts over the airport. So near and yet so far!

Then it was Honda all the way north. Gone were the meetings and the planned school visits – to mutual disappointment.

Fortunately the evening awards event could go ahead – and what a night for Limpopo!

About 120 people attended and the media turned up to witness the event.

Congratulations to Jonas Tshikundama-lema and to Limpopo branch committee for taking this initiative to award local decision-makers for their achievements in dealing with the 2000 floods.

Congratulations to the recipients of the awards!
Three special awards were made:
- Mr Collins Chabane – currently MEC of Economic Development, Environment and Tourism; Previously MEC of Public Works, for which tenure he received the SAICE award
- Dr Sean Phillips – National Department of Public Works
- Mr Secret Mnisi – Roads Agency Limpopo
- Mr Sam Phupheli – Roads Agency Limpopo

**AMATOLA**

Our plane arrived late but Steve Richter and Johan Joubert were on time and ready to donate a day to SAICE affairs around East London.

Our visit to the IDZ came at a point where the 250 hectare facility was about to sign up its first tenants after many years of paper, planning, dreams and construction of excellent infrastructure. It is a little bit like a spider weaving away and completing a brand new web – now for the quarry!

Next stop was the new Mercedes C-Class body shop that is as big as 20 rugby fields under one roof. Shiny floors, high quality finishes ready to receive the robots that will assemble the MB cars for the world. This 58 year old factory facility has a unique approach to recycling buildings and making use of all the available space on the site.

A meeting with officials of the Buffalo...
City Municipality and Amatola District Municipality focused on procurement of professional services, goods and infrastructure. Our president provided insight from national levels and we gained appreciation and confidence about what these municipalities were achieving in their own right to make sure that they were getting value for money and services of value. Skills and capacity were also on the table.

The cocktail-and-speeches event was well attended and appreciated but the questions were rather tame. I was wondering whether the absence of the ‘trouble makers’ would be the reason? I refer to Leon Oosthuizen and his backbench team, for example! But Graham Keppie was there and he said he was now FULLY retired.

Graham was one of those TOWN and CITY ENGINEERS in capital letters – a by-gone era?

Thank you, Steve and company!

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‘Die grootkoppe praat’: Willie Claassen, (chair, Southern Cape), Nazir Ali (Sanral), Sam Amod

Southern Cape team and Knysna views

The visit to this branch with Willie Claassen at the helm proved to be a delight in more than one way. The bed-and-breakfast at Brenton overlooking Knysna, breakfast with the members, and a unique coming together of minds concerning the famous, or is it the infamous, Knysna bypass proved to be entertaining, a learning experience and great stuff all round.

Nazir Ali of Sanral joined us for the visit. The deputy mayor of Knysna was there. All in all it was a worthwhile exercise.

After all, this was a story about how civil engineering infrastructure needs affect and influence lives, and livelihoods of individuals, families, communities, decision-makers. It is a saga that has at times been traumatic, exasperating and about 35 years in the making.

ALGOA

The ‘Underrated City’ is what Sam Amod calls Port Elizabeth. And they call themselves the Friendly City and some of us call it the Windy City. Truly a grown-up town for all seasons, judging by the explosion in development after the doldrums of many years caused by winds of change blowing via Algoa. Cars and tourism are fairweather news.

Henri Steynberg made sure that our visit to the staff and students at the newly merged Nelson Mandela University went without a hitch.

A lively discussion with the students was about:

- How does one become SAICE president?
- How much does SAICE pay its president?
- Prospects for students

And so on.

Eventually our meeting with the members was almost over before we arrived – but they had a great time without us at the Thai table…!

‘Die grootkoppe praat’: Willie Claassen, (chair, Southern Cape), Nazir Ali (Sanral), Sam Amod

Southern Cape team and Knysna views

The photo was taken with the main entrance to Zone 1A of the ELIDZ in the background. The consulting consortium of Ninham Shand / Lukhozi / T & A was responsible for the design and contract administration of the external bulk services and the internal industrial township services for Zones 1A and 1B of the ELIDZ, located on the West Bank of East London, to the south of the airport. From right to left: Dawie Botha, Sam Amod, Pat Steele (Lukhozi Consulting Engineers) and Stephen Richter (chair)

‘Die grootkoppe praat’: Willie Claassen, (chair, Southern Cape), Nazir Ali (Sanral), Sam Amod

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So everything went ‘voor die wind’. Our president winged back to Johannesburg and I stayed – since we now have family living in PE. On the foot-patrolled area on two occasions I discovered a new environment in the hinterland – horse manure and fynbos and plotselinge on smallholdings in a lush green that I never knew existed!