Civil Engineering

Siviele Ingenieurswese

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ON THE COVER

A passion for environmental and civil engineering excellence has led to the success of the challenging Thesen Islands Development project, the largest marina development on an island in South Africa. The project has culminated in a successful environmental and commercial project, and has added value to the greater Knysna area

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ON THE COVER

BLACK ECONOMIC EMPOWERMENT

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SAICE AND PROFESSIONAL NEWS

SAICE AWARDS 2005

SMART AWARDS

Compiled by Sarie Moolman
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Environmental and civil excellence awarded

Since its inception 15 years ago, the Thesen Islands Development has overcome adverse physical conditions, historical pollution problems, stringent environmental legislation and challenging design and construction problems by implementing innovative environmental and civil engineering design methods to meet excellent aesthetic quality standards and economic requirements.

By providing innovative solutions, the Thesen Islands Development has become a successful environmental and commercial project that has added value to the greater Knysna area

THESEN ISLANDS is a 96 ha island in the Knysna Estuary on the south-east coast of South Africa. The island is situated in the middle of the Knysna Lagoon and is unique in that it is one of only four habitable islands in the country.

Thesen Islands was developed as an industrial operation focusing on timber and was used as a wood treatment facility for more than 70 years. This led to chemical contamination of the land. A solid causeway was built as an access road from the mainland to the island, which prevented the circulation of water and subsequent flushing out of impurities in the sanctuary. Owing to these industrial activities, a large part of Thesen Islands was inaccessible to the local population.

In the early 1990s planning began for the remediation of the island with the aim of redeveloping it into a waterfront marina and housing development.

OVERVIEW

The ambitious and technically challenging Thesen Islands Development comprised the development, integration and protection of a 15 km marina, which included high-income housing and apartments, and a village lifestyle centre.

The project required that the development should be master-planned into 19 islands, surrounded by wide tidal waterways linked by bridges, and managed in the most environmentally sensitive way possible to ensure that the islands were developed in harmony with the Knysna Estuary.

In addition to the environmental requirements, the technical team had to consider the client's brief, which was to ensure that the development was aesthetically and financially viable in order for it to be a commercial success.

Because Thesen Islands had been used for industrial timber operations in the past, the contaminated area required remediation, which in itself posed major financial implications. Through innovative remediation solutions the technical team designed and constructed feasible and cost-effective methods that have added value to the overall development and created an 11 ha landscaped park.

Although the technical team provided general infrastructure services, the project required innovative engineering design and construction solutions for the canal waterways and embankments. Various methods were researched and gabion and Reno mattress combinations were selected as the most cost-effective and viable solution because of their flexibility to meet with the geometrical constraints of the canal embankments, durability under harsh marine environments and ability to lend themselves favourably to environmental rehabilitation. These innovative engineering solutions have contributed to the advancement of gabion technology by utilising double twist technology through the design and construction of gabions and Reno mattresses.

The civil engineering design also took into consideration the environmental requirement of no nett loss of salt marsh. The existing areas of salt marsh were redistributed to newly developed areas in the ecobelt by transplanting the salt marsh sods onto the top Reno mattress section. This successful solution led to the overall increase of the salt marsh area.

Ordinarily construction in the existing environment would have been impossible owing to the close proximity of the ocean and liquefaction of the soil. Dewatering the area was the proposed solution and the only way to prove the viability of this process was through in-situ on-site trials. The dewatering process had to be maintained until the Reno mattresses and gabions were placed and backfilled. This process proved successful and enabled excavation of the canals and embankment construction.

Since inception of this project 15 years ago, the Thesen Islands Development has overcome technically challenging conditions by implementing innovative environmental and civil engineering design methods to meet excellent aesthetic quality standards and economic requirements. By providing these solutions, it has been a successful environmental and commercial project and has added value to the greater Knysna area.

engineering

THESEN ISLANDS DEVELOPMENT

Winner of the SAICE National Award for Technical Excellence in 2005

Submitted by Southern Cape Branch

ROLE PLAYERS

CLIENT Thesen Islands Development Company
PROFESSIONAL TEAM Arcus Gibb; CSIR; Nieuwoudt & Hofmeyr; CMAI
MAIN CONTRACTOR Power Construction
MAIN SUB-CONTRACTOR African Gabions

Completed canal and embankment

OBJECTIVE

The objective of this ambitious and technically complicated project was to develop, integrate and protect a 15 km marina, which included high-income housing and apartments, and a village lifestyle centre. The key feature of the development was that it had to be managed in the most environmentally sensitive way possible to ensure that the islands were developed in harmony with the Knysna Estuary. The project was master-planned into an estate of 19 islands surrounded by wide tidal waterways linked by bridges.

CHALLENGES

The brief of the client, Thesen Islands Development Company (Pty) Ltd, to the technical team was that to be successful the project had to be environmentally, aesthetically and financially viable. There were many technically challenging aspects to consider in order to meet the brief, which included the following:

- Remediation of the industrial contaminated area to remove potential exposure pathways by isolation, containment or removal of contaminated materials; to eliminate the risk of contaminated groundwater migration via canals into the lagoon; and to protect human health by preventing contact with contaminated soil
- Design of infrastructure to protect and enhance the ecologically sensitive area and to provide viable cost-effective designs for the canal waterways and embankments

From an environmental perspective the project provided a technical challenge in that, for the first time in South Africa and potentially the world, all salt marsh areas disturbed by the development had to be rehabilitated in such a manner as to ensure 'no nett loss of salt marsh'.

TECHNICAL SOLUTIONS

Remediation of contaminated area

A feasible and cost-effective approach was required to remediate the contaminated land.

Various methods were used, including the following:

- Areas of local contamination were excavated and disposed of at a licensed disposal site.
- A 5 m deep, cement/bentonite slurry cut-off wall was constructed around the worst contaminated area and was capped with a geosynthetic clay liner.
- A 1 m deep cover was spread over all peripheral contaminated areas.
- The wood waste from the timber facility was chipped and composted for use in the creation of an 11 ha landscaped park.

Transporting contaminated material to a waste disposal site was not a viable solution. This led to the design and construction of the cut-off wall and capping.

ARCUS GIBB SCOOPS AWARDS

Arcus Gibb has excelled in the 2005 SAICE awards at branch level as well as nationally. In addition to the award for Thesen Islands, they received the following awards:

- The Neptune Interchange at Coega received the SAICE Algoa Branch Technical Excellence Award. The Coega Industrial Development Zone (IDZ) is a first in South Africa and includes a deepwater port. The construction of the Neptune Interchange provides easy access to both the port and the IDZ for the medium-term development of the IDZ and was constructed while several parallel projects were in progress that were technically challenging and required intricate planning in the early stages (article on page 32).
- The Eastern Cape Poor Farmers Pre-Feasibility Study received a Certificate of Commendation from SAICE's Amatola Branch. Arcus Gibb was part of a multi-disciplinary engineering and agricultural team appointed to evaluate ten irrigation schemes and develop long-term sustainable feasibility plans for rural farming communities in the Eastern Cape. The outcome of this study is a realistic plan based on the expertise of the local farmers and stakeholders as well as the specialist consulting team. These jointly formulated, realistic intervention plans are now being implemented successfully and indicate the innovative approaches and the impact consulting teams can have on poverty and rural development.
- At national level, Arcus Gibb received SAICE's Award for the Best Presentation for the construction of Rautenbach/Watt/Roosevelt link road, which is part of the Alexandra Urban Renewal project (see article on page 26).

Arcus Gibb CEO Richard Vries stated that they 'are honoured to receive so many accolades and are extremely proud to be involved in a variety of projects throughout our offices in South Africa [which] proves our multi-disciplinary diversity and success through technical engineering excellence'.

From left to right: Remediation of contaminated land and dewatering

The remediation of the contaminated industrial area met its objectives and created a natural open space. This added value to the development as a whole.

Design of civil services to protect and enhance the ecologically sensitive area

Although the civil engineering services included general infrastructure aspects such as bulk earthworks, water and sewerage, roads and stormwater, and electrical services, the project required innovative engineering design and construction solutions to the canal waterways and embankments.

Canal design and layout of waterways

The CSIR utilised hydraulic and hydrological modelling to assist in the design and layout of the canals and waterways. The canal design was modified until the model simulation showed that the final canal layout would allow for excellent water circulation, while having sufficiently low water velocities (below 0,5 m/s) to prevent scour of the canal banks.

This design was important for good water circulation to ensure that fauna and flora flourished along the canal bank through the supply of fresh nutrients and aerated water. Good circulation also regulates water temperatures, which has a positive impact on the development of a healthy ecosystem. The excellent circulation will assist in efficient remediation of water quality if accidental spillage or pollution were to occur.

Embankment stabilisation

Shoreline structures had to withstand a combination of actions induced by waves, currents and differences in water levels. The chosen structure had to remain stable when subjected to deformations due to settlement and scour, to protect the shoreline in the entire zone of inundation, and to withstand cycles of continuous saturation and draw down.

Consulting engineers Arcus Gibb considered various embankment protection options, including timber, rip rap, pre-cast concrete elements, Reno mattress and gabion/Reno mattress combinations. A cost analysis and feasibility study was conducted, which included practical feasibility construction techniques and aesthetics.

Structural designs were completed using hand calculations and confirmed with computer-generated models. They were reviewed by an independent geotechnical engineer and confirmed by African Gabions using Maccaferri design software. The profile was tested against slip circle failure, assuming that the material behind the gabions was fully saturated.

Gabion and Reno mattress combinations were selected as the most cost-effective and viable solution because of their flexibility to meet with the geometrical constraints of the canal embankments, durability under harsh marine environments, and ability to lend themselves favourably to environmental rehabilitation.

The gabion and Reno mattress design also took into consideration the environmental requirement of 'no nett loss of salt marsh'. The existing areas of salt marsh were redistributed to newly developed areas in the ecobelt by transplanting the salt marsh sods onto the top Reno mattress section. This successful solution led to the increase of the salt marsh area.

Dewatering before construction

Ordinarily construction in the existing environment would have been impossible because of the close proximity of the ocean and liquefaction of the soil. Dewatering the area was the proposed solution. The dewatering process had to be maintained until the Reno mattresses and gabions were placed and backfilled. The process included pumping water into cofferdams and returning the water into the estuary three days later. It proved successful and enabled excavation of the canals and embankment construction.

SOLUTIONS

The civil engineering design required innovative, cost-effective solutions that are

aesthetically pleasing. In addition, the environmental requirements had to be taken into consideration.

Innovative

- **'Topless' gabions** The Terramesh system comprises a front face and reinforcement tail made from one continuous panel. At Thesen Islands the lid of the traditional 1 x 1 m gabion was replaced with a Terramesh tail serving the dual purpose of closing the gabion and forming a reinforcement layer in the backfill.
- **Horizontal tensioning** Aesthetics were enhanced through the use of longitudinal tensioning. This process involved assembling an entire row of gabions, packing the end compartment to act as an anchor, and then tensioning the entire row, using a fencing wire tensioner to take up all the slack in the mesh. The opposite end is similarly anchored. This process ensured good line and level, thus improving the final finish.

The innovative solutions contributed to the advancement of gabion technology by utilising double twist technology through the design and construction of gabions and Reno mattresses.

Aesthetically pleasing

- **Vertical tensioning and formwork** Gabions are traditionally manufactured with the double twist mesh in a horizontal orientation. At Thesen Islands all gabions were custom made with the mesh in a vertical orientation along the front face. This, together with the use of a steel frame supporting the gabion during the rock packing process, contributed to the impeccable finish achieved with the gabion construction.
- **Bracing techniques** Bracing is the process of tensioning the front and back of the gabion to prevent bulging of the front face. It is a technique used to contribute to the aesthetic appearance of a gabion. Traditionally binding wire is threaded through the front and rear faces and twisted in the middle to tension it. This can be a time-consuming task; hence at Thesen Islands, preformed heavy gauge braces were specified to ensure time- and cost-effective construction.

Cost effective

- **Unique rock specification** SABS1200DK specifies a limitation on the minimum effective diameter and maximum dimension of rock for gabion and Reno mattress construction. In doing so the SABS specification excludes rock that has a small minimum diameter and a large maximum dimension. This leads to a large percentage of rock being rejected on site. In this project, the larger dimension was accounted for, and rock that has a minimum diameter smaller than the mesh diameter but a maximum dimension greater than 150 mm but up to 300 mm was deemed acceptable. In this way, a larger proportion of the rock delivered was used with less wastage on site.
- **Combined mechanical and labour-intensive construction** The lower 230 mm Reno mattress was pre-filled before being placed mechanically into position, whereas the gabion and upper 170 mm Reno mattress were hand packed. The combination of mechanical and labour-intensive construction allowed canal development to take place at a rate of approximately 80 linear metres per day.

ENVIRONMENTALLY SENSITIVE SOLUTIONS

The design solutions have met the environmental and engineering objectives of the project and have enhanced the flora and fauna of the Thesen Islands development and the greater Knysna Estuary.

An environmental monitoring programme has been set up and studies are undertaken constantly.

- **Erosion and sediment control** The design and construction have allowed for the highest level of erosion and sediment control – commencing with the optimisation of the canal layout to ensure water velocities low enough to prevent scour of the canal banks, through the selection of gabion and Reno mattresses used with a geotextile filter to create an ecobelt in the intertidal zone.
- **Fauna and flora** Research has shown that the innovative design of the gabions may be acting as a macro biofilter. The rock-filled gabions provide surfaces for the growth of algal-microbial films, which may contribute to nitrogen and phosphorus uptake from the tidal flow, thus reducing phytoplankton growth potential in the canals. Considering the depth of the gabion walls, which are permeable to canal water, and the total surface area afforded by the millions of stones packed into the gabions, it is possible that the gabions will act as a macro biofilter. Since construction started in 2000 there has been an increase in the diversity of resident fauna and flora inhabiting the gabions, such as epifaunal macrofauna, green algae, and the common hermit crab. The site closest to the marina mouth, which is subjected to the greatest amount of flushing through tidal activity, has the most abundant and diverse fauna.

CONCLUSION

The Thesen Islands Development comprises more than 600 completed high-income houses, which have been sold out, a village lifestyle centre, an apartment island currently under construction, and an 11 ha landscaped park.

Advancements in construction techniques and gabion technology, as well as unique revegetation methods in the form of salt marsh transplantation, have made this project possible under extreme physical and environmental constraints. □

Challenging project earns a commendation

THIS AWARD WAS submitted on the grounds of the successful implementation, on time and within budget, of a demanding contract, requiring innovative construction techniques for the implementation of a design focused on minimal disruption to vehicle export activities, and respecting the historical importance of a section of the existing quay.

For operational reasons the cope line could not be moved significantly seawards, and for aesthetic and environmental reasons the designers elected to minimise the impact of construction on a portion of the quay wall consisting of an attractive and historical masonry-faced cope. The quay, which is dedicated to the export of motor vehicles through the Port of East London, complements the recently completed parking garage, connected directly to the vehicle assembly plant by bridge overpasses. This cluster constitutes a world-class vehicle assembly and export facility, to the great benefit of the Eastern Cape region and to South Africa in general.

The berthing depth required for the larger car carriers was 10,7 m below CD. This meant that the toe of the caisson quay wall would be undermined by 1,7 m. Because of the relatively constricted width of the river, a significant extension of the cope line was not acceptable to the National Ports Authority. The design challenge was therefore to find a compact solution in which the cope line was extended by the smallest amount possible, while ensuring that the wall would not be undermined by the required excavation at the toe

PURPOSE

The construction of the Port of East London Car Terminal on the west bank was completed in 1999, providing local motor manufacturers and the Daimler Chrysler group in particular with sufficient storage area for the export and import of motor vehicles. To enhance the motor vehicle handling capabilities of the port, the associated berth had to be deepened to accommodate larger car carriers.

THE WEST QUAY

The existing West Quay berthing structure consists of two designs. The original 150 m quay wall, located in the Buffalo River mouth, upstream from the later extension, was constructed 'in the dry' in the 1930s. This structure consists of an in-situ mass concrete wall with masonry

DEEPENING OF THE WEST QUAY AT EAST LONDON HARBOUR

Commendation in the category Technical Excellence in 2005

Submitted by Amatola Branch

ROLE PLAYERS

CLIENT The National Ports Authority of South Africa
PROFESSIONAL TEAM Protekon Design Services
MAIN CONTRACTORS Protekon Construction (Border Civil)
MAIN SUB-CONTRACTOR Dura Piling

▶ *Fully functional*

▶ *Above: Lunch break*
Left: Falsework for access to the cope face

facing. The wall was founded on solid rock at a depth of 10,7 m below chart datum (CD). (Chart datum, which is equivalent to low water ordinary spring tide (LWOST), is the reference level used in nautical circles, where the available water depth at low tide is critical to shippers, and CD is consequently used in preference to mean sea level (MSL) for reference.) The effective berth depth, however, was 9,5 m. The quay wall was subsequently extended eastwards, toward the river mouth, in the 1970s. The later quay wall had to be constructed 'in the wet', requiring a different construction

For operational reasons the cope line could not be moved significantly seawards, and for aesthetic and environmental reasons the designers elected to minimise the impact of construction on a portion of the quay wall consisting of an attractive and historical masonry-faced cope

Above: Overall view of the construction site
Right: The final product: view from the east bank

technique. The selected system was the floating caisson method, which consists of the construction of box structures at a remote site. These structures are then floated out to the construction site, lowered onto a prepared stone bed, and filled with sand. A reinforced concrete capping slab is then constructed in situ.

This wall was founded at an elevation of 9,0 m below CD. The founding material is crushed stone, the thickness of which varies between 0,5 m and 1,1 m. These differences in the construction of the quay wall are described in some detail as they had a direct bearing on the subsequent design of the berth deepening.

DESIGN APPROACH

The berthing depth required for the larger car carriers was 10,7 m below CD. This meant that the toe of the caisson quay wall would be undermined by 1,7 m. Because of the relatively constricted width of the river, a significant extension of the cope line was not acceptable to the National Ports Authority (NPA). The design challenge was therefore to find a compact solution in which the cope line was extended by the smallest amount possible, while ensuring that the wall would not be undermined by the required excavation at the toe.

The solution was dictated by the design of the caisson quay wall with its shallower founding depth and its crushed stone bed.

After the evaluation of several alternatives, the optimum solution was found to be the extension of the cope line seaward by 1,5 m, in combination with measures to secure the wall against overturning as a result of the additional destabilising forces arising from the addition of a relatively heavy cope beam, and the removal of toe resistance.

The solution called for a combination of measures. First, the wall would be anchored by inclined rock anchors drilled into the hard rock on the landside of the wall. These anchors would fulfil the dual purpose of restraining the wall against overturning and anchoring the cope beam extension to the existing cope beam. Because the existing cope beam is heavily reinforced, it could not be hacked to achieve a key. Dowels alone were insufficient to carry the added cope beam with its mass of 5 t/m. The balance of the required capacity was therefore achieved by the shear friction afforded by the rock anchors in combination with shear corbels cut into the face of the existing cope beam. Two 100 t anchors were provided per fender panel. As fender panels are spaced at 8,7 m, the average anchor spacing is 4,35 m. Although each anchor was tested to its full capacity, the lock-off force was set at 30 t, at which value the system was close to its initial equilibrium.

In the case of the mass concrete wall, the additional overturning forces were essentially due to the addition of the new cope beam only, as the foundation was not undermined. The required anchor forces were accordingly less, and anchors were provided at 8,7 m centres. Anchorage of the cope beam to the mass wall was complicated because there is no reinforcement in this wall. Because no tensile forces could be permitted, the new cope beam was tied to an anchor beam constructed behind the existing cope beam. This was achieved by constructing tie beams recessed into the existing cope beam. By adopting these methods, the bulk of the existing masonry has been retained.

CONSTRUCTION TECHNIQUES

Construction of the cope beam and rock anchors was bound to be challenging. The cope beam had to be constructed over water, requiring innovation in the temporary works design. The falsework required to carry the heavy cope beam constituted a significant challenge. An impressive travelling girder was fabricated for this purpose, complete with substantial counterweights consisting of water tanks. Similarly, for drilling the holes for the rock anchors, and installing the anchors work had to be carried out over water. Again, innovative temporary works design was called for from the contractors.

The greatest challenge, perhaps, was drilling the inclined holes through the caisson sand fill, the rubble fill behind the wall, and finally into rock that proved to be fractured. It is a tribute to the expertise of the contractor that by employing the most sophisticated drilling techniques available, all of the many challenges were overcome, and the construction was completed on time and within budget.

OTHER INFORMATION

Project management and quality assurance services were provided by the staff of the NPA. As in any project characterised by complex design and challenging site conditions, the successful conclusion of the project owes much to the dedication of these team members. That the construction was successfully carried out without interruption of the car-loading activities is attributed to excellent cooperation among the team members. □

Water leakage reduction now saving millions

THE SEBOKENG AND Evaton areas form part of the Emfuleni Local Municipality (figure 1) which is located to the south of Johannesburg. The areas are predominantly low-income residential areas supporting a population of almost 500 000 with approximately 65 000 connections, each of which supports waterborne sewage. At the start of the project, the residents experienced average water pressures of between 30 m to 60 m.

The areas are supplied with potable water from a 200 Mℓ concrete reservoir through two large water mains (1 000 mm and 675 mm diameter respectively) which run parallel to each other before splitting into the two discrete areas. The new pressure management installation is located just before the two pipes split into Sebokeng and Evaton respectively.

The combination of low income coupled with high unemployment has resulted in a general deterioration of the internal plumbing fittings over a period of many years. The poor quality fittings cause high levels of leakage, which was clearly evident from the unusually high levels of sewer flow during the late evening and early morning periods.

The minimum night flow of 3 000 m^3/h in July of 2003 for the Sebokeng/Evaton areas was one of the highest levels recorded anywhere in the world. This minimum night flow represented 75% of the average daily flow (ADD), which was measured to be 4 020 m^3/h. In a typical well-managed system with no leakage problems, the MNF to ADD ratio is usually in the order of 10% to 15%, which would suggest an acceptable MNF of less than 400 m^3/h. While this low MNF may be too optimistic an area such as Sebokeng or Evaton (due to various historical factors), the figures clearly highlighted the scale of the leakage problem in the area and that the potential

SEBOKENG/EVATON LEAKAGE REDUCTION PUBLIC PRIVATE PARTNERSHIP

Commendation in the category Technical Excellence in 2005

Submitted by Pretoria Branch

ROLE PLAYERS

CLIENT Metsi a Lekoa / Emfuleni Local Municipality
PROFESSIONAL TEAM WRP Pty Ltd and DMM cc in association
MAIN CONTRACTORS WK Construction
MAIN SUB-CONTRACTORS AND SUPPLIERS Platinum Consultants (structural design); Coplan (concept design); IRCA (health and safety); Batho Pele (public involvement); Alliance to Save Energy's WATERGY Programme (independent auditor); MIIU (legal issues); Standard Bank (finance)

OVERVIEW

The Sebokeng/Evaton Leakage Reduction Public Private Partnership was initiated by Mr Sam Shabalala of Metsi a Lekoa, the water services unit of the Emfuleni Local Municipality, which is located some 50 km south of Johannesburg.

The main objective of the project was to reduce leakage and levels of wastage in the Sebokeng and Evaton water distribution systems through a PPP between Metsi a Lekoa and the WRP/DMM joint venture. The project is the first of its type in South Africa where the consultant has taken on hundred per cent of the financial risk through an extremely complex PPP involving no fewer than 12 key role players.

While the technical aspects of the project are clearly worthy of note (it is now the largest installation of its type in the world) the project was submitted based mainly on the contractual, project management and financial aspects of the partnership between a municipality and the consultant. The model developed by the partnership is based not only on a detailed legal document but on mutual trust between the client and the consultant. Without such mutual trust, the contract would never have been completed and the project would not have been commissioned so soon after its inception.

The project represents a significant advance in such PPPs and offers a potential solution to many other projects throughout South Africa where development is being hindered and delayed through a minefield of red tape, general apathy within development institutions and municipalities, as well as a lack of support from the financial institutions who are unwilling to provide funding for such high-risk projects.

Through a continuous process of monitoring, very detailed planning and extremely stringent quality control procedures, the project was fully operational less than three months after the site was first established.

project

for saving water is significant.

The purpose of the project was therefore to reduce the unusually high levels of leakage and wastage of water in the Sebokeng and Evaton areas which resulted in a water bill to the municipality from the bulk water supplier of approximately R120 million per annum.

It should be noted that the high leakage levels inside the properties resulted in water bills that few residents could afford to pay – this led to very low levels of payment, and little attention, if any, was paid to the household leakage. It is a typical cyclical problem in which one issue leads to the next. The only solution is to break the cycle of high leakage, after which the water bills will reduce. This in turn will eventually lead to realistic payment levels. In addition, the high levels of wastage resulted in excessive sewer flows necessitating the upgrading of the local sewage treatment works at enormous expense.

The project was the first of its type where a public private partnership (PPP) was formed to fast-track such a leakage reduction activity. The installation is also thought to be one of the largest advanced pressure control installations in the world and is addressing what was one of the highest minimum night flows ever recorded for an area the size of Sebokeng and Evaton.

The project represents the first phase of a long-term strategy to reduce water consumption (and energy consumption associated with the pumping from the raw water

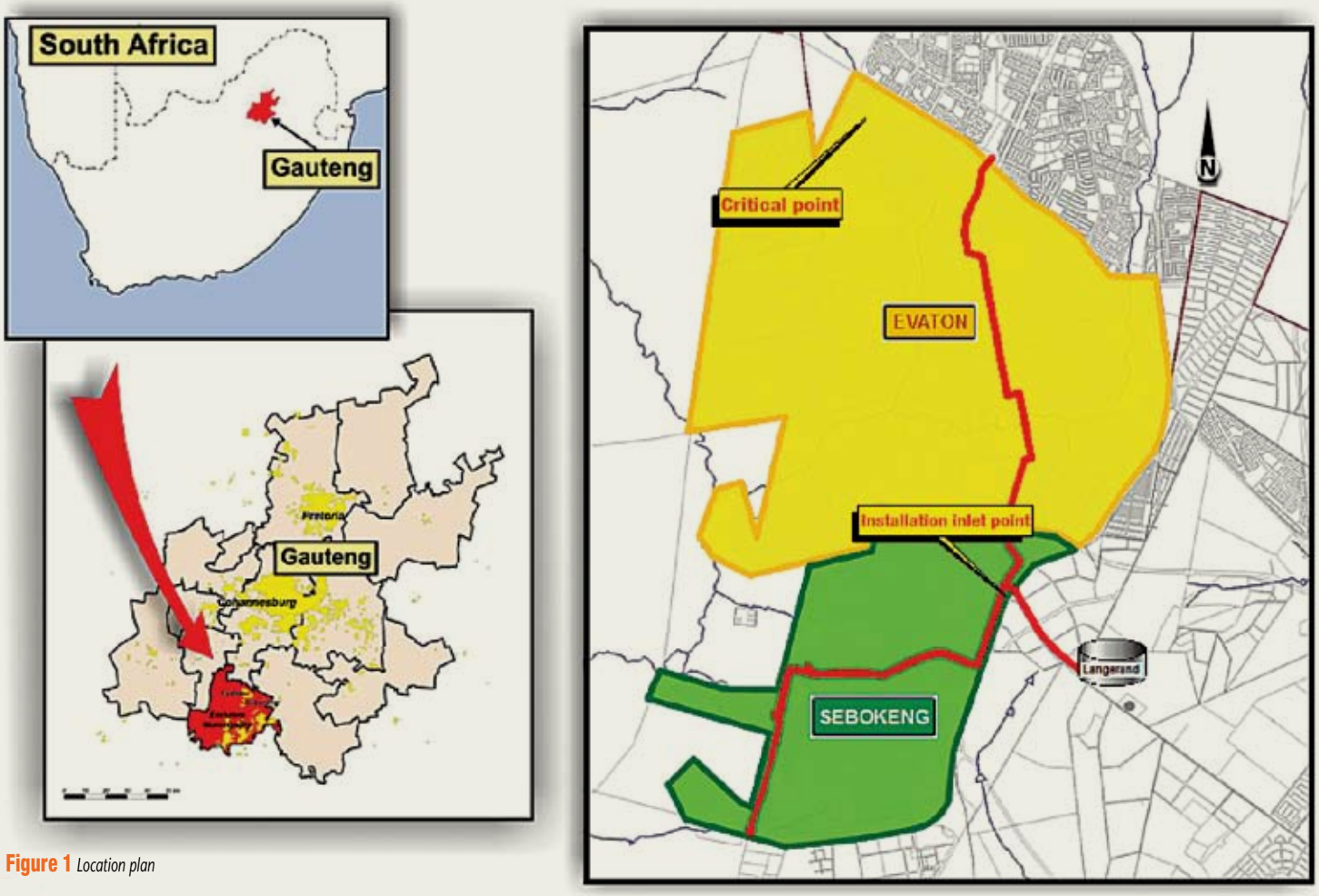


Figure 1 *Location plan*

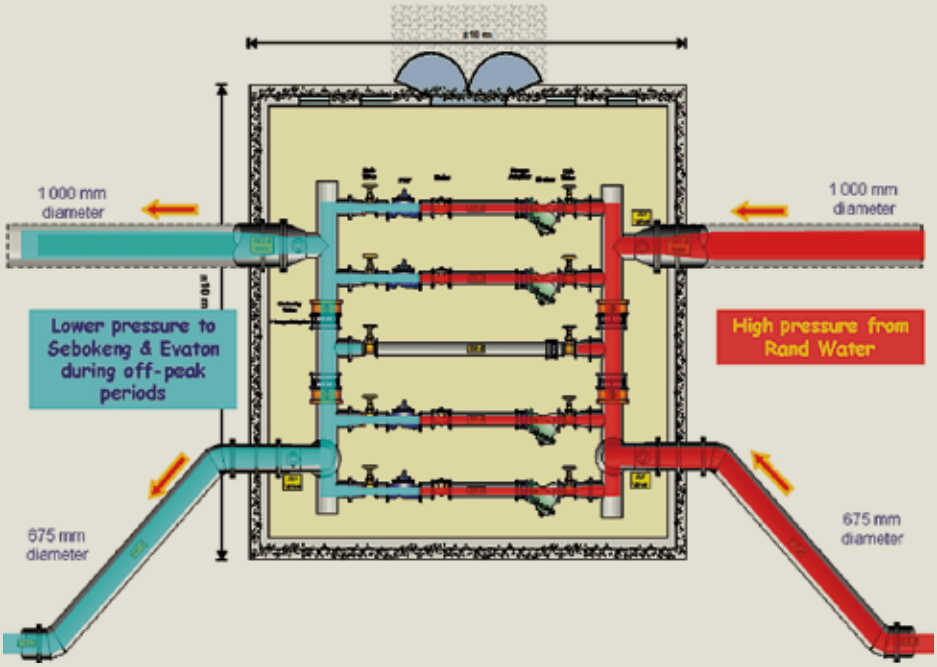


Figure 2 *Plan layout of the Sebokeng/Evaton installation*

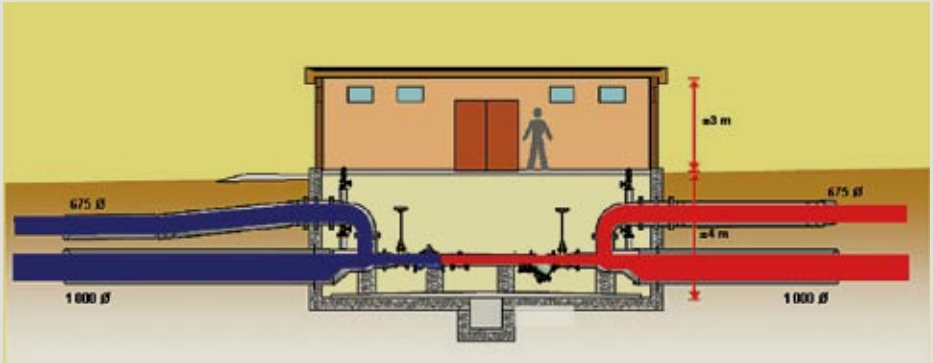


Figure 3 *Elevation layout of the Sebokeng/Evaton installation*

source) in the project area to normally acceptable levels, which in turn will lead to realistic levels of payment and, finally, to a sustainable and solvent water utility. Without the project, the water supply into the Sebokeng/Evaton areas would most likely have been reduced to an intermittent supply within the next few years in an attempt to reduce costs and water leakage levels.

WHY PRESSURE MANAGEMENT?

Most water reticulation systems are designed to provide a minimum pressure at all points in the system throughout the day. This means that the minimum pressure (normally specified in the local by-laws) occurs at some critical point in the system, which is often either the highest point in the system or the point furthest from the supply.

All water distribution systems experience significant fluctuations in demand throughout the day, with morning and evening peaks coupled with periods of low demand during the night and sometimes also during the early afternoons. Many systems also experience seasonal fluctuations caused by climatic factors that influence irrigation requirements or by holiday migration that can significantly influence the demand for periods of days or weeks at a time.

Since the water supply systems are designed to provide a set minimum pressure throughout the day, they are generally designed to meet this pressure requirement during periods of peak demand when the friction losses are at their highest and inlet pressures at their lowest. As a result of this design methodology, many systems experience higher pressures than necessary during the remaining non-peak demand periods. This is evident from the fact that major burst pipes tend to occur during the late evening and early morning periods when system pressures are at their highest.

THE INSTALLATION

From the outside, the installation is unimpressive and similar to a large concrete box – 10 m long by 10 m wide and approximately 5 m deep. Inside it contains the various pipes and valves required to manage the water pressures into Sebokeng and Evaton. Since leakage is driven by water pressure, any reduction in pressure, even if only for a short period each day, will result in lower leakage as well as fewer new burst pipes. If water pressures can be lowered significantly during the off-peak periods (especially at night) then very significant savings can often be achieved.

The Sebokeng/Evaton project is thought to be the largest project of its type in the world and the savings provide a pay-back period of less than three months. The construction was completed using labour-based

practices in order to maximise the employment opportunities to the local communities. In addition, a series of more than 50 public meetings were presented in the local communities to inform the residents of the project and to address any concerns they had with regard to the project. Through the detailed public consultation process, the project was completed without any incidence of theft or intimidation of any nature and all residents are in full support of the project – a key factor in its success.

The installation involved cutting into the two existing water mains and replacing a short section with a series of smaller pipes and associated valves, meters, strainers, etc. The new pipework and fittings enable the pressures into the two areas to be controlled in such a manner that the water pressures can be reduced during off peak periods and restored to the original high pressures during periods of high demand. In this manner, the leakage from the system as well as the incidence of new burst pipes was greatly reduced.

PROJECT TEAM

The project involves a unique interaction between 12 main role players in a sophisticated and complex PPP in which the consultant has taken on hundred per cent of the financial risk of the project.

- The client is Metsi a Lekoa, which is the ring-fenced water utility formed by Emfuleni Local Municipality and is managed by CEO Mr Sam Shabalala.
- The funds required to complete the project were raised privately by WRP and DMM through Standard Bank of South Africa.
- The establishment of the contract on which the project was based was funded and facilitated by the Municipal Infrastructure Investment Unit (MIIU).

Ronnie Mckenzie of WRP and Metsi a Lekoa's Sam Tshabalala signing the official contract

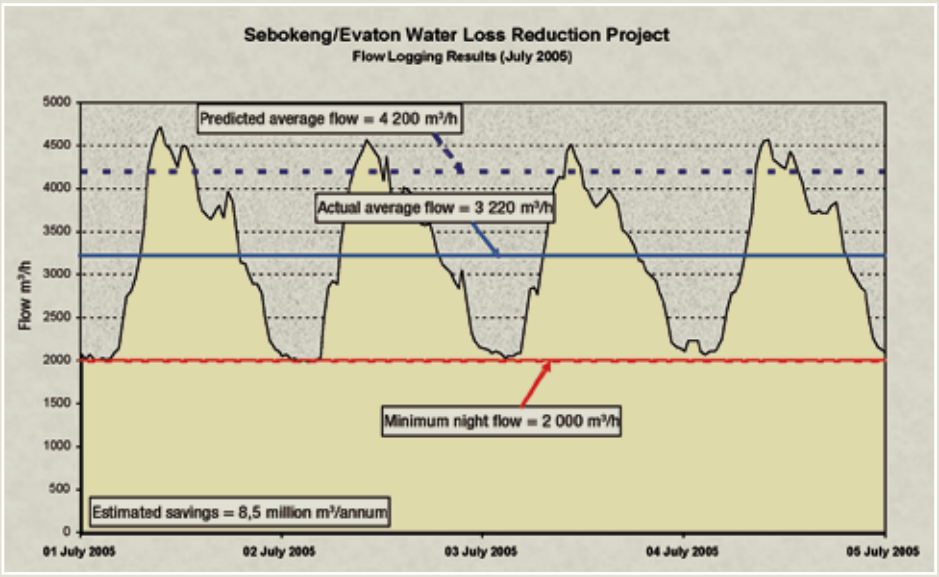


Figure 4 *Initial savings from the Sebokeng/Evaton project*

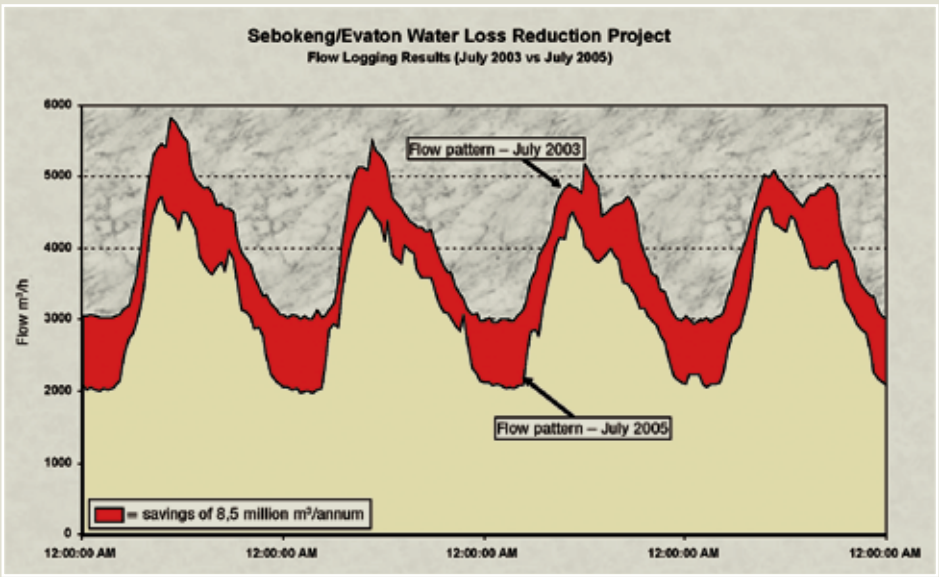


Figure 5 *Comparison of water use in July 2003 to that in July 2005*

The consultant's team comprised WRP Pty Ltd in association with DMM. Additional specialist support was provided by Platinum Consultants and Coplan. Wide Bay Water in Australia provided support as a specialist reviewer. Other team members included IRCA, Batho Pele and WK Construction (main contractor).

RESULTS

The project cost almost R5 million to complete and the initial results showed savings in the order of R20 million per year (as shown in figure 4). Average water savings achieved through the project exceeded 8 million m³/annum, which in turn represented approximately 20% of the total water supplied to the area.

The savings are shown in figure 5 (the shaded portion), which is based on the initial logging results from July 2003 compared to the corresponding period in July 2005. It should be noted that the graphs do not take the escalation of the water demands from 2003 to 2005 into account.

TEAM EFFORT

The project has been a true team effort involving many organisations and individuals. Its success is largely due to careful planning and design, proper execution and mutual trust between the client and project team. □

Amadiba Road
Uplifting the community

AMADIBA ROAD PROJECT

Commendation in the Community Based category in 2005

Submitted by Pietermaritzburg Branch

ROLE PLAYERS

CLIENT SANRAL (Eastern Region)
PROFESSIONAL TEAM CSIR-Transportek (Durban) (now CSIR Built Environment)
MAIN CONTRACTOR Amadiba community
MAIN SUB-CONTRACTOR Amadiba community – haulage contractors

The Amadiba Road project is an excellent example of how civil engineering can contribute to the overall development of communities. Not only has it ensured complete community involvement, it has also produced innovative engineering solutions that promote labour-maximising construction. The project has been sensitive to the environment and has preserved the natural beauty of the area. The Minister of Transport, Jeff Radebe MP, officially opened the road in May 2004

AMADIBA ROAD is a 40 km long gravel access road project in the Eastern Cape. The road begins on the R61 (Bizana/Wild Coast Casino main road) and ends near the Mtentu River mouth. The area is one of unspoilt natural beauty and plant life, being in the Pondoland Centre of Endemism, so special care had to be taken not to affect the environment. The design thus had to be sympathetic to this and to be of low impact. This was achieved by attention to drainage and avoiding the cuts and fills common to conventional construction.

An NGO operating in the area asked the CSIR for assistance in addressing the people's need for a road. The CSIR approached the South African National Roads Agency (SANRAL) for funding, which came from the National Poverty Alleviation Fund. The construction cost of the 6 m wide road, including wages, materials, plant and site overheads, was R198 000 per km, excluding VAT. The project was a difficult one that needed a certain amount of innovation, especially in the areas of contract type, causeways and drifts.

SOCIAL ECONOMIC DEVELOPMENT

The Bizana Municipality Integrated Development Plan indicated that at the time the municipality had a population of 235 326. The area is 2 806 km^2 and the population density was 84 per square kilometre. People between the ages of 20 and 60 constituted 33% of the population. Unemployment in 1999 stood at 75,6%.

The area was therefore ideal for an employment creation project. The ward in which it took place had a population of 15 542. The number of people eligible for employment was approximately 5 900, and of these some 75% (4 425) were unemployed. The project created job opportunities for some 1 700 people, which constituted 38% of the unemployed. The project thus had a huge impact on the area.

Taskwork was used where possible throughout the project. Of the total funds spent on construction 55% were spent on wages, 5% on local goods and services, and 20% on local haulage contractors. This meant that 80% (or R6,3 million) of the funds remained in the area, with the consequent multiplier effect.

CAUSEWAYS

The Mnyameni River is located midway on the route and often became impassable after rain. Here a 36 m long reinforced concrete arch causeway was built entirely by semi-skilled local labour. This was considered the most suitable form of construction, because the cost is similar to a causeway with pipes, but the flow before overtopping was calculated to be 80 m^3/s per second as opposed to the 27 m^3/s of a pipe solution, resulting in a causeway that is much more open during heavy downpours. The causeway was anchored down by means of dowel bars set in holes drilled into the rock base. The causeway is 5,25 m wide and was cast in 2,3 m sections, each containing a 1,9 m diameter arch.

DRIFTS

Substantial use was made of drifts on the project, as they were more cost effective than pipe culverts. They carry much more flow and are easier and quicker to build. Also, fill would have to be brought in to cover pipes. A total of 64 drifts were built. The drifts have the desirable effect of reducing speed on the road as they act as inverted speed humps. In general they were 20 m long with the middle 15 m being concreted. The concrete is placed in a grid of geocells, which creates a concrete block pavement of uniform thickness. The cross-section consists of two s-shaped curves with a flat bottom in the middle.

GRAVELLING

Such earth roads usually need a gravel surface layer, and the Amadiba Road was no exception. The soil in the area is gener-

ally sandy above the Msikaba Sandstone Formation. Gravel sources are scarce. In some places a thin seam of pea-gravel is found below the topsoil and above the sandstone. This seam was used extensively for the gravel layer. The topsoil was removed and stockpiled and replaced when the gravel had been removed, leaving the landscape basically unchanged in this environmentally sensitive area.

TRAINING

Training comprised modules for:

- Laying stormwater pipes
- Building head-walls and wing-walls
- Constructing sub-surface drains
- Steel fixing
- Erecting formwork
- Concrete batching and placing
- Gabion installation
- Stone masonry construction
- Small plant operation
- Entrepreneurial training

Technical training was commissioned at various stages of the project and allowed the trainees to receive hands-on experience during the construction process. In addition, three senior community members were enrolled on a project management course towards the end of the job. This has enhanced their ability to manage the maintenance of the road and to undertake projects other than roads.

PROJECT STEERING COMMITTEE

Throughout the process, all stakeholders had to be kept informed and were given the opportunity to make inputs to protect their interests. The PSC for this project consisted of the following constituents:

- **Amadiba Coastal Community Development Association (ACCODA)** is a local body that has formed a trust with the resulting legal status. It was the major role player in the PSC and was responsible for monitoring construction on behalf of the CSIR.
- **SANRAL (Eastern Region)** was the client.
- **CSIR-Transportek** was responsible for the implementation of the project.
- **Amadiba Tribal Authority** Traditional leaders had to be consulted as they still have much influence in the area.
- **Amadiba Coastal Sub-tribal Authority** The second half of the road fell into this zone.
- **Five tribal wards** The people in these wards are fiercely defensive of the right to decide who may work in their area. They reserve it strictly for their own people.
- **Mbizana Local Municipality** will play a major role in the maintenance of the road.
- **O R Tambo District Municipality** While their offices are a long way from the project, they have overall responsibility for the network of which Amadiba Road forms part.
- **Eastern Cape Department of Public Works** As with O R Tambo Municipality, the road is relevant to their network and it is in their interest that it is well maintained.
- **Department of Nature Conservation** Because the road crosses an area of value and nature tourism, they had an interest as well.

The road brought together many of the role-players in the area. It now acts as a catalyst for further development, indicating the important role played by transport. □

Causeway construction in progress showing semi-skilled labourers at work

Triumph for South African engineering expertise in Africa

THE KAGERA SUGARMILL and sugar estate are located on the Kagera River, near Lake Victoria, in the remote north-western region of Tanzania.

Originally government owned, the mill was first commissioned in 1982, but fell into disuse in 1996. It remained out of operation until it was purchased by the current owner in 2002.

The purchase and rehabilitation plans were fully supported by the Tanzanian government as these were in keeping with NEPAD's primary objective of accelerating the eradication of poverty in Africa. They were also intended to initiate the economic growth of the region with the revitalisation of an existing agro-industry through African ownership and leadership.

The mill rehabilitation was also planned to provide access to a mill for small cane growers as well as local production of a commodity that was previously imported.

PROJECT SUCCESS

The project internal rate of return (IRR) was originally projected at 20%. Current production would indicate that this will be achieved and thus prove the economic sustainability of the project.

In addition to employment opportunities during construction, the project generated employment for more than 1 700 regular employees and over 2 600 seasonal employees. Taking into consideration em-

KAGERA REHABILITATION PROJECT

Commendation in the category Technical Excellence in 2005

Submitted by Durban Branch

ROLE PLAYERS

CLIENT Kagera sugar estate
PROFESSIONAL TEAM Bosch Projects in association with Stemele Bosch Africa
MAIN CONTRACTORS John Thompson Africa; Forges Tardieu; Estim Construction; Africscan; E&R Maintenance; T L Irrigation; ABB South Africa

OVERVIEW

Stemele Bosch Africa (SBA), in association with Bosch Projects, received a highly commended award in the international projects section at the national awards function in Midrand in October 2005.

'This award for the Kagera Rehabilitation Project in Tanzania is a great honour for the B & A Group companies involved,' said Sid Turner, national operations director of SBA. 'This prestigious project, which was implemented on an engineering, procurement and project management basis, involved the rehabilitation of the mill to its original capacity of 100 t cane per hour, with an eventual capacity of 200 t cane per hour.

'This rehabilitation task, which aligned with NEPAD objectives, shows how project and logistics management meets the requirements of large fast-track multi-disciplinary projects in remote parts of Africa. It also represents success for South African engineering expertise in Africa, with the first commercial sugar being produced within 16 months of the project go-ahead.'

The Kagera project included the installation of infrastructure for the irrigation of 3 200 ha on the sugar estate to support the expansion of the mill. Without irrigation, cane supply to the mill is weather dependent and an economic risk to viability. It has proved efficient to use the river as a distributed source. Three pump stations were selected to service this new centre pivot irrigation system and the pipe distribution system uses the latest irrigation software.

Power for irrigation is drawn from the mill, which generates its own power during the crushing season and draws from the local grid in the off-season.

The Kagera project posed several challenges, particularly in the field of project management, logistics and management of local contractors on civils and river works, with all contracts being managed from the project office in Durban.

The Kagera factory was officially opened by the president of Tanzania, His Excellency Benjamin Mkapa, in November 2004.

ployment generation multipliers, total employment is estimated at more than 6 000. Given that wage earners will have a number of dependants, the completed project is estimated to support at least 36 000 people.

The skills development and training programmes set up by management (Bosch Projects has a three-year operations management contract) will enable the local community to become increasingly less reliant on outside skills employment.

TECHNICAL PROJECT OBJECTIVES

- To rehabilitate the Kagera sugarmill to its original capacity of 100 t cane per hour (TCH) with provision for expansion to an eventual capacity of 200 TCH
- To stabilise and vertically expand the cane supply by putting 3 200 ha of cane under irrigation, with the ultimate aim of 7 100 ha under irrigation in the second phase of development

PROJECT DETAILS

Owing to its remote location and because of the need to integrate new designs and equipment into existing ones, the project presented unique design and construction challenges.

Sugarmill

The mill was originally designed for 100 TCH with the flexibility of upgrading to 160 TCH.

The project objective was to initially rehabilitate the mill to 100 TCH, but to allow for future expansion to 200 TCH. This required the careful selection and sizing of factory layout and equipment to ensure that any 'wasted' costs were kept to a minimum when future expansion takes place.

Design considerations

Given that the mill and equipment had been out of operation since 1996 and were in various stages of disrepair, an extensive evaluation was initially undertaken to ascertain the re-usability and/or need for servicing, upgrading or replacement.

The remote location of the site further influenced technical (and commercial) decisions to ensure that operational protocol was appropriate. These included limiting spares requirements, providing strategic standby equipment, and employing simple robust designs and basic but comprehensive operational procedures.

As a result, the following major technical decisions were taken:

- To redesign, upgrade, retube and install two 75 TPH bagasse-fired boilers together with ancillary fuel firing
- To refurbish two 2,5 MW turbo alternator sets complete with instrumentation and control
- To purchase a new 30 TPH sugar drier, sugar handling equipment and bagging facility
- To replace the complete electrical system including transformers, MCCs, cables and motors
- To purchase new A, B and C centrifugals
- To build a new cane weighbridge and associated roadworks

The integration of new/refurbished equipment with existing equipment was a particular challenge and required detailed coordination of site measurement and off-site fabrication to minimise site rework and potential delays to an already fast-track programme.

Given the restricted budget, it was important to review technical solutions commercially, and not merely replace unsuitable equipment.

More than 1 500 drawings were prepared in the design office.

Procurement and logistics

Because of the design programme and sequence, together with the wide range of specialised equipment to be refurbished and/or procured, a main contractor option was not considered a practical contracting plan. Instead, it was decided to place individual contracts (63) for equipment, services and construction to be coordinated by the professional team.

In total, contracts to the value of US$26 million were placed, including 55 contracts valued at R140 million from South African contractors and suppliers.

Management requirements for logistics and shipping/delivery schedules to meet the fast-track programme resulted in the following strategy:

- A limited number of shipping lines were identified and issued with specifically defined shipping instructions.
- A single reputable road transport company with a sound track record was ap-

pointed. At the peak period of the project, 40 dedicated trucks were used to deliver containers (493 in total) to site.

- The receipt and unloading of containers was carefully controlled by the site team to ensure that damage was kept to a minimum and turnaround times optimised.
- It was ensured that the project had the full support of the Tanzanian government and that all the necessary approvals, procedures, etc, for importing equipment were agreed well in advance.

Construction

Construction on site commenced in February 2004. In addition to the logistical challenge of equipment and materials delivery, the site team were responsible for coordinating the site activities of up to 400 contractor staff and managing the provision of site accommodation, meals and transport.

Commissioning and operations

The factory was re-commissioned on 8 October 2004 and commercial sugar produced on 17 October 2004. It was inaugurated by the president of Tanzania, His Excellency Mr Benjamin Mkapa, on 11 November 2004.

Since commissioning, the mill has exceeded its design capacity of 100 TCH and has produced in excess of 15 000 t of sugar.

IRRIGATION

The Kagera sugar estate is situated at an altitude of 1 200 m and has a mean annual rainfall of 813 mm. Rain is bi-modal, with the main peak in March/April and a less pronounced peak from October to December.

Without irrigation, a rain-fed cane supply to the mill is weather dependent and is deemed an economic risk to the viability of the project. It was therefore vital that a significant portion of the estate should be put under irrigation.

Design considerations

The topography of the site is such that there is an immediate lift of 20 m to 25 m out of the Kagera River course to a relatively flat plain on which the sugar cane is grown. The soils suited to the cultivation of cane under irrigation lie in a narrow band, no more than 3 km to 4 km in width, parallel to the Kagera River over a length of approximately 17 km.

The Kagera River has a sustained supply of water along its entire length and is adjacent to the lands to be irrigated. It was therefore economical to use the river as a distributed source and pump water directly from the river to the irrigation systems.

The relatively flat nature of the topography and generally sandy soils favoured centre pivot irrigation, which had an advantage over the other irrigation systems that were evaluated because of its irrigation efficiencies, low power requirement, and flexibility of operation. It is also less susceptible to theft.

The pump station's operating protocol was kept as simple as possible with minimum automation because of its remote location.

The power for the irrigation is drawn from the mill, which generates its own power during the crushing season and draws from the local grid in the off-season.

Construction

The construction stage of the project was divided into five irrigation zones, each of which had a specific completion date that was integral to the cane planting and cutting programme on the estate and the completion date of the various irrigation contracts.

FINANCIAL

The project was completed within the established budget. □

Robben Island harbour improved

ROBBEN ISLAND is an internationally renowned landmark and a symbol of the political changes that have taken place in South Africa in the past 10 to 15 years. The island is located in Table Bay, some 12 km north of the Port of Cape Town. It covers about 5 km^2 and houses disused prisons and other structures that reflect the island's past human occupation.

Until 1997 the island was under the administration of the South African Prison Services. Today the island is administered by the Robben Island Museum and is used primarily as a tourist destination. Typical visitor numbers are some 350 000 per year (2002) and during the peak season ferry trips are undertaken throughout the day at half-hour intervals. Murray's Bay Harbour plays an important role in the ferrying of tourists and is the main transport link for freight and other supplies to the island.

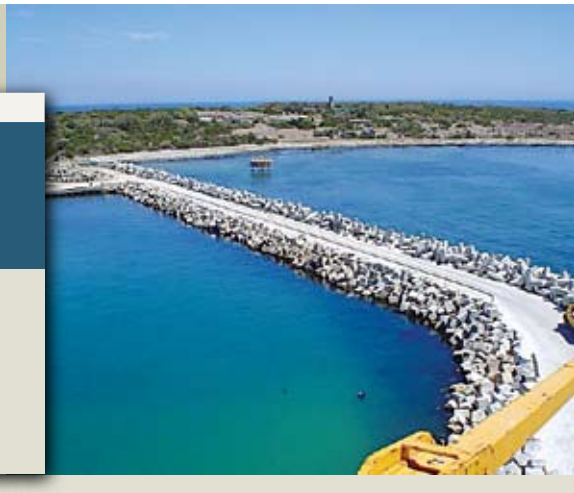
The harbour is located on the eastern side of the island, where it is protected from the dominant southerly to south-westerly swells for which Table Bay is well known. The harbour at Murray's Bay originated from a timber jetty that was constructed in the early 1940s, during World War II, for off-loading coastal defence guns. The harbour was reconstructed and extended in 1956 as a naval harbour. In the 1980s the South African Navy carried out repair work on the breakwaters. Further improvement works were carried out in 1993/94 and in 1995/96 the secondary breakwater of the harbour was armoured with 6 t dolos armour units.

DESCRIPTION OF THE HARBOUR

The harbour covers a total water area of some 6 ha, protected by a 535 m long main breakwater on the northern side and a shorter 280 m long secondary breakwater on the southern side. The harbour contains two quays: the main quay on the southern side of the harbour, some 230 m long, and another 275 m long quay on the eastern side. These structures consist of vertical concrete quay walls. The passenger and cargo transshipment area is located along the main quay, which also houses the

MURRAY'S BAY HARBOUR, ROBBEN ISLAND

Submitted by Western Cape Branch in the category Technical Excellence in 2005



ROLE PLAYERS

CLIENT Department of Public Works
PRINCIPAL AGENT Entech Consultants
CO-CONSULTANTS Manong and Associates
MAIN CONTRACTORS Murray & Roberts Construction

OVERVIEW

The harbour improvement project on Robben Island provided unusual challenges to both the engineers and the contractors in a number of aspects:

- Since the project was carried out on a world heritage site with significant political sensitivity, the engineering solution required adjustment to accommodate the heritage aspects of the island. Compromises were also required from the side of the Robben Island Museum to ensure that the essential upgrades to the harbour could be implemented.
- Construction on an island is unusual in the South African context. The final solution, as well as the construction methodology, was thus significantly impacted by transportation logistics on an island where all equipment and construction materials, including water, had to be supplied from the mainland.
- The need to reduce the impact of construction activities on the island meant that as many of the preparatory construction activities as possible had to be undertaken on the mainland, thereby making maximum use of pre-casting and the transportation of finished products across the 12 km Table Bay seaway from the Port of Cape Town to the island.
- The phasing of the construction not only had to take weather-related aspects into consideration, but the harbour had to remain operational for the important tourist trade and the transportation of normal goods and workers at the museum. In addition, the breeding requirements of the birds that use the breakwaters in the harbour area, especially the threatened bank cormorant, impacted on the scheduling of work. Alternative breeding areas, including a special bird platform, had to be provided during construction activities.

The project provides Robben Island with a low-maintenance long-life harbour that will offer better and safer facilities for the many visitors to this world-renowned heritage site.

buildings and other facilities used during the period that the island served as a prison.

The main breakwater is a rubble mound structure and, before the implementation of this project, was constructed of 1 m^3 concrete cubes (2,4 t) as the seaward and leeward armour layer with only a very limited rubble core. The cubes were in a very poor structural state and many broken and disintegrating units were visible. The slopes of the structure were very steep (slope > 1:1) as a result of the loss and movement of the armour layer, and during storm events armour blocks were often washed over the concrete capping and into the harbour.

THE PROBLEM

Operators of the ferries between Cape Town harbour and the island have complained for many years regarding conditions inside the harbour. The reported problems were mainly about excessive movements of vessels along the quay, causing damage to the mooring lines, bollards, fenders and the vessels themselves, and making it dangerous to board passengers on occasion. These problems are mostly related to excessive wave penetration and the development of long wave resonance conditions inside the harbour. In addition, navigation problems were reported in the entrance area, where siltation had reduced the water depth. A major concern, however, was related to the structural deterioration of the main breakwater and the potential catastrophic failure of the wave protection structure.

Repair and improvement options for the harbour were studied in 1996/97. The focus of these studies was on the nautical problems, as well as structural investigations of the existing structures.

WAVE STUDIES

Wave measurements were done in Table Bay at a position to the north-east of the harbour in a water depth of 12,5 m. Simultaneously, wave recordings were taken at a location inside the harbour. Measurements of the undisturbed deep-water wave height approaching Table Bay were available from a wave monitoring station with a long-term dataset of some 20 years.

The measurements were supplemented by numerical and physical modelling. In a wave refraction study, deepwater wave conditions were transformed to near-shore conditions in the vicinity of the harbour. These studies confirmed problems associated with the unique position of the harbour on the leeward side of the island that had already been identified. Two, almost opposing, directions of wave approach occur: the dominant south-westerly swell conditions transforms into south-easterly waves at the harbour, while the storm waves from north-west transform to local north-easterly wave directions. In addition, in summer the persistent south-easterly winds generate local seas over the 10 km fetch from the mainland. The combination of wave conditions makes it difficult to achieve the required wave protection for all conditions.

CONCRETE QUALITY INVESTIGATION

The existing breakwater was armoured with concrete cubes of 2,4 t mass, manufactured in different batches between the 1940s and 1980s. Material quality tests were conducted to assess the suitability of these concrete armour cubes for the reconstruction of the breakwater. Small diameter cores were extracted from a representative sample and compressive strength tests carried out. In addition, non-destructive ultrasonic testing was done to assess concrete density and relate these results to the concrete strengths obtained from the compression tests.

Most of the concrete blocks were found to be of inadequate strength and quality to guarantee continued service as main armour on the breakwater. Core strengths varied between 12 MPa and 42 MPa, indicating high variability in the material. Only 20% of the blocks had strengths in excess of 25 MPa, which is considered the minimum for use in the active wave zone.

Below: Barge with construction materials entering the harbour Insert left: Repaired main breakwater. The temporary bird platform can be seen in the background

Left: Construction yard on the island
Right: Repairs of the main breakwater are under way
Insert below: Construction of the new T-jetty. Extension of the main breakwater in progress in the background

RECOMMENDED SOLUTION

Following the technical studies, a solution was developed which consisted of the following aspects:

- **Reinstatement of the structural integrity of the breakwater** This was to be achieved by the reconstruction of the armour layer of the main breakwater of the harbour. The 2,4 t concrete cubes were to be removed and replaced by 10 t dolos or Accropode units on a properly designed stone underlayer
- **Improved wave conditions inside the harbour** Various alternatives were developed to reduce wave action as a result of swell waves, local wind-generated waves, and long waves and the development of basin resonance. They consisted of the addition of various structures to reflect or absorb wave energy. The most cost-effective solution consisted of the following structures:
  - Extension of the main breakwater by a 40 m rubble mound section
  - Extension of the secondary breakwater by a 30 m stub section
  - Construction of a 50 m T-jetty perpendicular to the main quay at a location 50 m from the eastern end of the quay
  - Construction of a second 40 m long T-jetty a further 80 m to the east
  - Construction of a revetment slope along the eastern quay wall

ENVIRONMENTAL AND HERITAGE ISSUES

Funds to implement the improvement works recommended in 1997 were made available only in 2002. By this stage the user community and the use of the harbour had changed completely from the time that the initial studies were undertaken. Robben Island Museum had taken over the administration of the island and it had become a tourist destination and a world heritage site. Consequently a reassessment of the improvement measures was required. Heritage and environmental issues were now important considerations in addition to the engineering aspects. The following points are noteworthy:

- No construction materials could be sourced from the island, and thus all materials, including water, had to be shipped to the island.
- The tourist trade was to be impacted as little as possible by the construction works and hence the construction areas had to be kept to a minimum. Restrictions were also placed on the movement and housing of construction workers.
- From a heritage perspective, the changes were to have as little impact as possible on the visual character of the harbour, and certain vistas within the basin had to be maintained, thus ruling out some engineering solutions. The internal walls of the breakwater had to be armoured with the existing concrete cubes and any new structures had to blend in with the existing structures, but in such a way that the various 'layers' of construction could be distinguished.
- Some of these old breakwater armour blocks had political inscriptions and had to be retrieved for preservation. These will be displayed in a commemorative wall to be used by Robben Island Museum, with interpretive signage for education.
- The landward section of the main breakwater contained the remains of a 'Cape gauge' railway that was used to transport building material during the construction and maintenance of the original structure. A section of this rail track was reinstated as part of the project.
- The island hosts 132 bird species and is the nesting site for many seabirds, including the African penguin and the endangered bank cormorant. The cormorant uses the main breakwater as a nesting site. The construction programme was phased to avoid disturbing the birds during the nesting season. In addition, an offshore platform was erected next to the breakwater to act as an alternative nesting site during the construction phase. Special measures were also introduced to avoid disturbing the colony of penguins that nest next to the root of the main breakwater, including penguin-proof fencing to discourage these inquisitive birds from entering the construction site.

REVISED SOLUTION

As a result of these requirements the elements of the harbour improvement measures were adjusted. Owing to the relatively remote location of the harbour, the main philosophy of the improvement works was to use well-proven and robust techniques that would limit the need for future maintenance. Furthermore, to improve mooring conditions within the harbour, the main requirement was to limit wave penetration into the harbour basin, thus sheltering the main quay from short and long wave action. The final project consisted of the following major elements:

- Restoration of the main breakwater by replacing the 2,4 t concrete cubes with 10 t dolos units
- Extension of the main breakwater by an 80 m section employing a series of four caisson units
- Construction of a 60 m long caisson T-jetty inside the harbour, perpendicular to the main quay, also using caisson units
- Construction of a floating jetty or pontoon, adjacent to the T-jetty, to assist with passenger movement

The revised solution simplified the constructability of harbour improvement and achieved satisfactory results for attenuation of surging and improving harbour entry conditions.

- Instead of extending both main and secondary breakwaters (40 and 30 m respectively) only the main breakwater was extended by 80 m.
- Instead of two T-jetties extending from the main quay, this was consolidated into

a single longer jetty along with a parallel and adjoining floating jetty to improve the safe transfer of passengers.

- To limit construction activities on the island itself, all harbour extensions were done with caisson structures built in Cape Town Harbour and floated across Table Bay to Robben Island.

CONSTRUCTION

Project implementation

The project implementation was divided into two phases. Phase I was concerned mostly with the rehabilitation of the northern main breakwater, whereas Phase II consisted of extending the main breakwater, and providing a T-jetty off the main quay and a floating pontoon for efficient and safe passenger transfer.

The phased approach was driven mostly by funding constraints and environmental approval processes for the various elements of the project. In terms of environmental legislation, the approval process for rehabilitation and/or repair is less complex than for upgrading and/or improvements.

The phased approach facilitated a step-by-step design process and detailing. Both phases were awarded through a tender process and thus the cost of works remained commercially competitive and within budget.

Both phases were won by Murray & Roberts Construction (Pty) Ltd, a company that has considerable experience in marine works.

Primary constraints

From the outset, the foremost constraint for construction is that Robben Island is an island. All design concepts for implementation had to take this into account. In addition the island is ecologically sensitive and a world heritage site.

It was thus incumbent on the designers to structure the project implementation so that the impact of construction on the island was minimised. As many activities as possible were performed on the mainland (Cape Town) and 'finished' items were transported across the bay to Robben Island, a distance of some 12 km. This premise also appears to have been the correct approach from a cost point of view by reducing the overall cost of mobilising plant, materials and labour to the island.

Construction sites

The overall construction took place on several sites. For Phase I the contractor leased a site within Cape Town harbour to establish a pre-cast yard for the dolos armour unit production and shipment of finished dolos units and rock armour. Here some 3 000 dolos armour units of 10 t each were manufactured. A barge was used to transport all construction material, including water, to the island. On the island the construction site was limited to a storage yard for dolos units and armour rock, with activities focused on the main breakwater only.

For Phase II a further site was established within Cape Town Harbour, adjacent to the Synchrolift. A system was devised to transfer the completed 1 000 t caisson units (seven in total) onto the Synchrolift for float out. The floating pontoon was contracted out to a steel manufacturer within the Cape Town dock area. The working site on the island was still limited to the main breakwater end and portion of the quay. This work entailed close cooperation between the contractor and tour operators.

Dimensioning of repair units

To retain repetition in construction, and thus limit costs, a common breakwater design was used throughout, with the main armour unit being chosen as dolosse of 10 t. All caissons had similar overall dimensions with the overall height of the structures being the only variable between the caissons used for the main breakwater and those for the T-jetty.

CHALLENGES

The Murray's Bay Harbour improvement project provided very interesting challenges because of its location and the influence of environmental, national and international heritage aspects. □

A gateway to Alexandra

CONSTRUCTION OF RAUTENBACH/WATT/ROOSEVELT LINK ROADS AND APPURTENANT WORKS, ALEXANDRA

Submitted by Pretoria Branch in the category Technical Excellence in 2005

ROLE PLAYERS

CLIENT Johannesburg Roads Agency (JRA)
CONSULTANTS Hawkins, Hawkins & Osborn in association with Arcus Gibb
CONTRACTOR Stefanutti & Bressan Earthworks
PROJECT MANAGERS Hendrik Mienie (JRA), Themba Maluleka (ARP project manager)

THIS CONTRACT FORMED part of the Alexandra Renewal Project. The R25 million project focused on the construction of the road linking Rautenbach Avenue, Watt Avenue and Roosevelt Street between Fourth Street, Wynberg, and Third Avenue, Alexandra. Specific objectives were to upgrade Watt Avenue to improve its capacity and to make further improvements in this formerly neglected area to increase safety and enhance the aesthetic appearance.

The contract was part of the intended main gateway into Alexandra from the Grayston Drive interchange on the M1 motorway. Access was provided to Heritage Precinct A (the area within Selborne in the north, Roosevelt in the south, First Street in the west and Second Avenue in the east).

The previous route from the end of Rautenbach Avenue (Wynberg) to Watt Avenue (Alexandra) led southwards along Fourth Street, Wynberg, round Rautenbach Square, and into South Avenue. Access to Alexandra was then via the off-ramp from the northbound carriageway of Pretoria Main Road and over the bridge across Pretoria Main Road. Access from Alexandra to South Street and to the northbound carriageway of Pretoria Main Road was by the same bridge over Pretoria Main Road. Access from Watt Avenue to the southbound carriageway of Pretoria Main Road was via the access ramps.

The old Watt Avenue was a single carriageway that was no longer adequate for the large volumes of mainly commuter traffic. The route from Watt Avenue to Roosevelt Street was south along First Street and then east into Roosevelt Street.

Clearly the existing system was tortuous and awkward for vehicles to negotiate and not in keeping with the gateway to Alexandra concept.

The purpose of the Rautenbach/Watt/Roosevelt link road upgrade was therefore to provide a safe, easier, uncluttered, direct route between Rautenbach Avenue at Fourth Street (Wynberg) and Watt Avenue, and then a direct link to Roosevelt Street in Alexandra.

The roadway cross-section over the existing bridge, built in the early 1950s, was widened to accommodate three 3,5 m lanes: two entering Alexandra and a single lane exiting. Along the south side, the existing sidewalk had to be abandoned, the bridge cantilever demolished and the severely damaged steel parapet replaced by a New Jersey (NJ) concrete parapet. On the north side a NJ barrier was constructed to protect pedestrians from traffic, and the sidewalk was widened by a new cantilever structure. Service ducts were routed through the new NJ parapet and in the NJ barrier and sidewalk. Repair and rehabilitation work was also undertaken on the bridge.

Land was not available to meet all the requirements of a dual carriageway without expropriation, and adjacent property had to be preserved, particularly through Heritage Precinct, where space was very limited.

The negotiations and costs regarding expropriation of land and changes to land use did not form part of this contract, although these aspects soon became part of the design and construction process.

Expropriation of land, relocation of people and rezoning of road reserve were conducted by the City of Johannesburg.

A number of services exist in the vicinity of the roadworks. The locations of many of these were unknown, so breakages

Photograph: Alan Main

were a constant nightmare. Services had to be relocated and frequently upgraded to accommodate increasing demands. Often pipes broke close to where work was being undertaken, purely because they are old and brittle.

When all the roadworks had been completed, the area was landscaped and the sidewalks were paved. In addition to providing safe pedestrian access, emphasis was placed on access for wheelchairs. Landscaping consisted of grassing and planting trees and shrubs to preserve the environment.

The project area east of the Pretoria Main Road was extremely congested with pedestrian and vehicular traffic. At most times of the day Watt Avenue was choked with taxi traffic. Road construction was originally planned to be done in half widths to allow access to the traffic at all times. Fortunately the taxi-owners, businesses, hawkers and the general public were extremely cooperative and major portions of the road could be almost completely closed to traffic during critical construction operations.

In the early stages the taxi traffic was relocated and a temporary taxi rank was constructed at the old Putco land depot.

Photograph: Alan Main

This allowed closure of Watt Avenue and the bridge over Pretoria Main Road, thus diverting traffic from the construction area. Hawkers were assisted in relocating to safer sites away from the construction area

Instead of spoiling all the existing premix surfacing, concrete kerbs and old basecourse layers, these were crushed on site by a mobile crusher. This material was mixed with the in-situ soils and used for the selected sub-grade layer and also stabilised to construct the cemented sub-base layers. Spoil material that was not suitable for crushing was buried in the landscaped areas within the access ramps to Pretoria Main Road. This alleviated the problem of spoiling the material off site and importing more suitable material.

Through the active involvement of the various parties, the project's objectives were attained. The project was completed on time and largely within budget. □

Severe environmental constraints overcome at

IN 1998, ETHEKWINI Wastewater Services commissioned a masterplan study for the disposal of sewage in the Greater Durban Area. This led to the adoption of a policy to convey sewage in trunk outfall sewer pipes along river valleys to coastal wastewater treatment works or sea outfalls.

In 2001, EWS commissioned the route location for a 12,4 km long outfall sewer from the head of an existing sewer near Umlazi inland towards Dassenhoek, all along the Umlaas River valley.

In 2002, EWS decided to construct 2,4 km of the trunk outfall sewer to drain sewage from the rapidly developing, high-density residential areas in Welbedacht in southern Pinetown.

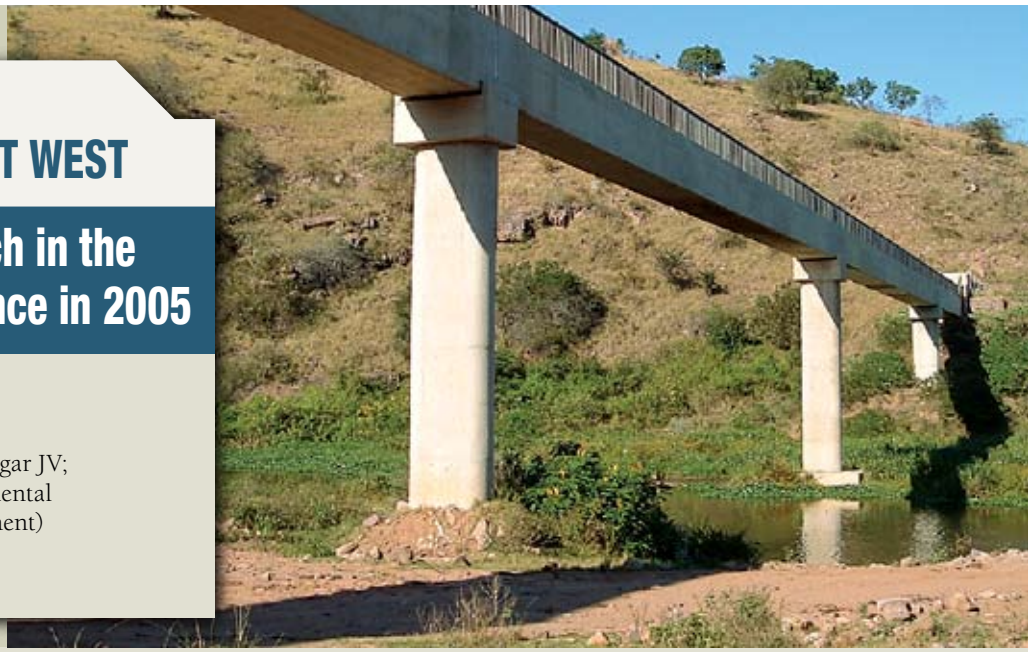
APPROACH TO THE DESIGN

The valley through which the Umlaas River winds is an inhospitable environment, featuring vertical rock faces that have been deeply incised by past flood events, alternating with undulating, rocky topography and a sharply winding horizontal alignment.

Because of the difficult access to the areas, extensive parts of the valley are still in pristine condition. Great care was taken throughout the design and construction stages to ensure that the environment was not negatively impacted by the construction of the project, nor by the management of the sewer during the operational span of its life.

The following design considerations had to be dealt with sensitively and were balanced to achieve fair outcomes while upholding the principles of solid engineering:

- All elements of the sewer are located above the calculated 1:100 flood line.
- Where vertical rock faces obstructed the route of the sewer, the sewer was taken across the river via reinforced concretes bridges with spans up to 150 m; this feature provided opportunities to drain the areas on both sides to the river without the need for more bridges across the river, or pumps or other costly alternatives.
- The bridge designs incorporate pedes-



UMLAAS TRUNK SEWER EXTENSION TO WELBEDACHT WEST

Submitted by Durban Branch in the category Technical Excellence in 2005

ROLE PLAYERS

CLIENT eThekwini Water and Sanitation
PROFESSIONAL TEAM Stewart Scott / Malcolm Biggar JV; Geosure (geotechnical engineering); Environmental Planning and Design (environmental management)
MAIN CONTRACTORS Murray & Roberts Construction KZN / Makhuba Civils JV

OVERVIEW

Innovative and cost-effective solutions to a range of technical problems were achieved in a challenging environment given a short time scale.

The R15,3 million project was carried out in a period of 15 months – from the time that the consulting engineers were appointed to the date that substantial completion was certified. The cash flow achieved during the construction stage is a credit to the contractors, as the environmental constraints to access in the sensitive area were restrictive in the extreme.

Despite the constraints, the area was left in a condition no worse than it was received, yet accommodating a fully functional piece of major civil engineering infrastructure in its midst without disruption.

Elegant solutions were sought to make multiple use of the new infrastructure. One such feature was the incorporation of pedestrian walkways on the pipe bridges across the Umlaas River, thus fulfilling a long-standing need to permit safe passage over the river, both during floods and also at low flow, when equally treacherous conditions exist. Without the new sewer bridges, safe pedestrian crossing of the river may never have materialised.

Because of the offensive nature of all matters pertaining to sewage and sewers, the project was carried out in such a manner that the public was generally not aware of its construction. This is a burden that the engineering teams have carried gladly, so that the public may be shielded from the less pleasant side of life that supports their health and wellbeing.

Umlaas project

trian walkways that permit safe passage over the river, not only during floods but also at low flow, when equally treacherous conditions exist.
- The pipes across the bridges were sized to cater for the estimated ultimate sewage flows that are expected to drain the areas as far inland as KwaNdengezi and Hillcrest so as to avoid future major construction of bridges while limiting current capital expenditure.
- Allowance has been made along the length of the sewer for possible future duplication/replacement so as to cause the minimum of disruption to the sewage flows and disturbance of the environment.
- The local communities were consulted during the design stage of the project and public meetings were held to ensure that the project addressed the concerns of the public and the local inhabitants.
- An environmental scoping study was carried out and no insurmountable environmental issues were encountered.

INTERESTING STATISTICS

The project is a showcase of some interesting features that are not readily observed:
- Two 150 m long, reinforced and post-tensioned concrete bridges, with 38 m spans between piers, were constructed.
- 900 mm diameter HDPE pipes were incorporated into the bridge details for flexibility.
- Flat gradients are in the order of 1:200.
- Some 2,4 km of generally undisturbed environment above the river floodlines was reinstated.

APPEAL OF PROJECT

The appeal of the project lies in the apparent simplicity of its design and the understated efficiency of the construction teams to overcome severe environmental constraints.

The project was completed on time and within budget. □

Unconventional rotary interchange

NATIONAL ROUTE 3 (N3) is the major transportation linkage between Africa's busiest port of Durban and Johannesburg, the economic and industrial hub of South Africa. The N3 passes through Pietermaritzburg, the capital city of KwaZulu-Natal, approximately 80 km from Durban. Traffic volumes on the N3 in the vicinity of the interchange (Armitage Road / Sanctuary Road) are in the order of 20 000 vehicles per day.

The development of a 38 000 m² regional shopping centre adjacent to the N3 in Pietermaritzburg acted as a catalyst to other major development proposals that have led to the establishment of a commercial node straddling the N3. Access to the N3 at this point is via the Armitage Road / Sanctuary Road Interchange – a dated, sub-standard half-diamond configuration with limited traffic capacity. The traffic generation potential of the proposed commercial node required the capacity of the interchange to be significantly enhanced.

A new interchange needed to satisfy both commuting and access requirements. Furthermore, the constrictions imposed by the site and financial constraints dictated that the options in meeting the stated goals were limited.

To accommodate these divergent functions, innovative proposals were tested in the quest to provide an efficient and effective solution. Modelling and testing was undertaken in collaboration with the National Road Authority, which recognised and encouraged the need for an innovative solution, using a combination of accepted computer programs. The CSIR reviewed the process and praised the rotary concept. The adopted rotary interchange was deemed the optimum in complying with the various constraints.

The decision to pursue an unconventional interchange configuration on a major national route and a major local arterial entailed rigorous research and analysis in order to determine the appropriateness, efficiency and ultimate success of such a device. Extensive workshopping of the concept with colleagues, client and the road authorities took place in order to ensure the full support of all affected parties. Strict management of both planning and technical design were critical, owing to inflexible client deadlines. Production of tender drawings for the rotary interchange was completed in ten weeks without compromise to the stringent quality assurance procedures.

The circulating crossroad represents a large roundabout, being slightly elliptical (80 m x 60 m), incorporating the existing overpass structure for the north to south movement of traffic. A new bridge was constructed to the west of the existing structure for the south to north movement. The rotary crossroad has a minimum of two lanes and a maximum of three lanes, the lane balance being dictated by the need for traffic capacity. The east to west and south to north movements require three lanes, whereas the west to east and north to south movements require only two lanes. All roads approaching the rotary crossroad are controlled by yield

ROTARY INTERCHANGE ON NATIONAL ROUTE 3

Submitted by Pietermaritzburg Branch in the category Technical Excellence in 2005

ROLE PLAYERS

CLIENT Liberty Properties
PROFESSIONAL TEAM BCP Engineers
MAIN CONTRACTORS Group Five Civils (KZN)

recognised

conditions as in a typical roundabout application and can be converted to signalisation in future if the need arises.

The construction of the interchange was completed in 10 months. This included a 40 m x 14,5 m bridge over the N3. The interchange was constructed while traffic flow was maintained on the ramps, the existing crossing road and the N3.

The rotary was completed within the budget of R10 million without any deviation from the original design or the billed quantities and was thus claim free. It was commissioned in September 2003, one week before the opening of the regional shopping centre. Consequently the rotary was subjected to intense testing in a very short period of time by motorists who themselves were undergoing a familiarisation process.

The performance of the rotary interchange is excellent, and surpasses all other interchanges on the N3 in the Pietermaritzburg area in that traffic delays and queues are minimal, with traffic flow being maintained even during the morning and evening peak periods. Conflicting travel needs – commuters versus shoppers – are managed with little difficulty, resulting in an efficient traffic solution. An added advantage of this type of interchange is that it has an inherent capability to accommodate significant traffic growth. There have been no reports of any serious collisions or significant road safety concerns.

PERFORMANCE

While the interchange may be unconventional in nature, its performance has exceeded all expectations, and has unlocked the adjacent land for extensive development by giving efficient access to the N3 for existing and future traffic. □

Essential infrastructure developed at Coega

NATURE OF THE PROJECT

The project involved upgrading the existing N2 to dual carriageway and constructing a full cloverleaf systems interchange on the N2 with Neptune Road (dual carriageway) on the intersecting road. The R180 million project consisted of the following elements:

- An underpass under the N2 to serve pedestrians and provide limited road access between the areas south and north of the N2
- A 168 m seven-span road-over-rail bridge, which was designed to accommodate 21 rail tracks
- Construction of four bridges on the N2 for the interchange
- Construction of three service box culverts

CHALLENGES

In meeting the client's brief, many civil engineering challenges had to be considered, including the following:

Appropriate infrastructure

Coega IDZ is largely a greenfield site without any appropriate infrastructure to attract investors. The challenge was to construct adequate infrastructure that would attract investors without wasting taxpayers' money.

Operation of the haul road to the Port of Ngqura

The Port of Ngqura is under construction and the breakwater is being built from rock that is mined at Coega Kop, north of the N2. The haul road runs parallel to Neptune Road, but crosses underneath the N2 at the position of the new N2 systems interchange. This created a major challenge because the haul road is fenced off and could not be crossed in the interchange area.

Restricted access to the site owing to parallel contracts

Management of the contractor's activities was severely restricted because of limited access to the site. Access to the site was restricted for various reasons:

- The haul road from Coega Kop to the port could not be used by the contractors due to the large volume of rock being transported.
- Direct access from the N2 to the construction site was not allowed.
- Neptune Road (which is the intersecting road to the N2) was also under construction north and south of the systems interchange.
- The N2 east and west of the systems interchange was being doubled.
- The main power supply to the IDZ was being installed.

Stormwater management

The systems interchange is a collection point for stormwater running from north to south. Butterfly Valley on the south-east provides a natural valley for channelled stormwater. However, the identification of an extremely rare butterfly species (the Coega Copper) restricted the discharge of stormwater to Butterfly Valley. Alternative routing had to be found for most of the stormwater.

Collapse of a road-over-rail deck

In November 2003, while concrete was being poured, the temporary support of a 23 m deck collapsed, resulting in the deaths of two workers.

SYSTEMS INTERCHANGE AT COEGA IDZ

Submitted by Algoa Branch in the category Technical Excellence in 2005

ROLE PLAYERS

CLIENT Coega Development Corporation; South African National Road Agency Limited (SANRAL)
PROFESSIONAL TEAM AGE Coega JV (comprising Arcus Gibb and African Engineering Consortium)
MAIN CONTRACTORS Ibhabhathani JV (comprising Stefanutti and Bressan, Rumdel and Msele Civils)

OVERVIEW

Coega IDZ is 11 500 ha in extent and is situated around the mouth of the Coega River, approximately 20 km from Port Elizabeth. It is the first industrial development zone in South Africa and includes a deep-water port. The development of appropriate infrastructure is essential for attracting foreign direct investment to Coega.

The systems interchange at Coega IDZ on the N2 will provide access to the deep-water port of Ngqura and the IDZ, north of the N2.

The haul road transporting rock to the breakwater at the port and the existing Port Elizabeth–Johannesburg rail line run through the systems interchange. These issues were addressed at the design and construction stages.

An environmental feature of the design and construction of the systems interchange is that the stormwater discharge into the sensitive Butterfly Valley, host to the rare Coega Copper butterfly, has been reduced to a minimum.

TECHNICAL SOLUTIONS

Analysis and design of an appropriate interchange

CDC has completed extensive masterplanning of the IDZ. Nelson Mandela Metropole has developed an EMME 2 traffic model for the metropole, which extends to Coega IDZ. Selection of the appropriate layout of the interchange involved the following analyses:

- An EMME 2 analysis for the development of the full IDZ
- An EMME 2 analysis for the core development area, which is likely to be developed in the next 20–25 years
- Detailed analyses of link flows, ramps and weaving lanes

The above analyses resulted in the construction of a cloverleaf systems interchange to accommodate the development of the core development area. The interchange will be upgraded at a future date and will consist of two stages:

- The construction of a directional link from the Nelson Mandela Metropole approach to the Port of Ngqura
- The construction of two additional lanes on the N2

Phasing of the construction of the N2 bridges

Four separate bridges have been constructed on the N2 to take into account the existing haul road and to allow for the future construction of lanes on the N2. The phasing has been designed to accommodate the haul road and to minimise disruption to the N2 traffic.

Stormwater management

Butterfly Valley, situated south-east of the interchange, was a natural valley into which to discharge stormwater collected at the interchange from the catchment area north of the N2. However, the identification of the Coega Copper butterfly restricted the discharge of stormwater into Butterfly Valley. Stormwater collected north of the interchange was diverted to Markman Canal, an existing Nelson Mandela Metropole canal. The additional runoff also improves the cleansing of the canal.

INNOVATIVE SOLUTIONS

Several aspects of the interchange design require innovative solutions and attention to detail.

Phasing of the bridge construction

The operation of the haul road from Coega Kop to the Port of Ngqura severely restricted the interchange construction site. The sequencing of these construction activities, which are normally part of the contractor's programme, was meticulously planned by the interchange designers to ensure successful execution of the project.

Minimising rail occupation

The seven-span road-over-rail bridge was designed to accommodate 21 rails tracks, including the existing Port Elizabeth–Johannesburg line. The first span on the southern side spans the existing railway line and has been designed as a combination of reinforced concrete and post-tension precast I-beams (to minimise the rail occupation time).

Abnormal load route

A route has been constructed to cater for abnormal loads that travel through the interchange.

ENVIRONMENTALLY SENSITIVE SOLUTIONS

Environmental specification for the Coega IDZ

The client, Coega Development Corporation, issued a standard environmental specification for construction in October 2002. This helped the designers and the contractors to consider all the environmental issues and minimise the impact on the environment.

Protection of Butterfly Valley

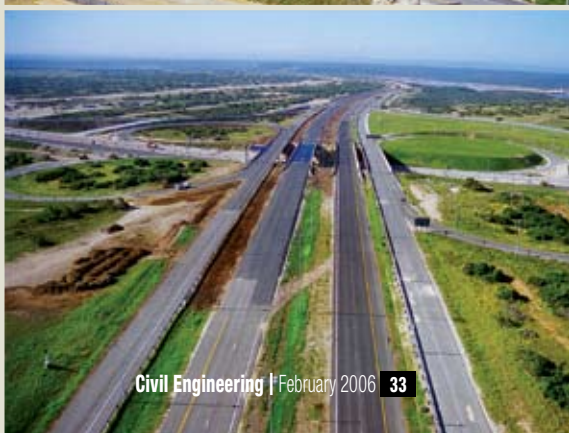
As stated, the Coega Copper butterfly exists only in Butterfly Valley near the N2 Interchange and near the Sundays River. Only the stormwater from the immediate interchange area was discharged into Butterfly Valley and the stormwater from the catchment area north of the interchange was intercepted and diverted to Markman Canal.

FUTURE DEVELOPMENT

Infrastructure development at Coega IDZ is essential for attracting foreign direct investment. Access from the N2 to the deep-water port and the IDZ is one of the first essential infrastructure improvements.

Medium and long-term traffic impacts were considered in the design of the systems interchange. The current cloverleaf interchange caters for the medium-term development of the IDZ and later phases of the interchange can be constructed when necessary. □

Left: Systems interchange (excluding road-over-rail bridge)
Below: Construction of road-over-rail bridge over existing rail line
Bottom: Systems interchange along the N2 from west to east



New future for New

NEW REST PHASE 1: ACCESS ROADS AND SERVICES

Submitted by Western Cape Branch in the Community Based category in 2005

ROLE PLAYERS

CLIENT City of Cape Town
CONSULTING CIVIL ENGINEERS HHO Africa
CONTRACTOR Requad Construction

NEW REST IS AN informal settlement situated along the southern side of the N2, adjacent to the formal urban area of Gugulethu. The community have occupied the settlement in substantial numbers for at least ten years and have initiated a number of attempts to improve the area and its situation. The City of Cape Town has provided basic services in the form of pre-paid electricity, communal toilets and standpipes as well as refuse collection, but the area has remained marginalised in terms of its urban and social character.

The technical project scope and objectives were relatively easy to define. The brief for Phase 1 required the design and construction of the main access roads to New Rest, together with the associated bulk civil services within these road reserves. The access roads would define what were called super-blocks consisting of between 80 and 120 erven. On completion of Phase 1, and subject to approval, Phase 2 would be implemented. This phase required the design and construction of services to the individual erven on each super-block. The final phase would consist of the construction of formal housing and other community facilities. However, these broad technical parameters had to be integrated within a number of technical, financial and social constraints.

DESIGN APPROACH

Technically, the site was unsuitable for development – one of the reasons that it had remained vacant until it was occupied as an informal settlement. The challenge for the design team was to convert this unsuitable building block into a product that met the engineering standards for integration into the urban landscape of the city.

The impetus for the project concept as an in-situ upgrade and the involvement of HHO Africa came about as a result of the work of Professor John Abbot – then head of Urban Planning Unit at UCT. The concept of an in-situ upgrade and the principle of minimum relocation of residents were mooted, based on international models and with the collaboration of the community. Reasons for this included preserving the residents' sense of community and of security of tenure. The project was also used to illustrate the use of GIS as a design tool in meeting the project concept of minimum relocation. This was done by utilising aerial photography together with CAD data to produce concept designs and to identify for relocation only those households that would be directly affected by the planned construction.

This concept eventually found acceptance within the City of Cape Town, which, after the project had stalled for a time, stepped in to take over the role of developer and implementing agent for the project. The definition of 'developer' met the terms of the criteria of the provincial housing department, as that department was then targeted to provide the funding for the project under the provincial (RDP) housing programme.

CONSTRAINTS

Because it was the first project of this nature for the city and the provincial housing department in terms of the in-situ concept, certain financial constraints were imposed by the provincial housing department. The initial allocation of funding covered only the main access roads and bulk services of the project (Phase 1). Based on the success (or otherwise) of this initial phase, additional tranches of funding would be made available as the project progressed.

This financial constraint added further technical constraints in that funding was not made available to plan and design internal (individual) services. As a result, the planning of the individual plot layout was not finalised before the design of Phase 1 commenced. The design therefore began with bulk services and this had further implications for the process, for example in terms of how provision was to be made for positioning future water and sewer house connections as well as stormwater drainage of the super-blocks.

The design also had to allow for a number of other technical constraints. The implementation of the project. Where relocations were unavoidable, these were to be kept to a minimum and within the area of the settlement.

Before the implementation of the project, New Rest was subject to repeated flooding during the Cape winters, with certain sections becoming impassable during the rainy season. While basic levels of service were provided to residents, the area retained an unhealthy urban character. The provision of access roads and bulk services has made all-weather access possible for residents as well as service and emergency vehicles, and has reduced the possibility of the rapid spread of fires in the community. The first phase of the development of New Rest was a major step towards improving the urban character of the settlement with the eventual aim of incorporating New Rest into the urban fabric of the city.

OVERVIEW

New Rest is one of the informal settlements situated along the N2 between Cape Town International Airport and the CBD. Upgrading the settlement is a unique project for the city. It is based on the principle of an in-situ upgrading where the community remains on site during the

Rest

site is bordered by the N2 to the north, the rail reserve to the west and the existing main access road NY1 to the east. Grades on site were generally flat to non-existent with the site acting as a sump for run-off from the N2 reserve. A further post-development constraint was that this stormwater run-off still had to be accommodated by the site. The area is generally badly drained with poor quality, poorly consolidated in-situ soils. The area had also been used as an illegal dumping ground, resulting in a varying quality of imported materials. This had been exacerbated over the years because the city and residents had filled low-lying areas to raise ground levels and prevent flooding of their homes.

The site is crossed from west to east by a major 1,6 m diameter water supply main, which forms an underground barrier to any potential crossing services. Two additional mains of 0,75 m and 0,6 m cross the site near the eastern edge of the site and re-cross to parallel the 1,6 m main in the south-eastern corner of the site. Overhead Telkom and electrical services added a further constraint to the design process.

In keeping with the principle of minimum relocation, only the 7 m road reserves and the area of what was to become the main detention pond were cleared of shacks and handed over to the contractor for construction. In addition, half of the detention pond was excavated, the balance being used for the contractor's camp. In general, the lack of space was one of the major constraints to construction.

The bulk of the stormwater run-off was designed to be accommodated by overland flow within the road reserves. Most of the roads therefore drain towards the main access and collector road within New Rest, which in turn drains to a low-point alongside the main detention pond. Final subgrade road levels at the low-point are very close to water-table levels in winter, and a solution was required for founding the structural layers of the road. This was accommodated by founding the sub-base on a gap-graded crusher-run structural layer confined within a geotextile layer.

PROJECT VALUE

Phase 1 has provided the community with all-weather access to the settlement as well as access for emergency and service vehicles to previously inaccessible areas within the settlement.

The heavy winter rains of August 2004, which severely flooded various areas of Cape Town, severely tested the newly completed infrastructure. The system at New Rest itself functioned well. However, the main detention pond was unable to drain owing to blockages of the system downstream from New Rest. But although only half the volume of the pond had been excavated at that stage, the storm resulted in some minor flooding of low-lying households in New Rest, and to a lesser degree than during the milder preceding winter.

The success of Phase 1 has provided the impetus for the continued funding of the project. Phase 2 is currently being implemented and is due for completion in March 2006. □

Smart Awards

SMART AWARDS WINNER
ROODEPLAAT DAM DRY CHAMBER

Dr Nick Dekker (Dekker and Gelderblom)

ADDITIONAL OUTLETS were required at Roodeplaat Dam. These outlets would be positioned approximately 12,5 m below the water level.

The installation of the new outlets would require the creation of a dry zone behind the wall to allow the completion of the hole through the dam wall, the installation of the breastplate on the upstream side, and the completion of the outlet.

As the existing gates would service the new outlets, very strict tolerances would be required to the installation of the same. It was envisaged at tender stage that the volume between the buttresses would be sealed off to the depth of the new outlet. This option would require some 27 m of seal between a panel and the existing dam wall. This seal would also be subjected to water pressure perpendicular to the face. Following emptying of the chamber, high buoyancy forces associated with the large volume would have to be accommodated through anchorage to the existing wall.

SOLUTION

A sound engineering solution would be consistent with the following principles:

- The minimum length of seal would be in contact with the existing wall in order to reduce the influence of tolerances of the existing wall
- Minimum volume in order to reduce the buoyancy force of the whole chamber
- Separate access to the chamber, not requiring sealing to the existing wall
- Efficient anchorage system to the existing wall

These principles were incorporated into the following solution:

- A reinforced concrete chamber was constructed. The chamber is 1 650 m wide by 2 050 mm high and has a depth of 1 200 mm to the wall. The chamber has a wall thickness of 175 mm and the geometry is such that all members are

SMART AWARDS COMMENDATION
CNCPAVE – AN INNOVATION IN CONCRETE ROAD DESIGN

Bryan Perrie (Cement and Concrete Institute), Dr Peter Strauss (consultant) and Dr Martin Slavik (BKS)

CONCRETE ROADS have been designed and constructed in South Africa using 'modern' technology since 1969. Several of these sections have been and still are being monitored for their performance and the information is being used in the upgrading of design and construction methods. Incorporated into some of the above sections were short trial sections of thin concrete roads that have been subjected to intensive testing, including the use of the heavy vehicle simulator (HVS), and monitored with time.

In 1998 it became clear that new initiatives were required if concrete was to be a more viable and competitive material for roads in the future. One outcome of these initiatives was the development of a new design method for concrete roads. It was designed specifically for South African conditions and calibrated against the actual performance of concrete roads locally.

To achieve this, the actual performance of existing concrete roads was assessed and a number of research projects undertaken. These included the construction of heavily instrumented trial sections on the N3 at Town Hill in KwaZulu-Natal and research at the University of Pretoria into load transfer on joints. This initial work was funded primarily by the South African cement manufacturers with a contribution from the South African National Roads Agency (SANRAL).

DEVELOPMENT

cncRisk was the first version of this new mechanistically based design method. It predicted the risk of failure of a particular set of conditions entered into the computer.

Further research was carried out using the HVS on load transfer at the joints in plain concrete roads and the performance of continuously reinforced concrete pavements (CRCP) in the Hilton area. Simultaneously a significant research project into the performance of thin concrete roads was undertaken in order to calibrate the models for low volume concrete roads in cncRisk. In a joint initiative between the Cement & Concrete Institute (C&CI), the Council for Scientific and Industrial Research (CSIR), the University of Pretoria (UP) and consulting engineers BKS, a number of test sections were constructed at the exit from a quarry at Roodekrans, west of Johannesburg.

Short sections of thin concrete pavement, 3,6 m wide, were placed on top of a newly constructed embankment on an access road to a quarry. These sections included thicknesses varying from 50 mm to 140 mm, differing pavement types (plain, CRCP and steel fibre reinforced) with varying support conditions.

The main objective of the Roodekrans test sections was to obtain information on the performance of relatively thin concrete pavement sections under real traffic. The sections exceeded expectations and by the end of August 2005 they had carried in excess of ten times the design loading.

THE PROGRAM

Although no computer program can replace the designer's intelligence and experience, cncPave, the latest version of the

subjected to axial compression under water pressure.
- The seal is compressed by water pressure
- The separate access tower consists of a 1 m diameter, 6 mm thick steel tube. The tube was split into two lengths with a flange splice to allow use of the chamber at two different depths.

As the breast plate and sleeve could not be passed through the access pipe, the assembly was lowered inside the dry chamber.

The use of reinforced concrete for the dry chamber provided a considerate reduction in the uplift forces due to buoyancy.

Sections of the access tower were spliced onto the dry chamber as it was lowered into position. Once the chamber had reached the correct level, the access tower was bolted to the grillage beams and anchored to the existing wall. □

Top left: View of the dry chamber ready for lowering, showing the breast plate assembly, the seal and the seal protector
Top right: The dry chamber being lowered into position between the buttresses
Bottom left: The steel access tower is lowered
Bottom right: View of the top of the access tower showing the anchor beams fixed to the existing wall

program, can quickly pre-try the design, evaluate its quality and thus facilitate competent decision-making. The approach is based on the evaluation of consequences. The consequences of a certain pavement design are expressed in terms of decision variables, namely shattered concrete surface, pumping concrete surface, faulting in the concrete pavement (in the case of plain and dowelled concrete), crack spacing (in the case of continuously reinforced concrete), and life cost of the pavement, in rand per square metre. cncPave treats input variables and all output items as random variables.

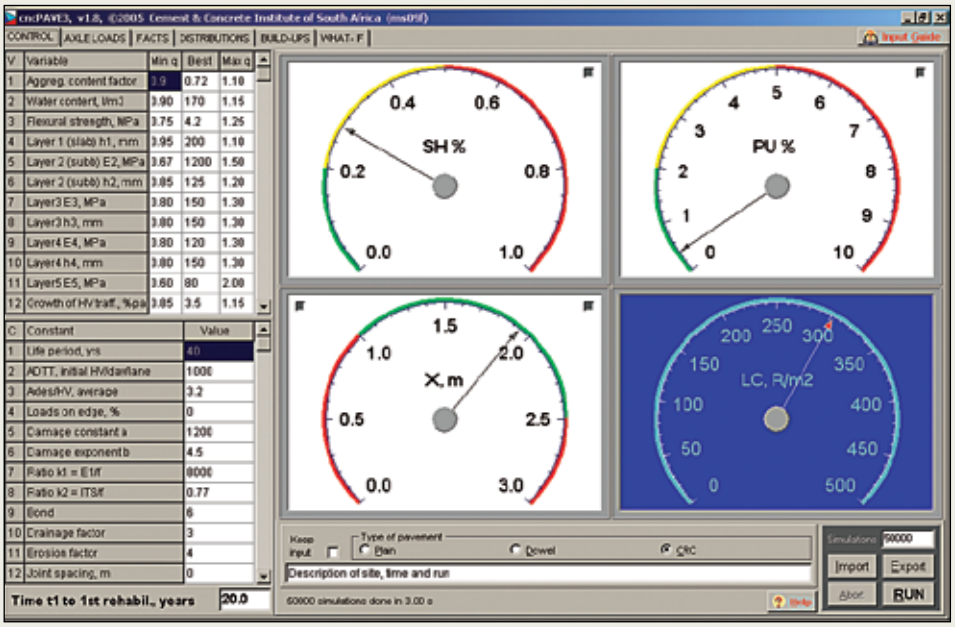
From the input variables, cncPave derives the probability distributions of the above decision variables by means of Monte Carlo simulations. The average values of the decision variables can then be compared with certain decision criteria and the quality of the design judged accordingly. In addition, probabilities of the decision variables exceeding certain limits can be read off respective graphs. These probabilities can be used to establish the confidence intervals of decision variables.

The program has 18 input variables into which the designer must enter the most likely value and expected variability of such value. These include concrete and pavement variables. There are 29 input constants covering cost analysis data, climatic information, etc. Traffic loading is defined in terms of the spectrum of vehicles expected on the road. The output predicts the degree of failure after a predetermined period of the key variables mentioned previously. It also provides relevant outputs from the many sub-models in the program in both analogue and graphical form and the life-cycle cost of the alternatives chosen. A what-if facility is included to quickly investigate the effect of certain inputs on certain outputs. The program contains a very extensive help file, which includes additional information on concrete roads.

UNIQUE

cncPave is a unique, practical, innovative program providing designers of concrete roads a user-friendly tool free of charge. The program will help to ensure more cost-effective labour-intensive concrete roads are built ensuring low-maintenance sustainable provision of services to the community. cncPave is freely available after registration at the program website – **www.cncipave.org.za**. □

Control screen



Text **Paul Janisch**
CEO of Caird Consulting

BEE and South Africa's growth strategy

TO MANY THE BEE equation is very simple: Empowerment = Entitlement. While this view is wrong, one cannot really be blamed for holding it. After all the press seems to only report on the sensational – the big deals and those deals that have failed – and never seem to devote many column inches to broad-based BEE, what it actually is and why it exists. This article will attempt to go more into the theory behind BEE without getting too bogged down by political rhetoric and jargon.

Before I begin, it is necessary to cover a few principles that will be consistently referred to throughout the next few paragraphs.

CODES

Broad-based BEE is contained in a series of codes of good practice. Each code contains an element. These elements are: equity, executive management, employment equity, skills development, preferential procurement, enterprise development, and corporate social investment.

SCORECARDS

The elements listed above vary in value from 10 to 20 points, creating a final target of 100 points (there are bonus points, so points in excess of 100 are possible). The equity element is 20 points.

The generic scorecard

Element	Points weighting
Equity	20
Executive management	10
Employment equity	10
Skills development	20
Preferential procurement	20
Enterprise development	10
Enterprise development	10
Total	**100**

WHY DOES BEE EXIST?

The short answer is that the government cannot realistically foot the bill for maintaining and sustaining a large percentage of the population. The recent spate of civil unrest over lack of service delivery, housing and jobs highlights this predicament. The pressure for the government to deliver on these promises is increased, especially with the local elections coming up in the next month or so.

There are various plans to address this issue. One of the solutions is Trevor Manuel's Accelerated and Shared Growth Initiative, which aims at achieving a sustained growth target of 6% by 2010. Manuel has recognised that the solution to this initiative lies in 'softer issues, such as education and skills training, and what government does about them' (*Financial Mail*, 9 December 2005). The article talks at length about critical skills and necessary subjects that South Africa need to be more proficient in, with a strong emphasis on mathematics and the sciences (subjects in which the readers of this publication are particularly well versed). Skills development is a cornerstone of BEE.

If the government cannot do it alone, then it will have to elicit help from the private sector. It's not practical to legislate and compel companies to get involved in the process, so they have opted for a gentler approach. This gentle approach is known as Black Economic Empowerment. BEE is an aggressive plan to grow the economy, increase the skills levels, create jobs and reduce poverty in a very short period of time.

BEE AND THE LAW

I mentioned earlier that the government cannot practically compel companies to implement broad-based BEE strategies. This process would have a negative impact on the economy. But they can insist that all government agencies and state-owned enterprises (SOEs) actively practise BEE. This is what they have done with the Broad-Based BEE Act of 2003. The Act is only binding on the state – private companies are under no legal obligation to adhere to this Act at all. But the government can insist that if you want to do business with them you have to have some sort of a BEE profile (this is known as preferential procurement). The companies that do business with the government then need to improve their own BEE profile and as such need to know the BEE score of their suppliers – and so BEE cascades through the economy.

Now that the law and the rationale behind BEE are clearer, we can start looking at some of the more prevalent myths that surround BEE.

HAVING A BLACK SHAREHOLDER WILL SOLVE ALL YOUR BEE PROBLEMS

Not true – shareholding accounts for only 20% of the scorecard and these 20 points are very hard to get anyway. Twenty per cent of the scorecard is not a great score.

GET A BLACK SHAREHOLDER OR CLOSE SHOP

We should look at a few realities that defy this myth.

- The first reality is that more than 90% of white-owned firms will not find a black shareholder. This is simply because their companies are not exciting enough or profitable enough for any potential shareholder to invest in.
- Secondly, these firms employ about 55% of the working population in South Africa and contribute 30% of the tax revenue.
- Thirdly, these firms are the companies that will employ more people in time. Larger corporations and the government will probably downsize.

If these realities are true, and I firmly believe them to be, then this myth needs to be squashed immediately. In all the literature I have read, Trevor Manuel has only voiced concern about job losses – something he doesn't want because he doesn't want these people to depend on his welfare resources. If these companies closed down not only job losses will be affected: tax revenue will take a dramatic dive (you are not going to grow an economy in this way).

EMPLOY UNSKILLED OR THE WRONG PEOPLE TO MAKE UP THE NUMBERS

There are companies that do this. All that happens under these circumstances is that the person in the job will not perform ad-

equately – this does nothing for his or her confidence and will place a strain on other skilled people in the company, who will have to make up the shortfall. A company cannot sustain itself indefinitely like this.

BEE IS ABOUT REPLACING WHITE-OWNED SUPPLIERS WITH BLACK-OWNED SUPPLIERS

How you are going to grow an economy by doing this is a mystery. At best the economy will stay the same size, at worst it will shrink. As it stands at the moment there are not enough black companies in the various sectors to replace white companies, especially professional firms. It is hoped that BEE will increase the number of black-owned companies across the board in time.

WHAT IS BEE?

My partner in Caird Consulting, Keith Levenstein, likes to look at BEE from the bottom up – that is, corporate social investment (CSI) to equity. He then compares the principles to Maslow's hierarchy of needs.

- **Physiological needs – satisfying hunger, shelter** Corporate social investment looks for charitable contributions to people in rural areas that will assist in satisfying these needs. The process needs to go one step further in creating sustainable programmes that will ensure that people can fulfil these needs themselves.
- **Security – basic economic needs** Once people are able to fend for themselves, they will look to start creating wealth to satisfy other needs. Enterprise development assists entrepreneurs in developing their businesses by providing them with the necessary capital or core skills development to create a sustainable business.

  Preferential procurement encourages established companies to purchase the goods and services from these up and coming companies.
- **Social needs** Skills development and employment equity are the next level. A person needs a level of skill in order to be employed. Employment equity creates structures for people from previously disadvantaged groups to become employed.
- **Ego needs – self-respect and autonomy** The person has been employed and has developed skills and experience over time. They now climb the corporate ladder and find themselves in executive management positions. The management code covers executive management and board representation.
- **Self-actualisation** The ultimate goal in BEE terms is owning a stake in the business you work for. Code 100 deals with equity ownership.

Admittedly I have taken a few liberties in attempting to massage Maslow into a broad-based BEE concept. But the example brings me back to one of my earlier points. BEE is about alleviating some of the social and economic stresses that the government faces in the next ten years. Maslow's hierarchy identifies corporate social investment and enterprise development as the priority areas in solving these issues. In delivering the remaining codes in December 2005, the Minister of Trade and Industry, Mandisa Mpahlwa, made two rather telling statements (they might be construed as appeals). Firstly, regarding enterprise development and CSI he requested companies to 'help government conquer the challenges of marginalised areas and people'. And when explaining the rationale behind preferential procurement he emphasised the private sector's required involvement in 'helping government grow and sustain small enterprises'.

Professionals such as yourselves are vital to the long-term success of the South African economy. BEE should not be regarded as a threat but an opportunity. I hope to cover these opportunities in the next few articles.

Paul Janisch is the CEO of Caird Consulting (www.caird.co.za), a consultancy that focuses on the BEE transformation of South African SMEs. He can be contacted at either info@caird.co.za or 011-483-1190

TRANSFORMING AN ISLAND KINGDOM INTO A BUSINESS HUB

THE BAHRAIN FINANCIAL HARBOUR (BFH) is set to transform the historical capital of the Kingdom of Bahrain into a world-class business centre. This $U51,3 billion development is a government-supported, private initiative aimed at securing the island kingdom's position as the financial capital of the Middle East.

Africon's involvement in this ambitious project ranges from master planning to the design of municipal infrastructure for the entire development.

The BFH development is no doubt one of unprecedented scale in terms of financial investment projects in the Kingdom of Bahrain and, as such, requires a wide range of design resources and multidisciplinary skills. Africon's involvement in this massive undertaking commenced in November 2002 when Ahmed Janahi Architects, the lead consultants for the development, appointed the group as the consulting engineers for the feasibility and urban planning study of the proposed BFH. The company's involvement has since expanded significantly and, to date, has incorporated the following:

- A financial viability and urban planning feasibility study
- Master planning for the entire development
- A concept structural and mechanical, electrical and plumbing (MEP) design of the dual 53-storey towers, the Financial Mall and Harbour House
- A pile design for the Financial Mall and Harbour House
- Preparation of the technical specifications for the design and built tender of the Financial Centre
- MEP and structural input on the 45-storey Diamond Tower, which is one of the remaining 25 buildings on the development
- In March 2004, Africon was appointed as the sub-consultant for the design and supervision of the municipal infrastructure for the entire BFH development, comprising all services required by the project, from roads to electricity supply. The municipal infrastructure design also includes the design of a state-of-the-art membrane technology compact wastewater treatment works and an impressive 100m single-span concrete bridge
- Africon was also appointed in August 2005 by Ahmed Janahi Architects for the structural and MEP design review and site supervision of the 22-storey Bahrain International Insurance Centre building and associated car park.

To date, the Financial Centre concrete works is nearing completion with the BIIC building expected to top out the end of February 2006. The Financial Centre is scheduled for completion by March 2007. The construction of the infrastructure, with a contract value of $US90 million, commenced in January 2006 and Phase 1 is expected to be completed in time for the commissioning of the Financial Centre.

'Furthermore, we anticipate that our empowerment partners in this venture will more than meet the client requirements, and a major focus will be placed on local employment as well as empowered procurement for the project.'

Andrew Howcroft of Murray & Roberts Construction has been appointed as the project director with Neil Blue from the company's KZN operation appointed as pipe logistics manager and André de Waal as commercial manager.

Some interesting statistics on the project are that it will require 2 million cubic metres of excavation to be done, with 1,8 million cubic metres of backfill, while some 150 tonnes of welding rods and 13,5 million litres of diesel will be used. At its peak the project will employ 1 400 people.

The contract for the construction of civil structures and mechanical and electrical works has been awarded to a joint venture between China National Overseas Engineering Corporation (COVEC), which will hold 75%, and Mathe's Construction (25%), a wholly owned black enterprise.

VRESAP CONTRACTS AWARDED

MURRAY & ROBERTS Construction, in a joint venture with Group Five Construction, W K Construction and the J & J Group, has secured the contract for the supply, installation and testing of the VRESAP (Vaal River Eastern Sub-System Augmentation Project) pipeline.

The project is designed to support the industrial needs of Sasol and Eskom, in Mpumalanga Province, through the transfer of water from the Vaal River system. The 1,9 m diameter steel pipeline will run from the Vaal Dam to Secunda and will be 122 km long. The project value is R1,5 billion rand and the contract period is 23 months.

Harry Nieman, business development manager at Murray & Roberts Construction, says that this fast-track project was awarded to the joint venture because the consortium met all the requirements to effectively and economically complete a project of this scope.

'Murray & Roberts Construction and Group Five have extensive experience in heavy earthworks excavation and backfill, while WK Construction is considered one of the leading pipeline installation contractors in the country,' Nieman says.

THE LATEST THREAT TO THE WORLD'S CLIMATE?

THE WORLD OF CLIMATE CHANGE science and policy has been rocked by the discovery that plants produce up to one-third of the second most important greenhouse gas.

The findings were published in *Nature* (12 January) by a team led by Frank Keppler from the Max-Planck Institute in Germany.

Until now, researchers thought that most methane was produced by bacteria in environments lacking oxygen, such as the digestive system of cows and Asia's flooded rice fields.

But Keppler's team says plants worldwide produce millions of tonnes of the gas each year, with the greatest share coming from the tropics. They say that the source of 10–30% of annual methane emissions has, until now, gone unnoticed.

The findings are important because, although there is less methane emitted than carbon dioxide (the main greenhouse gas), molecule-for-molecule it has a much bigger effect on climate.

The study is likely to trigger scientific debate about how something of this magnitude could have been missed.

Keppler's team is convinced they have made no error and say their findings could even shed light on many unexplained phenomena.

These include the large plumes of methane observed above tropical forests, the fact that rice fields emit less methane when there is less sunlight, and the high levels of methane found in ice formed 2 000 years ago, when plants covered more of the earth's surface.

The finding could also explain why the build-

up of methane in the atmosphere is slowing down – a trend that could be due to global deforestation.

The implications of the discovery are significant, and unlikely to be good news.

Climate policymakers have been advocating preserving and planting forests to capture greenhouse gases from the atmosphere.

'We now have the spectre that new forests might increase greenhouse warming through methane emissions rather than decrease it by [storing] carbon dioxide,' writes David Lowe of the New Zealand National Institute of Water and Atmospheric Research. In his accompanying commentary in *Nature* he describes the work as 'remarkable'.

Methane emissions from plants might increase as the world gets warmer. In laboratory experiments, Keppler's team found that plants produce more methane at higher temperatures, the amount doubling every ten degrees above 30 degrees Celsius.

Scientists also expect that, as atmospheric levels of carbon dioxide rise, plant growth will increase – a phenomenon known as 'carbon dioxide fertilisation'.

If Keppler's team is correct, this will in turn increase methane emissions, with the final effect of worsening the greenhouse effect.

'This paper,' concludes Lowe, 'will undoubtedly unleash controversy, not the least of which will be political.'

A case in point: a Chinese delegate at a conference on climate change and food security held in London last year suggested that carbon dioxide fertilisation might help boost agricultural yields in China.

Catherine Brahic
SciDev.Net
http://www.scidev.net/News/

CONCOR TECHNICRETE EXPANDS INTO EASTERN CAPE

CONCOR GROUP subsidiary Concor Technicrete has expanded its concrete brick and paving manufacturing operations into the Eastern Cape in a joint venture enterprise with local black business entrepreneurs.

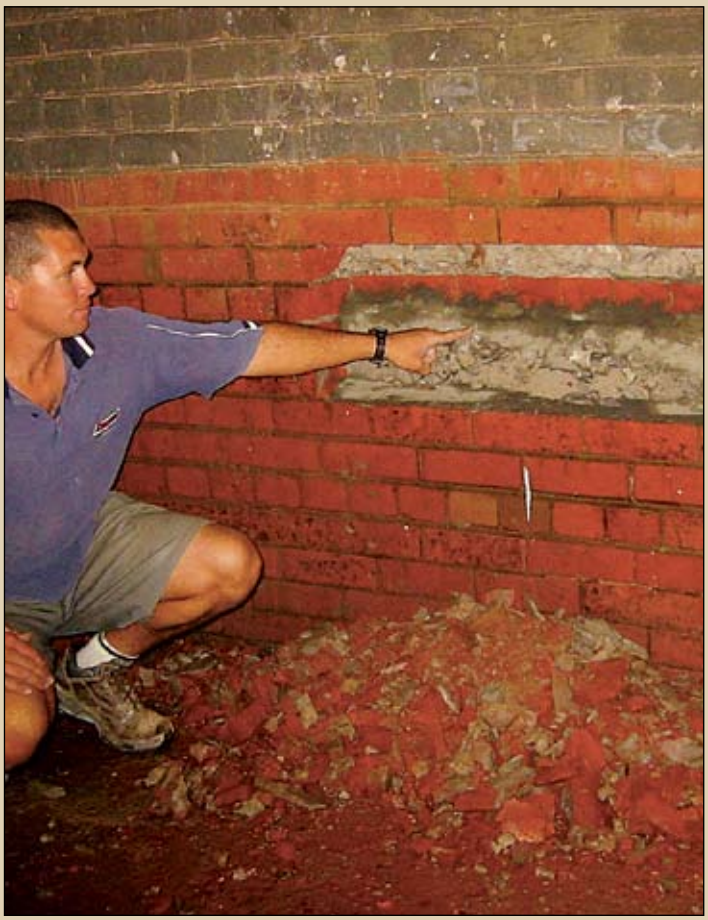
The move, following the establishment of a similar joint venture BEE company in North West Province recently, could be the forerunner of further expansion projects into other provinces, according to Concor Technicrete MD Paul Deppe.

'We have been looking at the Port Elizabeth area for some time, since it is such an important industrial growth point,' he says. 'We have now made our move through the establishment of a BEE enterprise with people who are in the mainstream of regional business. We expect this development will lead to the creation of new work opportunities in the region.'

The new Port Elizabeth-based company, Coastal Concor Technicrete, has been formed from the acquisition of the assets of the well-established local company, Coastal Bricks. Concor Technicrete holds a 60% shareholding in the new company, while the 40% balance is held by two prominent local businessmen, Max Boqwana, chairman of the new company, and Sivuyeli Ntlabezo, executive director. Deppe says Concor Technicrete will be injecting senior management, marketing and technical know-how into the enterprise.

Boqwana is chairman of the board of a prominent PE law firm, Boqwana Loon and Connellan, and a director of a number of local companies. Ntlabezo, also an attorney and director of Boqwana Loon & Connellan, comes to the company with much experience in property development and is economic development law consultant to local government institutions.

'There is a huge demand for housing in the Eastern Cape, and we expect the building prod-



ucts from Coastal Concor Technicrete will play an important part in meeting this demand,' says Boqwana. 'This is the first time that a company with a substantial black investment has become involved in the construction industry at this level in the region, and the combination of technical and management expertise from Concor Technicrete and our local market knowledge is surely a recipe for success.'

The new development illustrates how Concor Technicrete is focusing its growth strategy on opportunities within South Africa, Deppe says.

▶ **Info**

Concor Technicrete
011-495-2200

RESTORING CENTURY-OLD RESERVOIR

CHRYSO'S LANKO CONCRETE repair products were selected for the large-scaled refurbishment of the century-old water reservoir in St George's Park, Port Elizabeth.

Excavation for the reservoir started in August 1906. Installed on top of the storage dam is a memorial to the soldiers of the Prince Alfred's Guard regiment who had fallen in various South African wars – with the result that most Port Elizabeth residents are unaware that 8,8 Mℓ of water are contained under the familiar figure of soldier with rifle and bayonet on the ready.

▶ Left: Lanko 228 was used with pigment oxide for the refurbishment of the Prince Alfred's Guard Memorial balustrades Right: PAB Contracts' Sean Tinley inspecting the reservoir's damp proof course

The R6 million refurbishment of the reservoir – scheduled to be completed by the end of 2005 – was commissioned by the Nelson Mandela Metropolitan Municipality (NMMM) and carried out by Port Elizabeth-based PAB Contracts. The project involves the repair and renovation of the entire structure, including subterranean concrete columns, floors, surface decks, promenades and balustrades.

The circular reservoir is 31 m at its shortest

Above: The Prince Alfred's Guard Memorial after its unveiling in 1907
Left: The PAG Memorial in 2004, before the current refurbishment programme

point and 61 m at its longest. Municipal archives show that the concrete walls were built 2,7 m below and 1,2 m above the natural ground level. 'The walls were faced with "Grahamstown bricks" every fourth course between headers. The 225 mm concrete floor was cast in two layers, the bottom layer being 100 mm with a sheet of bitumen sandwiched in-between to prevent seepage,' said David Raymer, NMMM Assistant Manager, Water Management and Bulk Water Supply. 'The roof and columns were constructed of concrete reinforced with the Kahn system, designed to carry a safe load of 250 lbs per square foot.'

He added that the reservoir was fed by a Cape Road service dam, part of the Sand-Palmiet-Bulk Rivers water scheme, established in 1903.

Malcolm Tinley, Chryso's Eastern Cape branch manager, said the decision to specify Chryso's Lanko concrete repair range was taken after about 18 months' laboratory testing, carried out by Africoast Consulting Engineers with continuous input from Chryso.

Subsequently Lanko 228 flexible waterproofing coating was chosen as surface protection for the outside deck, soffits and floors of the reservoir; and also (with pigment oxide) for the coating of the balustrades. Aquafelt membrane, used in conjunction with Lanko 228, was brush- and roller-applied for the bandaging of cracks. Lanko 228 coating had shown exceptional resistance to concrete movement and micro cracking – a crucial factor – in the preliminary tests.

Lanko 730 mortar repair product was trowel-applied to the depressions on the floor of the storage dam while Lanko 731 was used for larger depression repairs. Chryso Aquastop was selected to prevent water penetration from the exterior with the admixture Chrysofluid CM90 applied to increase workability for the semi-dry concrete used in new cobblestone paving surrounding the reservoir and memorial.

'The condition of the concrete, considering it had been under water for a century, was found to be extraordinarily good. The reinforcing in particular stood the test of time remarkably well,' Tinley stated.

INFORMATIVE PUBLICATION FROM KAYTECH

KAYTECH, THE LEADING manufacturers and distributors of geotextiles in southern Africa, has launched a comprehensive six-page brochure entitled *Geotextiles as filters: nonwovens and wovens*.

This graphic and colourful publication essentially looks at the complex issue of filtration for the two generic geotextile types available in South Africa, namely nonwovens and wovens. The way these geotextile types function as filters in comparison to granular filters is illustrated and their application is discussed. The known filter criteria pertaining to these different filter types are listed. The interpretation of the wide range of geotextile filter criteria in relation to natural filter criteria is included. Based on this information the South African experience is presented. This document will help alleviate the confusion that exists about the crucial differences between nonwoven and woven geotextiles as to the way they behave and work as filters.

The brochure was prepared for Kaytech by Kelvin R Legge, a hugely respected pioneer of the geotextile industry in South Africa.

Legge has done fulltime research into the suitability of using geotextiles as filters in embankment dams while he was based at DWAF Materials Laboratory in Pretoria.

He has, among other aspects of his research and achievements:

- Evaluated performance for the full spectrum of geotextiles, including woven monofilaments, multifilament and tapes as well as nonwoven continuous filament, stitch bonded, heat bond and staple fibre materials
- Introduced the concept of splitting soil into fractions so as to evaluate geotextile filter interface behaviour. This test method is known as the Interface Flow Capacity Test
- Developed the high hydraulic gradient test to evaluate filter performance under extreme conditions using a modified large-diameter triaxial cell

His continued laboratory testing and investigations into dams and the implications for filters resulted in the proposed use of geotextiles as augmentations to chimney and blanket drains in certain earth embankment dam applications - advocating composite filter performance.

Legge is recognised as an international specialist in filtration culminating in his paper 'Geotextile selection as filters within embankment and tailings dams' at the international Geofilters Conference in 2004. He recently received the GIGSA Development in Technology Award for 2004 in recognition of his efforts in developing filter technology using geotextiles.

Info or copies of the publication
T 031-717-2300
ktechgmj@kaymac.co.za

RECRUITMENT DIVISION RECEIVES AWARD

THE KNOWLEDGE BASE Recruitment wing has been in existence for just over a year and their success has already landed them the Recruiter of the Month award in January 2006.

The Job Shop monthly award is issued to recruiters that make it their goal to deliver exceptional service to the job seeker. Candidates rate

recruiters on various categories which include effectiveness, friendliness and professionalism.

The Knowledge Base Recruitment wing specialises in the sourcing of top quality candidates for the engineering and design industries and offers a comprehensive website service to clients. The website allows prospective employers to search for candidates based on their geographical location, skills and competencies. Employers will therefore have access to the Knowledge Base Recruitment database of candidates that have been interviewed and approved.

The website ensures strict confidentiality in order to protect a candidate's privacy. Information that is displayed includes a short summary of a candidate's skills and qualifications and invites interested parties to contact the Knowledge Base Recruitment Centre directly for further information.

The division is backed by an experienced team. Candidates are assessed through a situational behavioural interview or by means of a personality profile capitalises on the strengths of people, enabling the organisation to maximise their return on human investment.

▶ **Info**

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PBMR 'DEFINES THE BOUNDARIES' IN FIRST DEAL FOR 2006

SPANISH MANUFACTURING company Equipos Nucleares SA (ENSA) is the latest in a string of suitors selected for partnership with PBMR for the proposed construction of the pebble bed modular reactor demonstration power plant (DPP) to be built at Koeberg in the Western Cape.

The R312 million ENSA deal covers the design and manufacture of the main power system pressure boundary for this world first inherently safe Generation IV reactor.

The pressure boundary is integral to the construction of the DPP as it acts as the entire steel 'exoskeleton' (pressure envelope) for 12 subsystems contained in the reactor unit, the power conversion unit and the pressure relief system, and contains some 2 000 t of steel.

'This contract with ENSA is yet another step forward in PBMR's commitment to delivering to its client, Eskom, a product of the highest quality, safety and reliability. We have been in lengthy negotiations with the Spanish group and are confident that their international expertise and commitment to localisation initiatives will prove that we have made the best choice,' said Brent Hegger, project director for the demo plant.

The contract comprises the design and manufacture, preparation for shipment, project management, quality assurance and configuration management, with completion anticipated in May 2009.

Functions of the pressure boundary include containment of the helium coolant, a barrier to the release of fission products into the environment, and structural support. The design ensures the prevention of chemical attack by air or water entering the system, any unplanned reactivity increases, and a loss of heat removal capability.

ENSA is committed to endeavouring to promote local fabrication to the extent of 50% of product and has a five-year relationship with DB Thermal, its South African representative. This agreement between ENSA and DB Thermal caters for the possibility of DB Thermal becoming involved in the manufacturing process of certain components which could constitute as much as 30–50% of the order value.

PBMR awaits certain procedural and judicial milestones before proceeding with its nuclear build programme. These include a positive record of decision from the Department of Environmental Affairs and Tourism and a licence to construct from the independent National Nuclear Regulator.

Nuclear construction is anticipated during 2007.

CHALLENGING DURBAN HARBOUR TUNNEL PROJECT

A NEW 530 M LONG TUNNEL is being installed below sea level to link Durban's Point and Bluff areas.

The R210 million tunnel is being constructed for the eThekweni Municipality with precast concrete segments and will be placed 30 m below sea level and 9 m below sea-bed, Montso Lebitsa, Resident Engineer: Tunnel & Shafts, of Goba Consulting Engineers, said. 'It will replace the current immersed tube tunnel which carries services such as electrical supplies and sewage from the Point Road pump station to treatment works at the Bluff. This tube tunnel is over 50 years old,' he explained.

The entrance to the Port of Durban will in future be widened and deepened to accommodate the depth of modern container ships and this has necessitated the installation of the new municipal services tunnel.

For the soft-ground tunnelling project, a 19 m deep shaft will be sunk on the Point mainland. There will be a 20% downward incline on the Point side and a 20% upwards incline on the Bluff side of the tunnel.

The tunnel will have a 4,4 m internal diameter and 13,8 m circumference. It will be constructed with 1,2 m long and 250 mm thick precast concrete segments produced at a Point Road on-site batch plant. The coupling of five main segments and one key segment will make up each tunnel section.

Goba's Senior Resident Engineer, Andrew Officer, says sinking shafts and tunnelling in soft ground inevitably pose challenges. 'Special tunnel boring equipment and skills imported from Herrenknecht in Germany are being used. Hochtief-Concor, the main contractors, will bring in skilled operators experienced in similar conditions for the project. The tunnel boring part of the project has to be completed in only four months so only a very short learning curve is available in this contract. As the boring machine advances, segments will be erected within the shield. The final part of the contract will be the decommissioning and removal of existing services in the old tunnel tube.'

Officer said spoils from the tunnel boring will be pumped into a separation plant and the material disposed of in a waste site. Planning allowance has been made for a second, pedestrian tunnel but no decision on its construction has yet been taken.

Vishnu Beeput, KZN branch manager for Chryso SA, says three Chryso products have been specified for the tunnel segment construction.

'In the first place, Chrysofluid L, high-performance water-reducing admixture was selected for its ability to reduce concrete permeability and enhance durability. Then Chrysofluid Premia 100, a "New Generation" super-plasticiser allows the lower possible water-cement ratio in the concrete mix while still retaining the easy-to-work-with feature. This product is mainly used for precast work where very high early strength and first-class finishes are required. Finally, Chrysocure WBD, a curing compound with Fugitive Dye, which helps to retain moisture in concrete for effective curing, is being used for the concrete segment production. The dye helps identify the areas treated but fades completely after one or two days.'

An aerial view of the Durban harbour tunnel route, with the segment production and finishing yard in the foreground and the South Bank site in the background

As stated, a Concor-Hochtief Joint Venture is the main contractor for the tunnel project with Goba the consulting engineers, in association with Mott MacDonald of the UK, Drennan Maud & Partners, and Wilson & Pass Inc.

Specialist input on the concrete specifications for the project was provided by the Durban company Contest Concrete Technology Services.

Info

Andrew Officer
Goba
T 031-368-2622

Vishnu Beeput
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T 031-702-4379

Text **Dawie Botha**
Executive director, SAICE

Nice little yacht in the San Juan backyard – sitting duck waiting for hurricane Wilma to pass

SAICE and international affairs

'What are you doing in America?
Nee, ons ry ry sommer so!'

AND SO SAYS CLARABELLE van Niekerk in one of her songs. But for SAICE it has never been an easy ride and it has never been a ride without purpose.

The world is a village. Engineering knows no borders. Civil engineering professionals from South Africa are everywhere. They bring their expertise and their principles and dedication to the engineering communities and citizens of the world. They also bring back good things to our homeland and continent for the good of the profession and the human beings they serve.

In the early nineties South Africa burst onto the international stage and was suddenly the darling of the world, was something of a novelty, and South African citizens were welcome almost everywhere. They were curiosities; they were wow! And they had to field answers about everything.

Subdued and low-key liaison over a period of 50 years or so suddenly became a frantic scramble on both sides. The first important professional contacts were made by ASCE and ICE and the first formal agreements were signed as early as 1994.

SAICE leaders were acutely aware of the need to link up with international networks for civil engineering and also multidisciplinary organisations in order to maintain world best practice and standards. We came onto the scene just when globalisation started to accelerate. And we made use of it. I sometimes used the term 'we used and abused' it. We took the gaps. We bridged the gaps. We used the windows of opportunity. We spoke up and made sure we were seen and heard. We carried small indigenous handicraft gifts abroad. We bragged about what we were capable of. We invited foreigners to come and visit South Africa and Civils SA and they did.

And what did we achieve? A great deal.

- Recognition
- Respect
- A voice and a say in international forums
- Support from our government in the

form of moral and financial assistance for the Africa Engineers Forum (AEF) for a session in Washington to tell the world why they need Africa
- Support and funding for capacity-building projects in South Africa and in the Southern African Development Community (SADC)
- Some foreign exchange flowing into South Africa from engineering tourism
- Formal visits by ICE, ASCE
- Informal visits by engineers such as the late Jan Jerström (director of the Swedish Institution of Civil Engineers) and his family
- Invitations to our members to lecture, to deliver papers, to serve in international forums and task groups
- Top-class lectures and speeches such as the Brunel Lecture
- Visits by dignitaries such as the mayor of Minneapolis
- The opportunity to reach out to Mozambican engineers and advise them on setting up their first institution, the Ordemo dos Eginheiros
- The privilege of working with ICE and the British Department for Foreign Development
- The great moments in 2002 when assisting ECSA in arranging Engineers Day for the World Federation of Engineering Organisations (WFEO) and receiving two slots in which to present papers
- The invitation to help to assemble a delegation of AEF signatories to attend the WFEO general assembly in Tunis
- Facilitating and supporting many reciprocity agreements in which ECSA plays a major role, such as the Engineers Mobility Forum

And as the advertisements so often say: Wait! There is more.

No member of SAICE remains untouched by these activities, although some

FOCUS AT THE ASCE CONFERENCE 2005

ASCE International Round Table

Surviving the forces of nature: Can civil engineers build safe communities?

CIVIL ENGINEERS BUILT much of the infrastructure that was destroyed by the 2004 tsunami, hurricane Katrina and other natural events across the world. The statement says a great deal, because in many places non-qualified residents also build cities. It is reported that in China many farmers are now building cities. And in many instances community settlements destroyed by nature's forces were built long before civil engineering became a profession.

The answer to the question above is a guarded 'Yes, but they cannot do it alone', says Hank Hatch, and our professionals must note:

- They must become politically astute lobbyists.
- They must strive for solutions that take economic, technical, social, cultural, environmental and political sustainability into account.
- They must have technical understanding as well as technical knowledge.
- They must recognise that decision making has to involve individuals and communities as well

do not naecessarily realise how it will benefit them. It would take a year or two of magazine articles to explain it all. Our members are urged to support the efforts and inputs and opofferinge that our leaders and many members make to maintain and enhance our status internationally and grow our depth of knowledge and contribute to a better and sustainable world for all.

What we see is growth and understanding and up, up and away!

SAICE INTERNATIONAL DIVISION

In October the SAICE Council resolved to establish an International Division. Until now SAICE's international affairs have been dealt with by various units and individuals, and it was time to create a forum where integration of effort could take place and continuity and capacity could be built into the system. It is clear that it will take some time to establish the unit, especially since the management structure to be implemented is not so clear cut as, say, that of a 'technical division'.

SAICE's international affairs have always been dealt with by the Executive Board, the SAICE-ICE Committee, the International Relations Committee, the executive director and SAICE National Office staff, by the technical divisions where these issues were discipline specific, and lately a number of capacity-building projects have been handled by the SAICE Section 21 Company.

Areas of activity, networking, interaction

It was decided to call together the SAICE-ICE Committee and the International Relations Panel under the chairmanship of SAICE president Sam Amod. At the first meeting of the so-called steering committee it was resolved to assemble the various role players who deal with SAICE's international affairs at a meeting in March to identify the issues to be addressed and decide on the way forward.

World Federation of Engineering Organisations

This multidisciplinary organisation has close links with engineering bodies across the world, the United Nations and UNESCO, the Commonwealth Engineering Council and many others. Since 2003 the South African representative has been our Engineering Council, since there was no multidisciplinary body in South Africa that could play a really meaningful and fully representative role in WFEO. SAICE has been involved with this body since 2002 and was invited to become an associated member, but funding restrictions prevented us from joining. This has not deterred the former presidents of WFEO, José Medem and Dato Lee, from involving us in many ways since the World Summit in Johannesburg in 2002.

The initial contacts led to funding and to an invitation to Dawie Botha to facilitate participation by a number of AEF signatories at the 2003 General Assembly in Tunis. ECSA first took part formally as

Far left: On the way home ... Dawie's FAVOURITE bridge: Brooklyn Bridge in New York
Left: Sleeping LEGO man in 50 year old Disneyland, Los Angeles

as governance structures, private and public

- Education and training must be appropriate. and sufficient, from artisan to engineer level.

Ultimately it is all about:

Engineering – Education – Enforcement

And maybe we should take the oath that our American counterparts subscribe to: 'We will protect the public from harm.'

Key contact programme

Young engineers also need to develop communication skills.

Thousands of ASCE members participate in this lobby and communication activity. How does it work? For example, when legislation that would affect or influence, say, infrastructure spending is submitted to the legislature, registered members are alerted and advised of the imminent activity. The members then lobby the USA governance structures to assist informed decision-making outcomes.

Unless we speak up and take care of our profession, we will become known as just another 'technical skills group'.

The South African political scene never really developed a lobbying system, but why can South Africans not start now? Maybe we can learn a lesson or two from the labour unions?

Maybe the SAICE Numbers and Needs initiative was a powerful lobbying tool that we did not recognise as such, but it is working very well nevertheless!

Corruption Inc – points to ponder?

- The construction industry is currently responsible for $390 billion of corruption costs per annum and ranks number 1 in the category of waste because of corruption – ahead of the arms industry! This amounts to a staggering 10% of all infrastructure investment in the world.
- Corruption can be defined as 'the wrongful use of power for commercial gain'.
- Zero tolerance is the key tool in fighting the corruption scourge.
- Transparency in engaging agents: for example, decide before you engage that paying for lunches is distributed equally between agent and employer.
- Contract documentation must include a clause to state that there will be zero tolerance regarding corruption in any particular project.
- Send a strong message and make buzz words bite!

the South African representative at this event. At that meeting the new Capacity Building Committee was launched under the chairmanship of Russel Jones of the USA. Through interaction with ASCE past president Luther Graeff, whom we had met at previous ASCE conventions, Dawie Botha was invited to become a member of this new committee due to his role in and vision regarding the AEF Protocol of Understanding, which is all about capacity building.

The first full meeting took place in Washington in June in 2004 (Dawie represented the AEF). The second meeting was in Shanghai in November, at which Dr Kevin Wall (SAICE president of 2001) stood in.

Subsequently Russel Jones attended the AEF-Department of Water Affairs-SADC-Rand Water workshop for capacity-building for professionals in water and sanitation at SAICE House early in 2005. The third meeting took place in Puerto Rico in 2005. Dawie attended because he was en route to Los Angeles to pick up the threads at the ASCE Conference and ASCE International Round Table after an absence of two years.

The fourth meeting of the committee is scheduled to take place at SAICE House in September or November 2006. Watch this space.

We are making progress!

WFEO – Puerto Rico, October 2005

If mention of the Caribbean conjures up images of palm fronds, golden beaches and azure seas, do not fool yourself. Puerto Rico is not like that – maybe the hurricanes of 2005 had something to do with it? I had the worst sinusitis and ear infection ever because if ice-cold air-conditioned meeting rooms and hotels and temperatures in the sweltering 30s with 100% humidity.

The WFEO Capacity Building Committee met for two full days. Representatives from Canada, the USA, New Zealand, Cameroon, Zimbabwe and South American countries waded through the quagmire to establish how to build capacity in diverse environments and in diverse communities. One becomes acutely aware of the huge challenges, but also of the magnitude of differences and what needs to be addressed. The British and Americans often need to address the same problems of lack of capacity in governments; they also battle with the issues of image and poor mathematics and science achievements in schools. At the same time, countries such as those in South America and Africa struggle to provide the basics of human needs and survival, incorporating potable water and appropriate sanitation.

The SAICE *Numbers and needs* book, which was researched and led to a conclusion by Allyson Lawless, drew quite an element of interest. Tony Marjoram of UNESCO even said that this model should be used by every country, so that we know what we face and how to address professional capacity.

The Capacity Building Committee is making progress, but it is a pity that it could not meet, say, four times a year in order to move ahead more quickly. The ultimate goals are projects and programmes and funding for capacity building programmes.

But we will have to wait for the next stop in South Africa at the end of 2006.

ASCE – Los Angeles, October 2005

The conference of the American Society of Civil Engineers in LA had a new look and new approach. Fewer liquorice allsorts and much more plenary became the flavour of the day. The focus was on natural disasters after the Katrinas and tsunamis, corruption in construction, and the youth.

As usual, we attended the ASCE International Round Table and as much as we could cram in of the other sessions. A bonus was that this year we were sponsored to attend the new-look ASCE structure – a full-day session that dealt with serving and servicing overseas ASCE members. Dawie Botha made a considerable contribution, which emanated from our SAICE experience in utilising our international cooperation agreements and networking. Ultimately it became clear that ASCE leaders would have to go back to the drawing board, since it did not seem feasible for one person to serve and represent for example the 3 000 ASCE members in sub-Saharan Africa from Johannesburg. Dawie was offered this honour, with the implication that he would become one of the governors of international Region 10. He declined within seconds! But he was asked to remain on the steering committee for the next round because of the value that he added.

In the meantime President Mike Deeks attended sessions on corruption in construction. And Carla de Jager was there as well to meet with ASCE counterparts, learning more and negotiating with ExCEED and the ASCE bookshop, experiencing how they dealt with the young member sessions, and linking up with our own high flyer, Meggan Farrell, who is now moving from managing ASCE conferences to ASCE International. □

From top to bottom:
Dr José Medem, previous WFEO president, and Mrs Medem with Dawie and Ria
Coffee after dinner with Carla de Jager and Meggan Farrell, former employee and nowadays ASCE director of International Affairs
Rosario Martinez Vazques de Parga, Secretary General of the Spanish Institution of Engineers, which was also established in 1903, shows off the RSA keyring Dawie gave her a couple of years ago
The Region 10 meeting with Chair Jaime Santamaria-Serrano of Colombia in the middle, back row

Compiled by Carla de Jager
SAICE

Continuing Professional Development

How it really works

IT'S 2006 AND compulsory CPD for renewal of registration is now a reality.

SAICE is one of the leaders in the field when it comes to the approval of CPD activities, and this quick update is intended to provide you with some clarifications on frequently asked questions and tips on how to claim your credits in this uncharted territory.

How do I know an activity has been approved for CPD credits?

ECSA has given approval to voluntary associations that are recognised as such in terms of the Act as well as to accredited tertiary educational institutions to run activities that will be acknowledged for obtaining CPD credits.

Each activity in category 1, including conferences, congresses, workshops, lectures, seminars, courses and refresher courses, will require a unique CPD validation number, which must be quoted when recording the activity for CPD.

The CPD validation number will commence with the name of the voluntary association that validated the specific event. SAICE selected the following method of numbering: SAICEGeo06/00001/09 (SAICE followed by a specialised field code; then the year of validation; the unique validation number; and the expiry date of the validation).

The full list of activities will be accessible on the ECSA website: **www.ecsa.co.za** and those validated by SAICE will be available on the SAICE website: **www.civils.org.za/events.xls**.

When a CPD activity does not appear on one of these lists, how can I be sure that it has in fact been approved or will be approved?

All voluntary associations recognised by ECSA in terms of the Act, as well as accredited tertiary institutions, have been approved by ECSA to offer CPD activities. SAICE, however, has a responsibility to ensure that the activities that are validated by the institution are of adequate standard. The SAICE Education and Training Panel implemented a pilot system for validating activities.

Members can be assured that a CPD activity provided by SAICE or one of the organisations approved for CPD events by SAICE will be acceptable for the ECSA system. SAICE is not a newcomer to the CPD environment. In the event that an activity does not meet the criteria, members will be informed that this event did not conform to SAICE standards.

At this early stage, the validation number for a specific event may not be available in advance or on advertising material, but members will be able to access and update their CPD portfolio after the event. Providers who submit activities for validation will be told as soon as possible of the status of validation and will inform delegates accordingly.

During the pilot phase, members should use the SAICE list of CPD events as published to ensure that they meet the CPD criteria. However, in the case of CPD events that are currently in the pipeline and are being offered before validation numbers have been allocated, attendees will have to visit the website at a later stage to ascertain whether these events have been validated. At this stage we do not see any major reason why these CPD activities would not be approved. The full ECSA list will be made available in due course.

What about activities of voluntary associations that are not recognised by ECSA?

A number of smaller voluntary organisations may not meet the technical criteria for recognition by ECSA. SAICE does recognise that there are organisations that have been providing valuable service for a number of years. For example, SARF, SAISC, C&CI, WISA and others are respected members of our professional community. In terms of CPD SAICE will treat these organisations in the same way as our branches and divisions.

How are conferences validated?

Conferences can only be validated if the SAICE panel has had an opportunity to review the proceedings. The nature of conferences means that the material will be validated retrospectively in most cases. Where copies of presentations are available in advance, validation could be done beforehand. However, conference proceedings may be submitted for validation after the event has taken place. Members are again urged to check the validated lists on ECSA and SAICE websites before and after conferences that they attend. All organisations are encouraged to validate conferences, since this type of event often constitutes a valuable source of CPD. Members are encouraged to ask conference organisers whether they intend to validate the conference.

How do I register attendance of a CPD activity on the ECSA website?

It is important to note that you should log your updated information onto the website at least annually in your CPD cycle. If you attend a course in January, you can enter this information on your portfolio at any time in that year. If the activity was validated and you attended before the expiry date of validation, you will receive the CPD credits for it.

On-line process

- Log onto the ECSA website: **www.ecsa.co.za**
- Go to the CPD menu item on the left-hand side of the screen. You will be requested to enter your ECSA registration number and ID number
- Click on Developmental Activities
- Click on the specific item, for example course, lecture
- The validated courses will appear as a 'select from' list

Note that you can also keep a manual recording system of your CPD activities.

What proof will ECSA require if I am audited for CPD?

ECSA will require proof in one of the following forms:

- Certificate
- List of results
- Record of attendance
- Receipt of course payment
- Written verification from the recognised voluntary association or accredited tertiary educational institution that presented the developmental activity

▶ More questions than answers?

Please submit your questions in writing to cpd.sharon@saice.org.za or Private Bag X200, Halfway House, 1685, attention: Carla de Jager.

We regret that we cannot handle large volumes of telephone calls since many of the questions are generic in nature and take a lot of time to handle individually. We would rather receive a number of questions and send out a compilation of frequently asked questions and answers.

Please remember to **read through the ECSA documents on www.ecsa.co.za** and also note the **events column in this magazine** for an update on activities scheduled for the months ahead (**www.civils.org.za/events.xls**)

Webster Ndodana – first African consulting engineer to become president of SAACE

SAACE inaugurates its first African president

THE SOUTH AFRICAN Association of Consulting Engineers (SAACE) has recently inaugurated its first African consulting engineer to the presidency of the Association.

Webster Ndodana takes up the role at a time when the construction sector is in the midst of major transformation with the expected implementation of the Construction Charter set for 2006.

Says Graham Pirie, CEO of the Association: 'The draft charter is expected to be finalised in the next few months and will likely be legislated early next year. We could not have had the able assistance of Webster at a better time. Together, Webster and I will be encouraging our members to begin working towards the targets outlined in the Charter with urgency and I believe that he will play a key role in gaining the confidence and widespread support of our member firms.'

Webster is a professional engineer registered with the Engineering Council of South Africa (ECSA). He is a member of the South African Institution of Civil Engineering (SAICE) and of the South African Black Technical Allied Career Organisation (SABTACO).

Webster will be supported by Althea Povey, immediate Past President (also a member of SAICE); Cecil Rose, 1st Vice President; and Felix Fongoqa, 2nd Vice President. □

DIARISE THIS!

Date	Event	Presenters	Contact details	CPD validation number	Notes
6–9 March	Seismic Design of Structures	Prof Alessandro Dazio Swiss Federal Institute of Technology	Jan Wium janw@sun.ac.za		University of Stellenbosch
8 March / 14 March	Seismic Design of Structures	Prof Alessandro Dazio Swiss Federal Institute of Technology	Dawn Hermanus T 011-805-5947 dhermanus@saice.org.za	SAICEstr06/00001/06	Cape Town Gauteng
9–10 March	Technical Reportwriting	Insite Training for SAICE	Dawn Hermanus T 011-805-5947 dhermanus@saice.org.za		
13–14 March	Project Management	Dr Carruthers	Johan van Schalkwyk johanv@saace.co.za	To be confirmed	http://saace.co.za
15 March	Risk Management	Dr Carruthers	Johan van Schalkwyk johanv@saace.co.za	To be confirmed	http://saace.co.za
13–18 March	Quality Management ISO 9001-2001	Dr Carruthers	Johan van Schalkwyk johanv@saace.co.za	To be confirmed	http://saace.co.za
14–17 March 2006	The Design of Slurry Pipeline Systems	Dr Robert Cooke Dr Angus Paterson	Terry Carolin T 021-683-4734 terry@pcce.co.za		Graduate School of Business Breakwater Lodge Cape Town
7–9 May	3rd South African Construction Health and Safety Conference	Prof J J Smallwood	john.smallwood@nmmu.ac.za T 041-504-2790		Cape Town
8–18 May	SCT 35 Concrete Structures Analysis and Design	Various	Rennisha rennisha@cnci.org.za	SAICEcon06C/00002/09	
30 May – 1 June	PMSA International Conference 2006	In cooperation with PMI SA Chapter	Taryn van Olden PMSA Conference Organising Committee info@cyansky.co.za		Johannesburg www.pmisa.org.za/ conference for more information
18–20 June	The First Built Environmental Conference	Prof J J Smallwood / Mr C F Parker	john.smallwood@nmmu.ac.za T 041-504-2790		Johannesburg