PROFILE OF SAICE’S 2008 PRESIDENT

Long-awaited Gautrain TBM commissioned

FOCUS ON THE JOINT CIVILS DIVISION

Numbers and needs in local government
ON THE COVER
Gautrain’s long-awaited high-technology tunnel boring machine (TBM) recently arrived at Rosebank Station, where it was assembled. The TBM was named Imbokodo, observing a global TBM tradition of giving women’s names to these giant machines as a sign of good luck for the project.

On the Cover
Long-awaited Gautrain TBM commissioned

PROFILE
The ultimate volunteer

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SAICE AND PROFESSIONAL NEWS
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Gold from straw?

Diarise this!
The ultimate volunteer

He readily admits that he tends to pile too much on his plate. ‘I sometimes think I can take on just one more important thing, and then I find myself stretched for time,’ says Johan de Koker, SAICE’s president for 2008. Yet, what he perceives as a flaw in his make-up is a quality that is valued and admired by his contemporaries in the engineering profession. To quote colleague George Fanourakis, ‘Johan generously devotes significant amounts of his time to matters that advance others, without expecting anything in return. He is one of the most unselfish people that I have ever known.’ Lorraine Fourie visited Johan and his wife, Verelene, at their home, where she found him amid what is generally known as orderly clutter.

HIS OWN PERSON

‘He doesn’t file, he piles,’ Verelene volunteers an explanation for the mounds of paper in Johan’s study. ‘When we had a burglary some time ago, the thieves rummaged through the study but failed to notice Johan’s digital camera on his desk!’

‘Obviously there is some merit in being disorderly,’ he retorts mischievously.

Johan’s heavy workload includes a never-ending stream of requests for assistance from the professional bodies with which he is involved, and he responds to these requests with meticulous attention.

‘My interests have always been linked to the engineering profession, and these things have a way of sucking you in, the more you commit yourself,’ he says, ‘even to the point where your social life often becomes limited to “calls of duty”, albeit pleasant ones’!

This remark hints at his inimitable way of looking at the world around him and the place he occupies in it. The personality trait that attracted Verelene to the young Johan more than 30 years ago – that he is ‘very much his own person’, an independent thinker and operator – has strengthened over the years.

He is non-committal when asked whether the road he followed to maturity had its origins in his days as a single child on a farm near Nelspruit. ‘It’s rather the experiences and the situations you encounter along the way that mould you,’ he comments.

After finishing school at Ben Vorster High School in Tzaneen, he began working for the then South African Railways & Harbours and was selected for training as an engineering technician in what was known as the sandwich course: six months of theory and six months of practical work. He obtained what is now known as the National Higher Diploma in Civil Engineering through the Technikon Witwatersrand in 1972. While he was stationed on various construction sites in the Eastern Cape in the early seventies, he met Verelene, who was an occupational therapist at the Provincial Hospital in Port Elizabeth. After they were married, they settled in East London for two years.
FINDING HIS NICHE

In 1976 he was transferred to the Railways’ Track Research and Development section in Johannesburg. The couple moved into a house in Discovery, Roodepoort, where they have lived ever since, having turned it into a comfortable home that mirrors their down-to-earth approach to life. Here they raised their two children, Estelle and Nico. Estelle, who studied biochemistry and psychology, works in Johannesburg for an international food ingredients company, while Nico is currently completing his PhD in mineral physics at the University of Michigan. Although Estelle and Nico – respectively – share their father’s love of persimmons and Beethoven, they are not nearly as passionate about bagpipe music as he is!

‘The kind of work that I did in track development suited my personality much better,’ Johan reflects. ‘It entailed planning and doing research and investigation, writing research reports and instruction manuals, testing and product specifications, designing and executing laboratory and track tests, as well as lecturing at in-house workshops. There is an aspect within me that likes to impart the knowledge that I have gained to others.’

Over the next 12 years he acquired in-depth knowledge of various aspects of rail maintenance, track components, and railway track lubricants and their interaction. ‘An investigation into rail lubrication was one of the first projects handed to me at Track Research and Development. I surveyed the lubrication situation countrywide and wrote a report on it, which led to my being promoted to work on the two heavy-haul lines, the Richards Bay coal line and the Sishen–Saldanha iron ore line.’

Rail technology – which included rail corrosion, rail joints, and newly evolving technologies such as rail profiling – became his specialist field. In 1992 he obtained a Master’s Diploma in Technology, Civil Engineering (Structural) at the Technikon Witwatersrand, after completing a dissertation on insulated rail joints. ‘We did a vast amount of development and evaluation of different types of joints from all over the world, and I was able to use many of these results for my thesis.’

All the while, rail lubrication remained a field of interest. ‘I kept on thinking how one could improve on the rule of thumb for the positioning of the machines used to lubricate the wheel flange and the rail.’ By 1994 Johan had developed and tested a formula for positioning trackside lubricators that eventually received international recognition and was included in textbooks on rail lubrication abroad. It is still used locally, as well as on some North American and Canadian rail systems. The paper that he delivered at an international conference on this research was awarded the SAICE Railway and Harbour Engineering Division’s Award for best technical paper in 1994. Later, in 2006, he also received the Chairman’s Award in recognition of his contribution in general to this division.

He is currently refining the ‘famed’ formula – the importance of which he downplays – to meet the demands of new technology and circumstances. It forms part of his PhD research at the Department of Mechanical Engineering Science, University of Johannesburg.

LEADER IN THE PROFESSION

Concurrently with the advancement of his career in the railway industry, Johan became a valued role player and leader figure in voluntary engineering organisations. His involvement with the Institute of Professional Engineering Technologists (IPET) began when it was still known as the South African Association for Registrable Engineering Technologists, and he has been a council member since 1987.

As IPET president (1993 to 1995), vice-president of the South African Institute of Civil Engineering Technicians and Technologists (SAICET) before its merger with SAICE, and chairman of the Board of Technicians and Technologists within SAICE (1996 to 1997), he was a tireless and astute negotiator for equal recognition for technicians and technologists in the engineering profession. As an IPET council member under Johan’s presidency, George Fanourakis came to know him well: ‘Together with the founders of IPET, Johan strove to protect and advance the rights and recognition of the professional engineering technologist, which at times really was a struggle. One of the many successes was convincing – over a number of years – some government departments to permit the appointment of professional technologists to posts that had previously been reserved for professional engineers. As technologists we are indebted to Johan for his initiatives that have benefited so many of us.’

Terry Stidworthy, chair of the Engineering Council of South Africa’s Registration Committee for Professional Engineering Technologists, expands on Johan’s team player ability: ‘This quality and his proactive attitude make him a sought-after person to have on a team when complex problems have to be solved. Under his guidance, innovative norms and processes were developed and introduced which are now part of the Registration Committee’s working processes.’

About his style of communication, which entails formulating his thoughts carefully before they are verbalised, Johan says: ‘After spending so many years in engineering politics, you learn to express yourself with circumspection to avoid rubbing people up the wrong way, and in due course it becomes second
nature. I suppose this goes for all kinds of politics …’

He served a second term as IPET president from 1999 to 2001. Subsequently he handled portfolios such as treasurer and organiser of conferences, symposia and awards, and trustee of the IPET Education Trust. In 1999 he was made an honorary fellow of IPET.

Johan registered as a professional engineering technologist with the Engineering Council of South Africa (ECSA) in 1986. Since 1990 he has served uninterruptedly as committee member, vice-chairman and chairman of ECSA committees in the education, accreditation, standards generating, and registration sections, and as ECSA council member from 2001 to 2004. ‘My involvement with the multi-disciplinary Registration Committee for Professional Engineering Technologists in particular has given me in-depth insight, not only into all civil engineering functions, but also into many aspects of other engineering disciplines. The process of evaluating applications also provided me with valuable experience in benchmarking and assessment.’ His participation in the ECSA accreditation processes for engineering courses at former technikons (now universities of technology) in South Africa, as well as in Ireland (the latter under the Sydney Accord), gave him significant insight into the engineering education process in general.

His long association with the Registration Committee has made him a valuable source of information and advice in the industry and profession. People seem to know that Johan is accessible on this subject at all times, and he therefore gets contacted frequently for advice on registration requirements and processes.

The De Koker husband-wife team has been a winning combination from the SAICE perspective, too. Their management of the SAICE Patrons’ Engineering Bursary Scheme (SPEBS) led to them being joint recipients of the President’s Award in 1999. SPEBS originated within SAICET to raise sponsorships for civil engineering students. After SAICET’s merger with SAICE in the early nineties, and against the background of a changing economic environment, the scheme continued to function, but needed restructuring and a more permanent champion. In 1994 Verelene took over the administration, working from home, while Johan was responsible for the outreach operation. Their commitment and hard work raised SPEBS to a new level of activity. Although Johan still serves on the SPEBS committee, Verelene is no longer involved.

Within SAICE, where he has served on most standing committees, has been a member of council since 1994, and has been vice-president since 2002, Johan’s role as a change agent and his contributions towards consolidating the status of the professional engineering technologist are well known. Fittingly, he was the first professional engineering technologist to be elected a fellow of SAICE.

Faried Allie, a longstanding colleague, brother in arms and friend, and the first professional engineering technologist to become president of SAICE (in 2003), endorses George and Terry’s observations: ‘As a member of SAICET and then SAICE, over many years Johan has contributed to the advancement of the status of the engineering technician and technologist. He also promoted equity in our dealings where this was required. Many a time as a team we had to fight for the rights of the technician and technologist, and now others in the profession can reap the benefit.’
INTO ACADEMIA

After nearly 40 years in the railway industry, Johan accepted the post of head of the Department of Civil Engineering Technology at the University of Johannesburg in July 2007. He believes his research record and his long association with the former Technikon Witwatersrand (where he served as member and later chairman of the Advisory Committee of the Civil Engineering Technology Department) were probably the overriding reasons that he was offered the position. 'Many years ago I made a resolution that I would try to deliver at least two papers a year – one of a technical nature and one that would hopefully contribute towards enriching the profession. I have always been of the opinion that you have to keep on trying to improve yourself through research and presenting papers.' He has kept to that commitment: since 1992 he has read more than 30 papers at local and international forums, and in 2001 an address he delivered at an international tribology conference received the South African Institution of Mechanical Engineering’s Award for the best paper on railway engineering.

Johan regards the forthcoming year as SAICE president as an opportunity for contribution, and reiterates the sentiment expressed by many previous presidents that in the order of personal experiences it is a humbling one, and probably one of the greatest opportunities granted a person in his or her lifetime.

An issue that Johan would like to see addressed during his presidency is the utilisation of all members of the engineering team to their full potential. In his view, many engineers in South Africa are not optimally employed and deployed. 'Professional engineers should be utilised on a much higher strategic level in organisations – especially state-owned entities – than is happening at present. Many of them are doing work that could be done by professional engineering technologists.'

With his level-headed approach to problem solving, there is no doubt that Johan will find a way to settle this and other issues confronting the profession. In the words of Terry Stidworthy: ‘His tenacious endeavours to promote and market the brand of engineering in South Africa make him a worthy choice for the presidency of SAICE.’

At Estelle’s wedding in 2003: Nico, son-in-law Gary Crowngold, Estelle, Johan and Verelene
FOCUS ON THE JOINT CIVILS DIVISION

What is the Joint Civils Division?

THE INSTITUTION OF Civil Engineers (ICE) was founded by a small group of enthusiastic engineers in a London coffee house in 1818. Today, ICE has 80 000 members in 150 countries.

In 1992 ICE and the South African Institution of Civil Engineering (SAICE) established a cooperation agreement. This culminated in the establishment of a joint committee in South Africa in 2007, which has now been named the Joint Civils Division (JCD).

Both organisations have benefited from the spirit of cooperation that flourished over a number of years. The purpose of the JCD is to develop this working relationship to its full potential for the mutual benefit of the institutions and their members.

The JCD committee has been established, activities have commenced, a website has been constructed (www.jointcivils.co.za) and the primary vision for the division has been published.

Current functions incorporated in the JCD include:
- Delivery of ICE country representative services, arrangement of presidential visits and Brunel International Lectures
- Promotion of communication through ICE and SAICE publications, programmes and best practices
- Provision of support for ICE international initiatives and projects in southern Africa
- Being the home for the New Engineering Contract (NEC) suite of contracts
- The division now represents South Africa in the monthly ICE Africa and Middle East teleconferences. This forum provides the exciting opportunity for dialogue on current challenges facing the engineering profession both locally and internationally.

Flowing from this recent involvement the division has been invited to attend and present at the ICE Regional Convention on the Impact of Climate Change and Poverty Alleviation Convention to be held in Egypt in January 2008.

For the JCD to be of service it must create a broader and more sustainable membership. Against this backdrop ICE members are encouraged to become members of the division.

The civil engineer in South Africa is experiencing similar challenges to those of their international counterparts. The objective of this division is to provide the foundation from which international interaction and learning may dovetail into solutions that fit the South African context.

Today civil engineering challenges are not exclusively centred on technical solutions rather we are confronted with societal issues, environmental challenges, achievement of sustainability and the search for innovative solutions.

In 2008 JCD will focus on addressing membership needs, deliver the core function of a learned society through access to the global knowledge economy, and improve the image and influence of the profession in an exciting and visible way.

JOINT CIVILS DIVISION COMMITTEE

The JCD held its first meeting on 22 March 2007, at SAICE House, where the committee members were elected.

The portfolios are currently held by Mike Lomas (chairman); Ron Watermeyer (vice-chairman); Michael Cullen (treasurer); Tobie Ueckermann (Transportation); Andrew Baird (out-going ICE representative) and Alain Jacquet (secretary). Other members are Mzamo Lephoma, Mike White, Rob Young and Dawie Botha (ex officio).

Please contact the committee through either the chairman, Mike Lomas (chair@jointcivils.co.za), or the secretary, Alain Jacquet (secretary@jointcivils.co.za), or visit the division’s website at www.jointcivils.co.za.

VISION OF THE JOINT CIVILS DIVISION

The primary vision for the JCD has been determined as follows:

- Represent ICE membership in South Africa
- Exhibit the benefits of ICE membership
- Exhibit the benefits of SAICE membership
- Assist persons to become members of ICE or SAICE
- Provide career guidance: encourage youngsters to enter into the civil engineering profession
- Promote visibility of international affairs
- Promote visibility of ICE in South Africa
- Sharing of international practice
- Encourage alignment with international practice
- Promote the Brunel International Lectures
- Be the home of the NEC suite of contracts in South Africa
- Host the NEC User Group
- Advertise meetings held in South Africa and the UK
- Promote knowledge transfer
- Knowledge transfer on the NEC suite
- Knowledge transfer of international practice
- Knowledge transfer of procurement
- Knowledge transfer of ICE products
- Provide networking opportunities
- Perform conversions or adaptations of UK systems for South African purposes: methods of measurement and payment
A new era in construction growth, capacity and innovation

Inaugural lecture by JCD Chairman Mike Lomas

The first lecture presented under the auspices of the Joint Civils Division was given by Chairman Mike Lomas. The talk focused on the drivers of civil engineering construction growth and the impact of the industry over the next decade.

POPULATION AND INFRASTRUCTURE

The skills shortages and capacity constraints experienced in South Africa are international phenomena and are likely to remain that way for the foreseeable future. The global population has more than trebled in the last 80 years and is increasing at a rate of 1 billion every 14 years. The societal and infrastructure demands arising from the population growth are placing pressure on the engineering profession to deliver (see figure 1).

The provision of infrastructure in South Africa has lagged economic growth for the last 20 years. Only in the last 2–3 years have we managed to halt the decline (figure 2). It will take 10–15 years of concerted investment in infrastructure and civil engineering delivery to place South Africa in a globally competitive position from an infrastructure standpoint.

FUTURE TRENDS

In reviewing international trends in successful project delivery the following key principles are paramount:

- The client must lead and be supported by a professionally qualified team from inception
- The client must clearly define the project imperatives to the design team
- The design team is to be chosen on best value knowledge and ability, not lowest price
- Early contractor involvement, quantification and equitable appointment of risk are essential to meet final budgets
- Projects are to be financially robust, meet environmental and sustainability criteria. Confrontational conditions of contract should be replaced by collaborative methods of working, and companies should be encouraged to become preferred employees.
- Creating new production processes – organise management and site activities along to support the supply chain

All the studies to date indicate creating the innovative environment is crucial to success. Historically we have recruited people into our organisations on the basis of intellect, diligence and...
obedience, whereas the future will demand passion, creativity and initiative as well (figure 3).

The challenge facing civil engineering at large is: How do we create the right environment for these characteristics to flourish?
- The construction process is to be a collaborative or partnering approach, with quick dispute resolutions processes
- Projects aspire to be injury and accident free

INNOVATION
Innovation and productivity are key to extracting more from current resources. Some of the international initiatives currently under way include:
- Off-site manufacture – leads to better quality control, safety and health improvement and environmental benefits
- Virtual design and prototyping – ‘try before you buy’
- Implementation of best practice – search for international best practice and incorporate in the design and construction process
- Creating the innovative environment – Measuring and rewarding innovation in industrial companies on an annual basis

CONCLUSION
Growth is set to continue for the next decade and fierce competition for skills will exist for the foreseeable future. Client lead, thoroughly engineered, risk managed and collaboratively constructed projects will create the necessary environment for innovation. International contractors have formalised risk procedures which many South African civil engineering contractors are currently adopting.

Several countries are strategically focusing on creating the preferred construction environment in order to attract scarce construction skills and encourage young people to enter the profession. ▶

Annual growth rate of the global population
Infrastructure is lagging economic growth
The human resource challenge
The Joint Civils Division and the new agreement of cooperation

I WELCOME THE arrival of the new Joint Civils Division (JCD) of SAICE; it has been a long time coming.

As the last of a long line of South African country representatives for the London Institution of Civil Engineers (ICE) I think I can safely conclude that such an arrangement never worked as effectively as intended. The individual holding such an appointment is usually a member of ICE with a fairly high profile in the country he represents and therefore most often just too busy to be able to give the required attention to the voluntary duties of the ICE country representative.

The new agreement of cooperation between SAICE and ICE – which simultaneously gave birth to the Joint Civils Division – was signed during the January 2007 presidential visit of ICE President Quentin Leiper and Director General Tom Foulkes.

The role of ICE country representative has not been abandoned, but now rests with the elected chairman of the new division’s executive committee. Many of the duties of the country representative have been included within the portfolios of elected members of the JCD executive committee, thereby sharing the burden across a team of people. I cannot think of a better person to lead this team than Mike Lomas, and I am sure he will have the full support of all of us.

For the many people who lobbied for change it was not difficult to devise a new model for liaison between the two institutions as there is already in place a very successful one between SAICE and the London-based Institution of Structural Engineers (IStructE). I would like to thank all those enthusiastic members of the Joint Structural Division who assisted us in getting the JCD off the ground. It is pleasing to see that two of the JSD executive committee members have also been elected to serve on the JCD committee, which is already ensuring an accelerated start.

The ICE will be watching the progress of JCD very keenly and have already indicated that if successful it could serve as model for application in other countries where there is a strong local institution and many ICE members resident in the country.

Whilst the prime function of the ICE country representative is to provide a point of contact for members of ICE resident in the country he represents for liaison with ICE head office regarding their membership, it was also expected that the representative would further the aims and interests of ICE as part of its international objectives. In countries where there is already a strong local institution serving civil engineers the latter could not be seen as interference in their affairs, but more as a joint effort in the interests of both institutions.

With the uptake in South Africa of ICE’s NEC system of standard form contracts, it is therefore not surprising that one of the portfolios in the new JCD relates to the application of the NEC system in South Africa. Having served on the ICE’s NEC Panel since its inception in 1993, and invited to serve again in the new panel formed in 2005, I have also been asked to take on the NEC portfolio within the JCD.

THE JCD NEEDS AND THE NEC SYSTEM

Three issues have already been identified as being of immediate focus for the JCD’s NEC portfolio. These are:

- The reinstatement of a local forum for NEC users to exchange experiences
- Overhaul of the process for accrediting, listing and appointment of NEC adjudicators, and
- Continuation of feedback to the NEC Panel about matters which affect South Africa’s application of the NEC contracts

REINSTATEMENT OF A LOCAL FORUM FOR NEC USERS TO EXCHANGE EXPERIENCES

Industrial Project Manager and ICE member Peter Thurlow and I formed a local version of the UK’s NEC Users Group in 1995. We constituted an association known as the SA NEC Users Group Association, organised some well-attended events, and ran the affairs of the Association with the help of a group of NEC enthusiasts. Unfortunately many of the enthusiasts moved to other countries and the load fell on too few shoulders to maintain the momentum necessary to keep the Association active. Furthermore it seemed rather pointless to compete with the UK NEC Users Group, which already provides an international focus. The affairs of the Association have now been wound up by auditors and the proceeds of the Association’s bank account transferred to a dedicated account within SAICE, which the JCD will monitor.

The JCD committee proposes to reinstate a local forum for NEC Users by arranging self financing events on matters of topical interest as well as joint events with the UK Users Group to assure an international focus.
A very successful NEC Users Group event was held in Johannesburg during the ICE presidential visit earlier this year organised jointly by the UK NEC office and SAICE’s event’s organisers. Coinciding with the signing of the new agreement of cooperation we were privileged to have Dr Martin Barnes as the anchor man for the event. Dr Barnes is the original designer of the NEC system, was first chairman of the NEC Panel, and is currently president of the Association for Project Management. Thanks to ICE financing Dr Barnes’ visit were able to use profits from the event as start-up funding for the JCD. (Dr Barnes’ presentation to the Users Group event can be viewed from a link given on the JCD’s web page www.jointcivils.co.za.) Similar events will be arranged jointly with the UK’s NEC office for early 2008.

The funds transferred from the former SA NEC Users Group Association will be used for specific projects identified by the JCD committee, which by their nature are not likely to be self financing. An example would be obtaining local counsel opinion on aspects of NEC in relation to South African law.

It goes without saying that readers are welcome to suggest NEC-related topics for consideration by the JCD committee for future events.

ACREDITING, LISTING AND APPOINTMENT OF NEC ADJUDICATORS

All the standard forms of contract mandated by South Africa’s Construction Industry Development Board (CIDB) for use by organs of state in South Africa now use adjudication as a first line of dispute resolution. This approach to dispute resolution was pioneered by NEC in 1993 and has become a statutory right in the UK for projects falling within the ambit of the Housing Grants, Construction and Regeneration Act of 1996. In the absence of such an Act in South Africa the closest to adjudication would be expert determination.

In short, the parties to a contract appoint an independent expert (the adjudicator) with no connection to either party to receive all dispute references and make a decision on each one within a stated time period and which is enforceable as a contractual obligation. The adjudicator’s decision is final and binding if neither party is sufficiently dissatisfied to take the matter further to either arbitration or the courts.

Each of the four approved standard form systems has different procedures for adjudication but the requirements for an adjudicator are essentially the same. He (or she) must be impartial, very experienced in the sector of procurement from which the dispute arises and in the form of contract which the parties are using in the contract between them. A sound knowledge of the law as it affects the contract between the parties is also desirable. Perhaps an even more important credential is that the adjudicator must be capable of recognising when his own skills and knowledge surrounding the matter in dispute are inadequate for him to make a decision, so that he will then approach others who do have the necessary skills to assist him.

In the NEC system it in intended that the adjudicator be a single person (expert) selected and appointed separately by the parties at the same time as they form the contract between themselves. The adjudicator is paid by the parties in equal proportion irrespective of his decision, but only becomes involved with the parties when a dispute is referred to him by either of them. All dispute references are in writing and only in very special circumstances would the adjudicator meet with the parties. If his decision involves payment by either party to the other or changes to completion dates, he is required to assess the effect of his decision in the same way as compensation events under the contract are assessed.

The first group of persons listed as being able to act as an NEC adjudicator was compiled by coercing persons with NEC and dispute resolution knowledge to attend two days of NEC adjudicator training and allow their names to be included on a South African NEC Users Group List of Adjudicators. This compares unfavourably with the very exacting process of accreditation used by the ICE. Prospective ICE listed adjudicators have to pass contract law exams, conduct mock adjudications and subject themselves to an intensive interview before a panel of adjudication experts. The first-time pass rate is very low as the standards are high. However, it has proved very difficult to persuade senior persons in the local industry to subject themselves to such a process on the off-chance that they may or may not be asked to act as an adjudicator in the foreseeable future if listed.

An attempt was made at combining all the other custodians of standard form contracts in use in South Africa to form a unified centre for dispute resolution, but this has not transpired mainly as a result of the wide differences between the dispute resolution processes in the various forms of contract.

The JCD committee (for NEC) in liaison with the SAICE Project Management Division (for GCC2004) continue to debate a South African solution to the problem of finding and accrediting suitable adjudicators. In the interim further coercion will be required as the original list of NEC adjudicators has shrunk from 12 to 7. Anybody interested in becoming an NEC adjudicator should contact secretary@jointcivils.co.za and those interested in becoming GCC 2004 adjudicators should contact Derek Burger on BurgerD@velavke.co.za

SOUTH AFRICA’S APPLICATION OF THE NEC SYSTEM OF CONTRACTS

Because of my membership of the NEC Panel, both inputs and feedback from South Africa have been continuous since the panel was formed in 1993. Many of the changes between the second and third edition of the Engineering and Construction Contract originated in South Africa. This process will continue but continuity into the future should be better assured by being done with the knowledge of the new JCD. The JCD will also manage the provision by the NEC Panel of any special South African requirements similar to the national requirements already provided for users in the UK and New Zealand. These are known as ‘Y’ clauses.

The NEC Panel’s focus for just about the whole period since the launch of the NEC3 documents in June 2005 has been the development of the new NEC3 Supply Contract, and a short version of the NEC3 Term Service Contract, to be known as the NEC Term Service Short Contract. The new Supply Contract is currently out for consultation and is due for publication in about March 2008. The consultative edition can be accessed from www.neccocontract.com. A deputation from Australia has also asked the NEC Panel to assist them with the use of NEC3 in project alliancing applications.

Andrew Baird is the former ICE country representative, member of the NEC Panel, member of the JCD’s executive committee, and owner of Engineering Contract Strategies, Johannesburg.
At the heart of society

Extracts from David Orr’s ICE presidential address

David Orr, the 143rd president of the Institution of Civil Engineers (ICE), on 6 November 2007 delivered his presidential address ‘At the Heart of Society’, which put forward his ‘vision for civil engineers as people acclaimed for merit, people at the heart of society’. David argued that to achieve this, each of us must stand up for the value of civil engineering; stand up for the highest professional standards; stand up for excellence in procurement; and stand up for the unsung heroes of our profession. David is the Director of Central Procurement in the Northern Ireland Civil Service, where he leads the procurement of construction works, supplies and services. The ‘excellence in procurement’ portion of his address is very pertinent to South Africa and is reproduced here.

SIX KEY PRINCIPLES

There are six key principles for the successful procurement and delivery of civil engineering projects, perhaps from a client’s perspective. These are not new, and some are fairly obvious, but it’s surprising how often they’re forgotten, usually with serious results.

- The informed client
- Crucial first steps
- Consider the impacts
- Long-term financial planning
- Good design
- Managing risk

The client

Let’s start with the client. There is no doubt that the chances of a successful project are greatly enhanced by an informed client. And for the larger clients, it is essential to have professionally qualified people on the client team.

An informed client knows the facts of construction life:

- The importance of proper planning and scope
- Realistic estimates
- The need to select a contractor on quality and price
- Strong risk management
- Integrated client, design and construction teams
- Collaborative partnering

All of these were identified by Sir Michael Latham in his 1994 report ‘Constructing the Team’. And they are embodied in ‘Achieving Excellence in Construction’, a road map for success developed by the Office of Government Commerce.

So that’s my first call: informed clients with in-house professionals as part of the construction team.

Crucial first steps

Next, clients must focus on the crucial first steps. The million pound mistake is often made on day one, because of a poor brief or an inadequate estimate.

It is vital for the client to provide – or be helped to provide – a clear brief defining the project scope. The project team needs to know precisely what their client is expecting. How can a project be successful if success is not defined?

And why are initial estimates frequently too low?

Quite simply, clients can become blind to the true cost of the work through haste, uncritical enthusiasm and lack of professional input. They can come up with an unrealistically low initial estimate through a combination of insufficient costs for the known scope and omission of key items.

And if the initial estimate is unrealistically low, projects become burdened with the perception that ‘costs have spiraled out of control’. But of course, the problem is often not real increases in cost; simply that the initial published estimate was so low it was never realistic in the first place.

The unwelcome outcome can be very tight cost control. Changes that would add value are suppressed, and an adversarial culture runs throughout the project.

Take the London 2012 Olympics. The original estimate for the core infrastructure and facilities was broadly correct, and has since stood up to scrutiny. But there were inadequate allowances for land and security, and no costs for the legacy works, VAT and contingencies.

So when the estimate increased to £9 billion it wasn’t because costs had
also wasteful of time and effort. The answer is to employ experienced professionals at the outset to: 
- Develop the scope and avoid scope creep 
- Allow for risk and uncertainty 
- And, most importantly, avoid being bounced into declaring a cost until a robust estimate has been worked up.

**Consider the impacts**

It is a great art to balance the needs of the many against the interests of the few. But what does that mean?

When we create any public work, we do so for the benefit of the many people who will use the asset, during the course of its working life. But that same project could badly affect a relative few: people who will lose their land, or neighbours affected by noise or visual intrusion. So to balance the needs of the many against the interests of the few, we need full and open consultation on a range of options. That means considering the impact on the environment, as well as the impact on everyone who will use or be affected by the scheme.

When a preferred option is decided, it will often be tested by a statutory process. And on many occasions that will mean a public inquiry to verify the proposals. That is right and proper, but it should not mean a guerrilla war in the courts and public inquiries, extending over several years – such as we saw with Heathrow Terminal 5.

If we are to develop the infrastructure that this nation deserves, Government must put in place a timely planning process for major schemes – first to confirm the strategic principle of the project, and when that is agreed, to assess the engineering options and their impacts.

So consider the impacts, and carefully balance the needs of the many against the interests of the few.

**Financial planning**

One of the great challenges for the public sector is that financial planning is short term – on a three-year timescale. Not much good when your project takes ten years from concept to completion. It’s a recipe for stop-start programming, which is not only frustrating for the public but also wasteful of time and effort.

The use of public private partnerships has helped. They allow both capital and ongoing maintenance commitments to be established at the outset of the contract. And this translates into a unitary charge over the 25 or 30 year life of the project.

And let’s not forget that capital investment is only the starting point. We must follow through with proper maintenance of our ageing infrastructure – roads, bridges and water networks. It is a matter of professional ethics for civil engineers to insist that this is funded on a systematic and proper basis, not just the funds that are left when other demands are met.

**Good design**

This is critical to the success of any construction project. Early investment in design will be repaid hundreds of times during the working life of the project. And creating good design is a key role for our members. Often good design is taken to be a building or structure that looks striking, or is innovative.

But design quality is much more than style or appearance. It is a combination of functionality (how successful the project is in achieving its purpose); impact (how it contributes to the sense of place); and build quality (how well it performs in service).

So good design ensures that the finished product is fit for purpose and meets the needs of users over its whole life. This is what Sir Ove Arup meant when he said that ‘an exterior is just a reflection of the interior’.

**Risk**

Lastly, no civil engineering project is without risk: the trick is to plan for it and manage it. An excellent way of managing risk is through independent peer review at various stages of the project.

The ICE has been proactive in risk management. Various approaches are being used on some of the largest projects around, schemes like Crossrail and the Olympics, and will help to ensure successful delivery.

**THE NEW ENGINEERING CONTRACT**

These are my six key principles for excellence in procurement. And, as we shall see, our Institution is playing a leading role in delivering procurement excellence.

Together with Engineers Against Poverty, ICE is also gradually shaping procurement in developing countries. Our case studies in India, Indonesia, Kenya and Nigeria will produce guidance showing how procurement can build capacity in developing countries. And expand the local content of projects so that more development funding stays in the region.

Our work has already attracted interest from the European Commission, the African Development Bank, and the United Nations.

But perhaps ICE’s strongest contribution to excellence in procurement is in the New Engineering Contract – a contract which has been endorsed by the Office of Government Commerce as upholding the principles of ‘Achieving Excellence’. It is widely used in the UK and across the world.

NEC3 is helping the construction industry to deliver on time and on budget, and with closer cooperation – integrated working across the construction team. It provides transparency and incentives for innovation and good performance. And when things do go wrong, its ‘no surprises’ culture provides an early warning process, allowing everyone to focus on getting things back on course.

**IN CONCLUSION**

Let us remember that civil engineering is a vital art; working with the great sources of power in nature for the wealth and well-being of the whole of society.

We have seen that, these days, civil engineering is largely undertaken by unsung heroes – ordinary people doing extraordinary things – working to the highest professional standards to procure and deliver civil engineering works with outcomes of real value to society. For too long the crucial work of civil engineers has gone unrecognised. We need a fresh vision, a global vision, and one with which we can all identify.

Last month, Council unanimously endorsed such a new vision for the Institution. Our global vision is: ‘To see civil engineers at the heart of society, delivering sustainable development through
knowledge, skills and professional expertise.’ And this is no idle vision. For it is civil engineers who take on the challenge of creating, operating and maintaining the water systems, transport networks, public buildings, ports, flood defences, energy infrastructure and all the other essentials on which society depends, each, and every, day …

We may well ask the question: ‘What is our destiny?’ Well, I say it is this. To use our imagination and talents as civil engineers for the good of the nations; for the benefit of the people; and for their sustainable future.

David’s full address may be downloaded from www.jointcivils.co.za

The new agreement of cooperation between ICE and SAICE that was signed in January 2007 simultaneously gave birth to the Joint Civils Division. Front: Andrew Baird (the outgoing ICE representative in South Africa); back: ICE President 2007 Quentin Leiper, ICE Director General Tom Foulkes, SAICE President 2007 Neil Macleod, and SAICE Executive Director Dawie Botha

An article on SAICE-ICE-JCD membership will be published in a forthcoming issue
Engineers Against Poverty

WHO ARE ENGINEERS AGAINST POVERTY?
Engineers Against Poverty (EAP) is a UK-based international development NGO committed to producing practical policies and innovative solutions to support the alleviation and eventual ending of world poverty. EAP does this through brokering and supporting multi-sector partnerships between the state, private and civil society sectors and by developing other innovative pro-poor engineering initiatives. EAP has special expertise in improving the corporate social responsibility (CSR) programmes of engineering services companies.

THE FIGHT AGAINST GLOBAL POVERTY
This year marks the midway point between the adoption of the UN Millennium Development Goals (MDGs) and the 2015 deadline. Improvement is being made in all regions, but it is very uneven and at the current rate of progress, sub-Saharan Africa – the world’s poorest region – is unlikely to meet any of the MDGs.

EAP recognises that simply increasing aid and writing off debt is unlikely to deliver sustainable and cost-effective solutions. EAP believes that business can be a powerful ally in the fight against poverty. This is why EAP is working to strengthen the role of the engineering industry, through aligning its commercial interests more closely with the development priorities of the poor countries where it operates.

EAP’s efforts focus on improving corporate and public policy to create jobs, promote enterprise development and provide education and training. These are practical solutions, rooted in business principles, with the power to transform lives.

KEY EAP MESSAGES
Some of EAP’s key messages are:

- Poverty is a deep-rooted and complex problem that comprises political, economic and social dimensions. If its causes are multi-dimensional, it follows that any strategy aimed at reducing and eventually eliminating poverty, must be similarly multi-dimensional in its approach. This realisation has lead to a consensus amongst policymakers – including the United Nations, the World Bank and the Department for International Development (DFID) in the UK – of the need to build strategic partnerships for poverty reduction.
- In the next 15 years, hundreds of billions of pounds will be invested in poor countries through engineering services contractors. This represents an enormous developmental opportunity that may, or may not, be exploited. EAP is developing practical policies and innovative solutions to ensure that it is

EAP’S MAJOR SUPPORTERS
EAP is supported by the Chartered Institution of Water and Environmental Management; Institution of Mechanical Engineers; Institution of Civil Engineers; Institution of Diesel and Gas Turbine Engineers; Institution of Structural Engineers; Society of Operating Engineers; South African Institution of Civil Engineering.

Other major supporters of EAP include AMEC, Anglo American, Balfour Beatty, BHP Billiton, British Telecom, Thames Water and Wardell Armstrong. Grant monies are received from the Department for International Development.

PROGRAMME HIGHLIGHTS
EAP is currently engaged in a number of programmes.

The Sustainable Project Model
The Sustainable Project Model (SPM) is a practical and effective integrated planning, monitoring and evaluation tool for assessing the sustainability and poverty reduction performance of infrastructure projects in developing countries. It is being developed through a partnership between EAP and Arup with the help of grant support from the Institution of Civil Engineers (ICE).

The model will ensure that sustainability and poverty reduction outcomes are specific and measurable and that they are fully integrated into the project delivery process. Once complete, it will be made available to a wide range of project stakeholders including local government and civil society organisations.

Improving occupational health and safety
The construction industry is one of the main sources of employment (outside the agricultural sector) in poor countries in sub-Saharan Africa. It is also one of the most dangerous economic sectors in which to work, with young and casual workers (who form the majority) at particular risk of ill health, injury and death. Legislation has been introduced in many countries to strengthen workers’ rights to a safe and healthy workplace,
but the capacity on the ground to implement this new legislation is very low.

**Building global perspectives within UK engineering education**

EAP is working with eight UK universities to incorporate issues of sustainability and international development into undergraduate programmes in engineering. The project includes representatives from business and student bodies who are helping to assess how curricula may need to change in response to pressing global issues. The project, funded by the Department for International Development, will make a series of recommendations that will feed into the curriculum review process. A second phase is also planned in 2008 that will work with individual universities to manage the changes that are needed.

**Modifying procurement procedures**

EAP recently completed an extensive piece of research, in partnership with the ICE, aimed at identifying opportunities to improve the delivery of social development objectives, by modifying the way in which infrastructure projects are procured. The research found that social outcomes are routinely overlooked when making critical choices about the type of infrastructure that is needed and the systems and procedures through which it is built and maintained. A second phase is now under way that includes development of a practical toolkit to guide decisions at all stages of the procurement cycle so as to maximise the opportunities for social development.

**Regional seminar**

The theme of the 12th Regional Seminar for Labour Based Practitioners held in eThekwini was 'Prioritising employment creation in government policies, investments and infrastructure programmes'. EAP was invited to lead a plenary session. EAP partnered with the Joint Civils Division, CIDB and eThekwini Water and Sanitation and initiated a discussion on 'Public procurement approaches to large-scale employment intensive works'.

This session enabled EAP to present the findings of the research which was conducted with ICE into procurement. It allowed the JCD to outline a programme management model aimed at spending infrastructure budgets over a three- to five-year period, using the NEC3 form of contract (option C – target cost) to separately contract with a programme manager, a design consultant and a contractor, in the absence of a detailed scope of work, to translate a budget allocation into construction works. The CIDB made use of the opportunity to present a range of approaches to attain social and economic deliverables through construction works contracts that have been captured in a recently published CIDB specification. eThekwini Water and Sanitation presented a client’s perspective in implementing the large scale contractor model using the described model and CIDB specifications.

Further information may be obtained from Engineers Against Poverty’s website, www.engineersagainstpoverty.org. A number of reports, briefing notes and reports may be downloaded from this website and the JCD’s website www.jointcivils.co.za.

Peter Matthews, the CEO of EAP, recently attended the UNESCO-SAICE Workshop at SAICE House. He is currently trying to facilitate funding for several Africa Engineers programmes. Dawie Botha has recently met with him in London, together with the Royal Academy of Engineers, regarding capacity-building programmes. More about that in a future issue – Ed
The adoption of CESMM3

as a standard method of measurement of civil engineering quantities in South Africa

THE USE OF bills of quantities on construction contracts permits three important objectives to be achieved:
- Tenderers are provided with adequate information regarding the extent of the work required to enable them to accurately and confidently prepare tenders which may readily be compared with other tenders.
- Employers can pre-determine with a high degree of accuracy the costs of contracts and the impact of possible variations to the works.
- A sound basis is provided for the valuation of work carried out at any stage of a contract.

Bills of quantities need to be underpinned by a system of measurement, preferably a standard one.

DEVELOPMENT OF A STANDARD METHOD OF MEASUREMENT SYSTEM IN THE UK

The Institution of Civil Engineers (ICE) published a report of a committee dealing with engineering quantities in 1933 which provided a standard procedure for the drafting of bills of quantities for civil engineering work. ICE subsequently published the Standard Method of Measurement of Civil Engineering Quantities in 1953. This was reissued with slight amendments in 1963 and a metric edition in 1968.

In 1967 the Construction Industry Research and Information Association (CIRIA) initiated research into improving contract procedure. One of the projects proposed the means of making the information in the bill more useful. CIRIA Report 34 concluded that civil engineering bills of quantities should apart from scheduling the components of the contemplated work, should also contain charges related to the method and timing of the contractor's operations. ICE worked on these proposals and published the Civil Engineering Standard Method of Measurement (CESMM) in 1976. The principal changes were:
- Greater standardisation in format
- The introduction of various levels of classifications or 'pigeon holes' from which descriptions could be developed
- The introduction of a coding arrangement
- The use of method-related charges to represent more clearly site construction costs such as the cost of setting up and operating plant, labour teams and the like
- A large number of small changes to remove anomalies and differences in interpretation

The second edition, CESMM2, was published in 1985 to keep pace with new technology, particularly in the site investigation and geotechnical processes, and to secure better compatibility with building measurement practice with the introduction of SMM7, Standard Method of Measurement of Building Works. The third edition, CESMM3, was published in 1991 to align the system with the sixth edition of the ICE Conditions of Contract.

CESMM3 defines a bill of quantities as 'a list of items giving brief identifying descriptions and estimated quantities of work comprised in the contract'. Accordingly, the billed items merely identify the work and the person pricing a bill of quantities will have to look at the scope of work (drawings and specifications) and the contract data to obtain most of the information to arrive at a price.

DEVELOPMENT OF A STANDARD SYSTEM OF MEASUREMENT IN SOUTH AFRICA

The first edition of the Standard Method of Measurement of Civil Engineering Quantities was published in 1960 by the South African Institute of Civil Engineers (SAICE), the South African Association of Consulting Engineers (SAACE) and the South African Federation of Civil Engineering Contractors (SAFCEC). This document was based on the 1933 and 1953 editions of the equivalent document published by the Institution of Civil Engineers (London). The first edition was revised in 1969, because of impending metrification and the 1969 edition was revised in 1973 to eliminate certain unsatisfactory features which it contained. A third edition was published in 1979.

Civil Engineering Quantities 1973: the Standard System of Measurement of Civil Engineering Quantities for South Africa and South West Africa (CEQ73) used the term 'Schedule of Quantities' as opposed to 'Bill of Quantities'. According to CEQ73, a 'Schedule of Quantities' is 'a list of items giving the estimated quantities and brief descriptions of the work to be performed and materials to be provided.'
under the Contract, the quantities being derived from the drawings and specifications, and space being provided for the insertion of price rates against each item and the extension and totalling of prices. CEQ73 makes it clear that:

The Schedule of Quantities should be prepared on the understanding that, in the absence of specific directions to the contrary, the rates and prices that will be inserted will be considered as being the full inclusive rates and prices for the finished work described under the respective items as covering, not only all labour, materials, temporary work, plant, on-cost items and other overhead charges and profit, but also the general liabilities, obligations and risk arising out of the conditions of contract and specification. The contingent and potential causes of expenditure, generally classified as contractors’ risks (eg timbering or side-sloping of excavations) are to be clearly and precisely defined in the conditions of contract specifications, so that they may be properly apportioned to the rates and prices in the Schedule of Quantities.

The measurement and payment clauses of SABS 1200 Standardised Specification for Civil Engineering Construction that was published in 1979 are based on CEQ73. Guidance on the application of this system was provided in SABS 0120, Code of Practice for use with Standardised Specifications for Civil Engineering Construction and Contract Documentation. ‘The measurement and payment clauses of the Committee of Land Transport Officials’ (COLTO) Standard Specification for Road and Bridge Works for State Road Authorities built upon and expanded the system of measurement and payment clause of the applicable CEQ73. The contents of CEQ73 were subsequently incorporated into SABS 1200 or in Civil Engineering Quantities 1990 – that is, the system was no longer in one document. What has happened over time is that the principles and thinking behind the current system of measurement and payment clause of the applicable standardised specifications, or the project specifications, or particular specifications conflict with the terms of the schedule or, when relevant Civil Engineering Quantities, the requirements of the standardised, project, or particular specification, as applicable, shall prevail.

SABS 1020: Part 4 also provides guidance on the development of schedules of quantities.

### MEASUREMENT AND PAYMENT IN TERMS OF SABS 1200

Each part of SABS 1200 is divided into eight main clauses dealing with scope, interpretations, materials, plant, construction, tolerances, testing and measurement and payment. All the parts of SABS 1200 covering construction activities include in the supporting specifications a reference to SANS 1200A, SANS 1200AA, SABS 1200AD or SABS 1200 AH. Each of these parts of SABS 1200 contains a clause 8.1.1.1 which reads:

**Method of measurement, all Sections of the Schedule**

Except where otherwise specified in Clause 8 of the standardised specifications or in the project specifications or in the preamble to the schedule, all items in the schedule shall be measured and shall cover the operations as recommended in the standard system of measurement of civil engineering quantities for South Africa and South West Africa [Namibia], published under the title civil engineering quantities as approved and recommended for general use by the South African Institute of Civil Engineers, the South African Association of Consulting Engineers and the South African Federation of Civil Engineering Contractors.

The standard wording to clause 1.1.3 of the Preamble to the Schedule of Quantities in SABS 0120: Part 4 (1982) reads as follows:

*Descriptions in the schedule of quantities are abbreviated and the schedule has been drawn up generally in accordance with the latest issue of Civil Engineering Quantities. Should any requirement of the measurement and payment clause of the applicable standardised specifications, or the project specifications, or particular specifications conflict with the terms of the*
The NEC3 family
of standard form contracts

THE CURRENT FAMILY OF NEC standard form contracts have been in use internationally for ten years or more. They are the:

- NEC Engineering and Construction Contract 2nd edition November 1995 (ECC2)
- NEC Engineering and Construction Subcontract 2nd edition, November 1995 (ECS2)
- NEC Engineering and Construction Short Contract 1st edition July 1999 (ECSC1)
- NEC Engineering and Construction Short Subcontract 1st edition July 2001 (ECSS1)
- NEC Professional Services Contract 2nd edition June 1998 (PSC2)
- NEC Adjudicator’s Contract 2nd edition June 1998 (AC2)
- NEC Partnering Option X12, June 2001

Valuable feedback from has been received and is now incorporated into the latest ‘third editions’. Some members of the existing family are still in their first editions, but to avoid out of sequence revision, all members of the family, including the new contracts, have been branded ‘NEC3 [Contract Name] June 2005’.

The new contracts in the NEC family are the NEC3 Term Service Contract (June 2005) and the NEC3 Framework Contract (June 2005).

The body responsible for NEC development is the NEC Panel of the Institution of Civil Engineers (ICE) in London. This panel of eleven members provide their services to the Institution on a voluntary basis, bringing to the panel their diverse experiences from all sectors of the engineering and construction industry and the practice of law.

The NEC Panel’s strategy for updating the existing family of documents to NEC3 status has been as follows:

- The existing basic philosophy and function of the NEC system should remain, with no radical change at this stage
- It should be a process of consolidation from experience in use rather than change for the sake of change
- Improvements are made in line with the three original key objectives for the NEC system, of flexibility, clarity and stimulus to good project management
- Each member of the family should be drafted so that, wherever possible, the same text is used to describe procedures which are common across the family
- All members of the family should be changed at the same time to avoid the problem of contracts revised earlier being out of step with those revised later

METHODOLOGY
The approach used by the NEC Panel has been to focus on the most comprehensive member of the NEC family, namely the NEC Engineering and Construction Contract (ECC), and then bring other members of the family in line with the revisions made to the ECC.

CHANGES MADE
Changes have been made in many clauses not mentioned here in the interests of improving clarity and removing some aspects of conflicting interpretation.

It would be extremely unwise for users of the present editions to ‘cherry-pick’ changes made for NEC3 and apply them as additional conditions to older editions. As with all standard forms of contract, each clause is an integral part of the whole contract and in application all contracts are interpreted in their totality. Hence to use a clause where it has not been designed to be used could give rise to undesirable consequences for the user.

Whilst the overall format of core clauses, main and secondary option clauses is retained, all contract secondary option clauses are now denoted with the prefix ‘X’. The same number is given to option clauses performing the same function.

The formerly separate NEC Partnering Option X12 has now been included within the contracts where its application is appropriate.

Changes can be classified as improvements in clarity, additional needs, and significant changes.

Improved clarity
Unintended interpretations in the second edition have been clarified.
Additional needs
In response to user requirements the following have been provided for:
- No change to the contract not already provided for unless reduced to writing and signed by the parties, and contract is the entire agreement between the parties
- Management of risk through the use of a risk register into which early warnings are recorded
- Prevention or ‘force majeure’ as it is known in some jurisdictions
- Work may now be done by the management contractor under Option F
- A secondary Option (X18) is provided for limitation of liability, as well as a secondary Option (X20) for key performance indicators

Significant changes
The more significant changes which have been made are as follows.

Fees and subcontracted work
- The fee on the contractor’s own work uses the direct fee percentage. There is a separate fee on work done by a subcontractor using the subcontracted fee percentage
- When assessing compensation events, subcontracted work may use a rate or lump sum by agreement in certain circumstances

Key dates
- Contractor pays employer’s own costs and those payable to other contractors for failing to meet stated condition by the key date
- Optional as there is no obligation to use key dates

Compensation event process
- The changes are based on the situation which arises when either the contractor or the project manager does not act within the times required or does not act at all, causing the process to stall
- If the contractor does not notify in time, he is now time barred from doing so
- If the project manager does not ask for a quotation when he should, the contractor may provide one anyway
- If the project manager does not respond to the contractor’s quotation within the stated time limit, and does not act when reminded of his duty, the contractor’s quotation is accepted. This can be referred for adjudication, but the onus of proof is reversed

Prevention (force majeure)
An event occurs that is out of both parties’ control. It stops the contractor from completing the works or completing the work by the date shown on the accepted programme and is not one of the other compensation events.
- The project manager decides how to deal with event and instructs the contractor under Clause 19
- It may give rise to compensation event 60.1(19)
- Provision is made for the employer to terminate under Clause 91.7

Adjudication
- Two adjudication procedures are now required because of UK statutory requirements for adjudication. W2 is the Act-compliant procedure for use in contracts subject to the UK’s Act; W1 is the NEC procedure for use in all other contracts worldwide
- The procedure is made the same wherever possible but there are differences in the referral process, time scales, and effect of failing to give decision on time
- In W1, late notification and late submission of dispute to the adjudicator by either party is time barring, and the referring party is further barred from proceeding to the tribunal (arbitration of court)

Delay damages
- To comply with certain legal jurisdictions, there is now a reduction in damages on take-over of parts of the work
- Measurement of the reduction is based on the benefit to the employer of taking over the part and not the price or value of the part

Limitation of liability
- This is now included as a secondary option for use in design and construct or international contracts
- Differing liabilities are listed with an amount stated in the contract data for the contractor’s limit for each liability
- The final cut-off date for the contractor’s liability to the employer is also stated in the contract data

Changes made to other existing contracts

NEC3 Engineering and Construction Short Contract and NEC3 Professional Services Contract
These contracts have been updated to incorporate similar changes (where they apply) to those in ECC above and to include provisions from ECC that make for easier subcontract administration; for example when the PSC is used as a subcontract to the ECC in a design and construct main contract. Common text has been used for the same procedures wherever it is practical to do so making for better integration of the NEC system.

NEC3 Adjudicator’s Contract (June 2005)
New provisions are included which require that the adjudicator:
- Does not decide any dispute which is the same as one already decided by his predecessor
- Provides information received from others to the parties for their comments before making his decision
- Is to be paid an advanced payment by the party referring a dispute of the amount stated in the contract data and within one week of when the dispute is referred
The first two additional provisions arise from precedent set by references to the UK courts challenging an adjudicator’s decision.
Clauses dealing with the adjudicator’s risks have been moved to the W1 and W2 dispute procedures in each of the other contracts.

NEC3 Term Service Contract (June 2005)

Demand for the contract
- Users have been adapting ECC2 for use in maintenance situations
- There has been growth in outsourcing by employers
- Industry has requested advice on how to use ECC2 for term-based works

Examples of application
- Maintenance of highways, harbours, a
nuclear power station, a railway
- Periodic inspection and reporting on an asset
- Providing ambulance services for a group of hospitals
- Street cleaning, refuse collection or maintenance of street lighting
- Providing data-processing services
- Servicing and maintaining buildings

Some distinguishing characteristics
- The work carried out on an affected property which may or may not belong to the employer
- The employer’s agent is the service manager
- The contractor provides a plan for the service (similar to design in ECC)

NEC3 Framework Contract (June 2005)
Need for and some features of the contract
- There has been a demand from employers forming alliances with suppliers and by contractors entering into concession agreements on PPI/PPF ventures
- The contract is between the employer and a number of suppliers for a period of time
- It pertains to work of any kind under any of the NEC family of contracts
- Contract data identifies conditions of contract for any work ordered by the employer and provides data applicable to all work

Supporting documents; guidance notes and flow charts
- All existing contract guidance notes have been changed to cover changes made to their respective contracts and include some improvements required by users
- The flow charts for each contract have been recreated
- A new guidance document dealing with procurement and contract strategy for the whole NEC3 system is also available

It would be extremely unwise for users of the present editions to ‘cherry-pick’ changes made for NEC3 and apply them as additional conditions to older editions
THE OFFICIAL OPENING of the magnificent redevelopment of St Pancras Station took place on 14 November 2007.

The redevelopment of St Pancras constitutes the architectural restoration and extension of a unique London landmark. When the station first opened in 1868, William Barlow’s train shed was a spectacular feat of Victorian engineering and held the world record for the largest enclosed space for many years.

The incredible £800 million project has seen the former Barlow shed completely reglazed and the paintwork taken back to its intended pale sky-blue colour.

The completion of St Pancras is just one small part of the £6 billion project, High Speed 1 (formerly known as the Channel Tunnel Rail Link), and just the beginning of redevelopment and regeneration of the King’s Cross area.

THE BARLOW SHED
William Barlow was the Engineer in Chief to the Midland Railway Company. The creation of the Barlow shed was one of the great feats of Victorian engineering. The roof is 689 feet long by 100 feet high and with a 243 feet span it was the largest enclosed space in the world.

Where possible the building has been restored by recycling the brick work from the original building or sourcing clay from the original clay sources in the Midlands.

THE EXTENSION
The masterplan for the extension to St Pancras was originally created by Sir Norman Foster, and has since been developed by RLE’s chief architect, Alistair Lansley. The glass extension has been designed to house the extra-long Eurostar trains in their new home.

RIDGE AND FURROW GLAZING
The ridge and furrow glazing of the Barlow shed contains 14 080 glass panels, giving a total glassed area of nearly 10 000 m² – almost two football pitches, or 38 tennis courts. The bottom third of the roof is finished with 300 000 slates hand crafted and supplied from Wales.

ST PANCRAS HISTORY
St Pancras Station has been voted one of London’s favourite landmarks and has a rich and colourful history.

1863–1866
St Pancras train station was designed by William Barlow in 1863 with construction commencing in 1866. The famous Barlow train shed arch spans 240 feet and is over 100 feet high at its apex. On its completion in 1868 it became the largest enclosed space in the world.

1866–1876
One of the most recognisable features of St Pancras Station today, the red brick Grade 1 listed Gothic front façade, was created as part of a competition in 1865. It became the Midland Great Hotel designed by Sir Gilbert Scott and built between 1868 to 1876.

1935–1945
In 1935 the Midland Grand Hotel was closed and the building became railway offices, and known as St Pancras Chambers. The station played an important role during both world wars, acting as a meeting place for troops and a de-
parture point for soldiers off to war, and helping transport children out of London to the safety of the countryside.

During WWII the station was hit during the Blitz on London. Despite the devastation, London Midland and Scottish Railway engineers soon had the platforms working again.

1966–1967
The greatest threat to the station came in 1966 with plans to amalgamate King’s Cross and St Pancras. However, public opinion had been sharpened by the demolition of Euston in 1962. Sir John Betjeman took up the cause to protect the station and in 1967 the government listed the station and hotel as Grade 1.

1967–1995
St Pancras Chambers were used as BR offices until 1985 before falling vacant in the late eighties. In the early nineties emergency safeguarding works were undertaken to combat roof leakages and general decay.

Present
St Pancras Station and St Pancras Chambers are popular locations for film and television productions, appearing in Harry Potter, Batman Begins and the Spice Girls’ first music video. St Pancras Chambers will be restored to a five-star Marriot Hotel with luxury private apartments on the upper levels.

St Pancras remains one of the greatest Victorian buildings in London, with impressive Victorian Gothic architecture. A replica of the famous St Pancras Station clock has been constructed and hangs high above the station platform once more.

London & Continental Railways
In 1996, London & Continental Railways (LCR) was selected by the government to build and operate High Speed 1 (formerly called the Channel Tunnel Rail Link) and to own and operate the UK arm of the Eurostar international train service.

High Speed 1
HS1 is a major element of the British government’s private-public partnership programme which enables important infrastructure to be provided for the benefit of the public sector while taking advantage of private sector management and efficiency.

Compiled by Tobie Ueckermann
(http://www.stpancras.com/about-stpancras)
Civil engineering – the critical profession for service delivery

This is the subtitle of Allyson Lawless’ new book titled *Numbers and Needs in Local Government*. The book outlines the pressing problems faced by the country in the field of local government, but also makes recommendations to ameliorate the situation. The general conclusion is that unless rebuilding the skills base is tackled with resolve, long-term erosion of public confidence and consequent decline of the local government sector are likely as the older generation of public service professionals retire or move on and the inadequately prepared younger generation battle with their new-found responsibilities. Some salient points made by Allyson in the new publication appear below.

**ORIGINS OF TODAY’S PROBLEMS**

After 1994 the TBVC states were re-incorporated into South Africa and the needs of the non-independent homelands were considered. Consequently the country came face to face with the challenge to provide services to some 12 million people for whom little had been done under the previous dispensation. Isolated rural communities and areas administered by national and provincial government also required incorporation into local government.

A number of new municipalities were formed while others were integrated as transitional bodies in an attempt to offer better services to the overall population. In 2000 the new model of ‘wall-to-wall’ municipalities was launched, with many existing municipalities being merged into larger units. The net result was a total of 284 municipalities, composed of six metropolitan municipalities, 231 local municipalities and 47 district municipalities. Metros are large, stand-alone structures serving 200 000 to almost one million households, whilst local municipalities range from large, such as Buffalo City and Emfuleni (servicing just under 200 000 households), to small (serving as few as 1 500 households).

Several districts were already in existence, whilst others were set up along the lines of the Canadian model to strengthen local municipalities and take care of very small settlements consisting of only a few households.

These could not realistically be constituted as stand-alone municipal structures able to take care of their own water supply, sanitation disposal, police, parks, public transportation, capital borrowings or strategic planning.

Consequently the three-tier model of local government was born.

**PROVISION OF SERVICES**

Municipalities must be in a position to provide the basic services to address poverty and offer people the opportunity to live in dignity.

During the post-apartheid era, the public sector has been devoted to the development of basic infrastructure to address the inequalities of the past, thus addressing the human face of South Africa.

In many instances the new, shared services approach to support line functions has resulted in inadequate equipment, materials and staff being made available to handle operations efficiently.

Sadly, as a result of the neglect of the other aspects of development and maintenance, municipalities have exposed themselves to huge costs to rehabilitate completely run-down assets. However, they have taken little action to collect outstanding debt or increase their income base from industry and the paying residential sector. Thus many municipalities find themselves in a precarious financial position.

These challenges are witnessed not only in new rural structures but in municipalities nationwide. The wall-to-wall model has resulted in most expanded municipalities incorporating large areas of low-cost housing which were either...
underprovided in respect of basic services or had basic services that had been inadequately maintained for many years, resulting in appalling conditions.

**NUMBER OF CIVIL ENGINEERING STAFF**

Although the need for engineering skills actually increased dramatically by virtue of the fact that the entire population and not the elite few required servicing, the restructuring process did not recognise this. The rationalisation of the existing engineering departments thus resulted in significant numbers of engineering staff being retrenched, retiring early or leaving the service, including many senior engineers. Restructuring and offering packages have continued unabated.

A study of local government carried out by the South African Institution of Civil Engineering (SAICE) in March and April 2005 revealed that:

- There had been a migration of staff to the private sector.
- There was a shortage of civil engineering professionals in municipalities, with 83 municipalities having no civil engineering staff and 49 with only one or perhaps two very young and inexperienced civil engineering staff.
- There were many student technicians who were unable to obtain experiential training or employment after graduation.
- There were few experienced staff in production positions with sufficient time to act as supervisors or mentors for young staff members.

A summary of the numbers are given in tables 1 and 2.

**PAST AND PRESENT – LESSONS LEARNT**

These shortages manifest themselves as follows:

- Where there are no civil engineering professionals, non-technical staff carrying technical responsibilities are not confident to take decisions and therefore little or no spending and operations and maintenance (O&M) take place.
- Where there is only one civil engineering technician there is generally inadequate capacity to deal with the myriads of problems and, consequently, limited spending or O&M takes place.
- Where there are only young staff, they are not experienced enough to make decisions with confidence and, consequently, limited spending or O&M takes place.
- The same picture emerges wherever there are no technical staff with authority.

Figure 1 shows how wide-spread this problem is with the orange and red shading denoting municipalities that have only one or no technical staff member, respectively.

A recent SAICE report highlighted the fact that most municipalities that do have civil engineering staff are nevertheless suffering from vacancies of 35% to 50% against their current organograms. When considering appropriate organograms the percentage of vacancies could be considerably higher!

At the time of writing (mid-2007), possibly only about 1 300 to 1 400 civil engineering professionals were employed in local government. Considering that the population is now some 47 million, that means that there are two to three civil engineering professionals for every 100 000 members of the public – a dramatic drop from the 20 to 21+ of the previous dispensation, when 2 500 to 3 000 civil staff were servicing 14 million people.

Vast areas thus have no one to attend to their civil engineering needs, draw up project specifications or call for private

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**Table 1 Civil professionals employed in all levels of local government, April 2005**

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>Engineers</th>
<th>Technologists</th>
<th>Technicians</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>47</td>
<td>43</td>
<td>43</td>
<td>154</td>
</tr>
<tr>
<td>Local</td>
<td>231</td>
<td>98</td>
<td>100</td>
<td>377</td>
</tr>
<tr>
<td>Metros</td>
<td>6</td>
<td>240</td>
<td>226</td>
<td>253</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>284</strong></td>
<td><strong>381</strong></td>
<td><strong>369</strong></td>
<td><strong>784</strong></td>
</tr>
</tbody>
</table>

**Table 2 Age distribution of civil professionals in local government, April 2005**

<table>
<thead>
<tr>
<th>District</th>
<th>Local</th>
<th>Metro</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total staff aged below 35</td>
<td>131</td>
<td>208</td>
<td>230</td>
</tr>
<tr>
<td>Staff aged 35 to 49</td>
<td>80</td>
<td>212</td>
<td>292</td>
</tr>
<tr>
<td>Staff aged 50+</td>
<td>29</td>
<td>155</td>
<td>197</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>240</strong></td>
<td><strong>575</strong></td>
<td><strong>719</strong></td>
</tr>
</tbody>
</table>

Source: Municipal Demarcation Board. Map generated by GIMS.
sector involvement in delivering much-needed infrastructure. Worse still, there is no one to ensure ongoing operation of critical plant or maintenance of existing infrastructure.

QUALIFICATIONS AND EXPERIENCE

The depth of knowledge, international qualifications, exposure and the number of years’ experience seen in the earlier municipal engineering communities is a thing of the past.

Inexperienced technicians and, unfortunately, in many instances, non-technical staff are found running technical departments and project management units.

The hierarchies, activities and responsibilities of technical staff have largely been dismantled resulting in the demise of technical skills in local and district municipalities. The executive role of councils means that many decisions previously taken by senior technical staff are no longer in the technical domain. Being some of the most highly educated and trained staff in local government, civil engineering professionals have left the sector as their skills were no longer being adequately utilised. This has more than halved the capacity that was in the system 20 years ago.

At this stage metros do still have the range of skills shown in figure 2, but as mentioned above, numbers are dropping and the frustration levels of those who are able to make a contribution but are not adequately utilised are ever increasing.

The selection of staff is often not based on skill or experience, but rather on equity and cost criteria, which compromises technical departments severely. In all but the largest municipalities there are few engineers or staff with significant experience. Where there are experienced staff they have generally been marginalised and are sitting waiting to retire. As such, few are involved in making strategic decisions.

Decisions are either deferred, are not made at all or, where they are made, are often inappropriate.

Figures 3 and 4 show the large group of young technicians who have been employed in local government. Whilst there is no problem with employing these young people, their qualifications and level of experience have not prepared them to deal with the complex challenges that they will face in local government today. Working in a vacuum, often on their own, they have no guidance and can therefore make little or no professional progress or offer direction to their municipalities.

THE GENERAL CLIMATE

Most technical staff, except a few isolated technical directors, regardless of race or gender, are frustrated to the point of giving up, as their skills are not being adequately used.

They are all too aware that many decisions being made, whether they relate to the level of service, choice of service provider, or allocation or re-allocation of the budget, will impact negatively on the solutions and long-term sustainability. Morale is at an all-time low and needs to be addressed as a matter of urgency.

OPERATIONS AND MAINTENANCE

The need for efficient operations and maintenance (O&M) is not well understood.

Limited funds are budgeted and the number of staff attending to the well-
The reduction in staff also means that day-to-day operations are not adequately handled resulting in poor-quality water, unacceptable effluent quality, waste accumulating in the streets, etc. The neglect of infrastructure will now require huge investment to restore the status quo. Without assessments, little budgeting or planning takes place. The number of technicians, superintendents, operators, artisans and general workers employed has also been reduced. As a result routine or preventative maintenance is limited.

**Emergencies – response to failures** Stores are depleted, vehicles broken and experienced staff no longer employed. Consequently response to failures in all but the major centres is poor. The most alarming incidences are long-term sewage spillages, long breaks in service provision, roads breaking up and municipal property becoming prematurely dilapidated.

**Operations** The reduction in staff also means that day-to-day operations are not adequately handled resulting in poor-quality water, unacceptable effluent quality, waste accumulating in the streets, etc. The neglect of infrastructure will now require huge investment to restore the status quo.

Effective engineering decisions cannot be made without experienced engineers. Engineering processes and systems cannot be developed or managed effectively without experienced engineers. Young engineering personnel cannot be trained effectively without experienced engineers.

It is recommended that a major campaign to recruit experienced civil engineering personnel be mounted nationwide. Control should be relaxed and authority returned to those able to make meaningful decisions.

**TRAINING**

The advent of the Sector Education and Training Authorities (SETAs) has placed much emphasis on formal training courses. Little or no distinction has been drawn between formal training and workplace training. Public sector staff spend inordinate hours in training courses, but commensurate improvement in efficiency, expertise or decision making is not evident.

Many young graduates are not career ready. Many of our young graduates have attended inadequate schools and are thus inadequately equipped to benefit fully from their tertiary studies. Because of language difficulties, they are unable to grasp several concepts. As a result of poor numeracy they battle with application in certain fields. Owing to inadequate tertiary institutions they may not have had any laboratory experience. As such they graduate with minimum marks and need much support in the workplace.

**CONCLUSION**

Engineering services cannot be effectively conceived, designed or delivered without experienced engineers. The SAICE Infrastructure Report Card issued in November 2006 rated municipal roads and water in rural areas as a D– and sanitation as E (the rating ranged from A to F for failed). Urban infrastructure fared slightly better, ranging from C– for sanitation to C+ for water. The report card cited lack of investment and skills as the major bottlenecks.

**INTERNATIONAL BENCHMARKS**

To arrive at an understanding of international norms, data was collected from many centres in English-speaking and Scandinavian countries. Small, medium and global cities that responded ranged in size from a small Swedish town with a population of 9 500 to San Francisco that is home to seven million.

From figure 5 it is clear that in 1989, South African numbers were considerably closer to international figures, which would explain how the level of infrastructure of that era was achieved. It is therefore quite unrealistic for us to expect the current two to three civil engineering staff per 100 000 to achieve all our targets.

- Examples are:
  - **Planned upgrades** With little attention being given to O&M, few annual assessments take place. As a result, few (if any) recommendations are made on capacity increases, or replacing ailing equipment. The power crisis faced by the country is a good example of this, as is the increasing gridlock seen on the roads of many of South Africa’s towns and cities.
  - **Routine or preventative maintenance** Without assessments, little budgeting or planning takes place. The number of technicians, superintendents, operators, artisans and general workers employed has also been reduced. As a result routine or preventative maintenance is limited.
  - **Emergencies – response to failures** Stores are depleted, vehicles broken and experienced staff no longer employed. Consequently response to failures in all but the major centres is poor. The most alarming incidences are long-term sewage spillages, long breaks in service provision, roads breaking up and municipal property becoming prematurely dilapidated.
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It is recommended that a major campaign to recruit experienced civil engineering personnel be mounted nationwide. Control should be relaxed and authority returned to those able to make meaningful decisions.
Executing strategy within the context of critical skills shortages

THE BUSINESS WORLD at large – and South African engineering companies in particular – is in a strategy crisis. Not because managers can not formulate a good strategy – most actually can – but the core of the crisis lies within execution or, more accurately, the lack thereof.

Engineers have played a key role in the industrial development of South Africa. However, the industry is currently experiencing a critical shortage of qualified as well as experienced engineers. This critical shortage compounds the strategy execution dilemma.

South Africa is currently graduating 45 engineers for every million people in the country, lagging far behind China and the US that graduate 225 and 290 engineers for every million people respectively. India’s graduates 95 for every million. Industry analysts are of the opinion that the estimated shortage of civil engineers alone is between 6 000 and 12 000.

The South African government has agreed on detailed plans to expand the number of graduated engineers. Deputy President Phumzile Mlambo-Ngcuka, who drives the country’s Joint Initiative for Priority Skills Acquisition (Jipsa), recently indicated that the estimated shortage of civil engineers alone is between 6 000 and 12 000.

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THE STRATEGY EXECUTION GAP

Statistics surrounding the success that organisations have in executing strategy paint a bleak picture. A study conducted by Bain Consulting in 2006 noted that seven out of eight companies in a global sample of 1 854 large corporations failed to achieve profitable growth, though more than 90% had detailed strategic plans with much higher targets.

A longitudinal study conducted by the Harvard Business School over the past 15 years revealed the following about organisations’ struggle to align and execute strategy:

■ Sixty per cent of typical organisations do not link their strategic priorities to their budget, therefore these priorities often do not get funded properly
■ Two-thirds of HR and IT organisations developed strategies that are not linked to the organisation’s strategy
■ Seventy per cent of middle managers and more than 90% of frontline employees received compensation that is not linked to strategy
■ Ninety five per cent of employees in most organisations do not understand their organisation’s strategy

Effective business performance management can assist managers to ensure optimised performance.
On a regular basis, we thus see major organisational disconnects between the formulation and execution phases of strategy. The ability to cascade an organisation's vision, mission and core strategies into actionable behaviours that achieve critical objectives is more difficult than much of our current strategy literature would suggest. Failure to execute strategy not only leads to shareholder and board frustration but also accounts for high levels of executive turnover. Within the context of the critical skills shortages the compelling need for the better execution of strategy is undeniable.

**THE SOLUTION TO THE STRATEGY EXECUTION DILEMMA**

According to research done by Palladium there are three foundational capabilities that organisations need to enable them to execute their strategies successfully. These are visibility, leverage and responsiveness.

*Visibility* is a corporation's insight into past business results and foresees into future business performance. Visibility transcends space as well as time. The business must have both the depth to see from the top of the organisation all the way down to a specific department or individual and the breadth to see from one business unit or division to another. By maintaining a clear and timely view of business results and the drivers of performance, executives can see what's happening. This clarity enables them to take action, commit resources to optimise existing processes and explore new business opportunities.

*Leverage* is a corporation's command of its business model. This mastery begins with an understanding of the core business processes and leads to the identification of the cause-and-effect relationships that drive business performance— that is, how business operations contribute to economic and customer outcomes. Leverage is having the knowledge of how the business and industry really work so focus can be applied to maximise the impact of one's actions.

*Responsiveness* is the ability to respond to the internal needs of the corporation and the external stimulus of the market. Responsiveness is built upon a strong knowledge-sharing network and a tailored process for governance and resource allocation. A company's responsiveness should be graceful and always one step ahead of its competition.

In today's competitive and fast-changing business environment, the level of complexity and extent of interrelations between casual factors have increased to an almost bewildering level. Any improvement actions are likely to include decisions across a wide spectrum. The large number of variables and the complexity of the interrelationships have made the generation of actions difficult. Traditionally it was sufficient for managers to rely on experience and intuition using their own mental models. Within the context of skills and experience shortages this approach is not adequate anymore, however.

How do engineering companies equip their businesses with these three capabilities?

Performance measurement *per se* is not the solution – companies typically deliver a blizzard of nearly meaningless data that quantifies practically everything in sight, no matter how important or unimportant; that is devoid of any particular rhyme and reason; that is so voluminous as to be unusable; that is delivered so late as the be virtually useless; and that then languishes in printouts and briefing books without being put to any significant use.

A well-developed and -implemented business performance management (BPM) model will, however, provide these capabilities to a skills- and experience-strapped industry. BPM is an organisational approach that assess and monitor performance in relation to a set of goals and objectives. It encompasses methodologies, frameworks and indicators that are used to help organisations in the formulation and assessment of the strategy, which motivate people and communicate or report performance to external stakeholders. Business performance management is thus a set of processes that help organisations optimise business performance. It involves consolidating data from various sources, querying and analysing the data, and putting the results into practice.

**PREREQUISITES FOR EFFECTIVE BPM**

Research done by the author on BPM best practice in the South African context reveals the following prerequisites for effective BPM:

- The development of an effective business performance management methodology requires enormous dedication and sponsorship from the CEO and executive team.
- The executive team should involve the entire organisation in the strategy formulation process.
- The strategy as well as progress towards the achievement of strategic goals should be communicated on a continuous basis.
- The meaning of success for the organisation and employees alike should be defined clearly and unambiguously.
- Authority should be delegated at the earliest possible stage.
- The line of sight should be short, and managers and staff should not be held accountable for things that they have no control over.
- Performance and reward should be linked and rewards should be significant enough to enable motivation.
- Effective BPM is only possible when performance data is accurate and can be integrated, accessed and evaluated timely; investment in a well-defined BPM framework has thus become essential.

**CONCLUSION**

From the above analysis it should become clear that strategy execution is indeed complex. Within the context of the engineering industry in South Africa, which is characterised by acute skills shortages, the challenges become even bigger.

It is no longer sufficient to only have well-thought-through strategic plans, and well-defined policies and procedures. Companies also require the essential capabilities of visibility, leverage and responsiveness. A BPM culture that is driven by executive management, as well as an appropriate BPM model, is the departure point for organisations wishing to equip themselves with these capabilities. Many leading organisations also make use of some form of an integrated and well-defined technology platform to enable them to execute their strategies.

Johann Stimie is co-founder and director of Petros Business Solutions (PBS). The company has a specific focus on the development and implementation of human capital management solutions for organisations. Since the company was founded they have been involved in projects across a number of industries, including mining, engineering and healthcare, insurance, local government and construction.
Accelerating infrastructure delivery with the infrastructure cost model

IN THESE DAYS of ever-increasing costs, most clients, globally, are insisting on projects being designed and executed to give maximum value for money, with the following economic considerations:

- Clients have become more exacting and cost conscious for reasons of profitability and accountability. As a result, construction costs are being scrutinised more closely and with greater skill and accuracy.
- There is a need a more efficient usage of funds and higher accountability.
- There is now greater emphasis on a faster pace of the construction process.
- Rising construction costs has introduced a general trend towards greater cost effectiveness and a move to reduce or eliminate waste where possible.
- Clients have complex requirements requiring assessment of their full financial implications before incorporation into a construction project.

The cost planning model presented in this article – as well as its outputs – is a disciplined effort to produce fundamental decisions in shaping the project cost and will place the onus on the consultants to use client’s money in the most efficient way possible.

WHAT IS THE COST PLANNING MODEL?

It is globally acknowledged that the complexity of infrastructure planning and realisation is growing, both technically and financially.

The cost planning model attempts to relate the design to their cost so that, while taking full account of quality, utility and appearance, the cost is planned to be within the economic limit of expenditure.

The infrastructure cost model has been developed to provide clients and consultants with more control over the economic decisions taken in each design stage.

Cost planning is often interpreted as controlling the cost of a project within a predetermined sum during the design stage, and normally envisages the preparation of a cost plan and the carrying out of cost checks.

Figure 1 illustrates the conceptual model for cost forecasting at the different stages of design, as well as standard forms for the analysis of the various options.

The underlying structure for the proposed cost model is based on a hierarchical breakdown of the project into four stages described below:

- **Stage 1 – feasibility stage**: It involves dividing the project into various components and by a series of cost analysis; the various levels of services can be compared with each other to ensure the optimum use of the budget.
- **Stage 2 – scheme design stage**: This stage translates broad project requirements into functional elements, allowing for an elemental cost analysis, allocation of target costs for these elements and cost checks.
- **Stage 3 – detailed design stage**: The final stage is the preparation of the detailed cost analysis and the detailed cost plan.
- **Stage 4 – Bill of quantities stage**: In the production design stage, the main work items can further be broken down into a detailed selection criterion and uses the materials cost analysis form to evaluate the effect on cost savings of using alternative materials. The technical specifications form is required to set out the acceptance criteria.

APPLICATION OF THE MODEL

Through its disciplined cost reporting, the model will enable clients with the opportunity to respond to design decisions. Financial control will also be shifted from the consultant to the authorities. This approach is in line with the emphasis on assessing outputs and outcomes and will enhance real accountability to the relevant authorities.

The model will assist consultants and clients in the following ways:

- To manage the planning and design of projects as well as the correct pricing of infrastructure services with a clear and credible presentation of the cost of different options and their influence on the budget.
- To make informed cost-effective decisions.
- To make realistic comparisons of different items and design options to be used and readily assessing alternatives.
- To enable executing authorities to have final power over most cost decisions of projects and will enhance real accountability to the authorities.
- The tools used in the model provide a graphical method of presenting their results. It allows engineering, practical and financial issues to be easily weighed up against one another. For example in the case of roads, the cost of pavements with cemented bases can be found to be cheaper or equivalent to granular bases.
The correct pricing of infrastructure services, with a clear and credible presentation of the costs of different options and their benefits

The cost model offers sustainability through quality and affordability

Municipal services must be sustainable. This is particularly important against a backdrop of scarce financial resources. The model aims at achieving a performance improvement in service delivery as well as service provision, by developing the client-focused cost model. This meets a well-recognised need to achieve cost savings as well as improved levels and standards of service.

The infrastructure cost model has a higher level objective, which considers the trade-off between cost efficiency and quality. It can be seen as a strategy which achieves improvements in efficiency and accessibility without degrading quality.

By far the most important factor influencing the choice of service is affordability. Affordability is measured on an ongoing basis in the various cost reports.

The design optimisation model undertakes a qualitative analysis in the context of infrastructure projects and is concerned with ensuring value for money.

Cost limits and other economic criteria have been used to develop the cost model with the objective of establishing a system limiting the expenditure on initial construction costs, while maintaining quality.

The cost model optimises the projects value by progressively ensure efficient, affordable, economical, and sustainable provision of infrastructure services, which results in a project of higher standard without the need for additional funds.

CONCLUSION

As projects become more complex and clients more exacting in their requirements, so it becomes necessary to improve and refine the cost control tools. This cost planning approach makes cost-effective decisions just one of the criteria relevant to the project planning.

This article shows how different levels of cost estimate can be prepared in parallel with design development and allows for the various components of the costs to be estimated at their own discrete level, depending on the level of design information available.

The development of the cost planning model is a strategy to reduce and optimise the use of the client’s budget and to ensure that he gets value for money.

The outputs of the cost model outlines in a systematic and practical way how the decision-maker can reduce costs while retaining or improving quality, at any stage in the design evolution. The output reports referred to in the cost-planning model serve to support decision-making on infrastructure projects and are distinguished from the textbook definitions of cost planning and value engineering, in that they offer a more practical application of these concepts.

With the use of the cost model, clients, consultants and government can evaluate the cost of decisions at planning stage, where costs are most affected, thus increasing the volume of services available to the poor, enhancing service delivery and facilitating the growth and development of South Africa.

This, together with basic principles of cost planning and construction economics, can contribute to the concept of ‘affordable township infrastructure’ and will result in a delivery system that is more efficient and effective.
Risk management for contracts

I WAS ONCE asked the following simple question: Why do we need contracts?

I gave a response along the lines of: ‘It defines the rights and obligations of the parties.’

The person asking the question told me that in his view the single reason we need contracts is to define how the parties will act when an uncertain future event takes place.

Whilst this may not be realised by many, the whole contracting process is actually the management of risk in its varied and many forms. Risk can be defined as uncertainty which could affect the outcomes of desired objectives. For example, one of the first things that you are taught as a junior engineer, quantity surveyor or supervisor on a site is to get instructions in writing. What you are managing is the risk that you may do something (more or changed work – the subject of the instruction) and not get paid for it.

Risk is also managed by the employer or his consulting/project management team when a decision is made to adopt a particular contracting strategy. One of the major risks that is recognised by all involved in the overheated construction market is the limited number of skilled people available. Wise employers are securing the services of contractors by making strategic alliances on the basis that a reasonable flow of work will be available to the contractor and that he can achieve an acceptable return from such work. In return, the contractor undertakes to make resources available that might otherwise be deployed on other contracts.

Such contracting arrangements (alliances) are typically collaborative and may for example be structured on the basis of a target cost. This naturally requires a cultural change within both the contractor and employer organisations. We have seen employers embark on such alliancing strategies only to abort them once it becomes apparent that the implementation personnel are not culturally aligned to a collaborative relationship with the contractors.

Much like alternative dispute resolution (ADR) methods, collaborative working is not a soft option. People must move out of their comfort zones and ditch the ‘them and us’ approach that adversarial traditional contracting strategies encourage and form a team with the members of the alliance that could, particularly in brown field developments, include the employer and the employer’s production personnel.

It is probably true to say that many of the modern contracts published over the last ten years or so lean towards the employer and place more risk with the contractor. This is particularly so of the FIDIC 1999 suite. The adoption of more stringent claiming requirements like conditions precedent and time barring clauses reinforce this impression. Of course, these are also risk management techniques designed to limit the potential exposure to claims from the contractor and enable the employer to take appropriate action to mitigate the damage that might be done had he been unaware of the event that was causing grief for the contractor (delay and extra cost).

Contractors also have tools available to them that are, in our experience, seldom appreciated or properly used to manage the risks that contractors are taking. In simplistic terms these are the contract programme; the allowable cost for carrying out the work; the technical specification for the work to be done; and the commercial terms applying to the contract.

Invariably, when contracts go wrong, the first thing we find is that either there is not a competent programme, or that there is no agreement as to which programme applies to the contractor’s work.

The allowable is usually associated with the month end cost reporting exercise. This is an excruciating process suffered by most contractors on a monthly basis mainly for the benefit of the accounting people, and it is of limited use to the contract personnel managing their contract. Used properly, however, the allowable is a vital management tool for purchasing and productivity monitoring.

A detailed understanding and knowledge of the commercial terms applying to the contract is vital, particularly when administering the claims provision of the contract alluded to above.

In this regard, any assumption that, for example, a contract under the NEC form of contract can be administered on the same basis as a contract under the GCC 2004 or FIDIC terms would lead to disaster. The NEC requires a far more proactive (some might say aggressive) approach from the contractor.

Conversely, project managers and employers’ representatives are often upset by what they perceive to be a ‘claimsmanship’ approach by the contractor when he is bombarded with compensation event early warnings. This is a sure sign that he too does not understand the requirements of this contract which, if properly applied, encourages good administration of the contract, though it also requires higher skill levels and additional resources being committed to the contract.

Again, the process is one of risk management. By giving early warnings, the contractor is managing ‘up the tree’ and the employer and his professional team can get their acts in order and provide the access, drawing or piece of information that is causing the distress. The contract then runs smoothly, to the benefit of all.

We recommend the use of risk assessments and management during all phases of a contract life cycle – from tender evaluation, through project launch and contract implementation, right to project closeout. By formalising the risk assessment and management approach, controls and measurements can be implemented that are appropriate to the circumstances and the work being carried out in addition to the restrictions that may be imposed as a result of the limitations in the skills and resources that are available at that time.

In this way, successful contracting from the perspective of the employer as well as the contractor can be assured.
It is difficult to choose a career, especially if no proper career guidance is available.

Career choices for those with a rural upbringing are influenced by a limited knowledge of what is available, while they are also influenced by older siblings and relatives. Choices are normally limited to common careers, for example in teaching, nursing, medicine, the police force (security) and the military.

A question that may be raised is where are the teachers, the libraries and role models in the community who should be providing the necessary guidance. The fact of the matter is that most teachers have a similar background, and hence limited knowledge, while most of the role models are not educated and those who are educated have left to live in more affluent areas. In most cases people have accepted that education (further education) is only for those with the necessary resources.

Learners are not using other alternatives such as television and newspapers to find out above available careers. Poverty is a reality and most people cannot afford to buy newspapers.

My choice of career was influenced by the situation I found myself in when growing up, the fact that I wanted a totally different career from the usual choices, and that I wanted to make a difference in the community as a grownup. I would not be telling the truth if I claim that I knew what civil engineering was all about, except that I will work with water, dams, roads and bridges.

The standard of education and the facilities in some of the rural schools are not on a satisfactory level. My first visit to a laboratory and library was at university.

My matric results were such that I did not qualify to study for any engineering degree. Fortunately the university where I enrolled had a bridging programme for those whose matric results were not adequate. I was admitted to the programme, and the rest is history.

If your matric results are not satisfactory, the chances of getting financial assistance are minimal. I experienced difficulty obtaining a bursary, but fortunately the university approached several companies on behalf of several students and I was one of those who received a grant. From then on I applied myself and ensured that my year-end results was such that I would get another bursary.

Although my childhood intentions of staying within the community after graduating have not been fulfilled because of several factors, I have started a bursary fund together with my former schoolmates to assist with financial resources where possible as well as with career guidance for learners attending community schools.

My advice is the following:

- To those with a similar background to mine: Go back to the communities where you grew up and assist in any way whatsoever with the upliftment of these communities.

- To those who think engineering is a difficult career: Yes, there are difficulties in every career that is worthwhile. The so-called easy career will take you nowhere.

- To those who grew up with relative ease: Be considerate and try to understand the background of others before you become judgemental.

- To all companies: Please consider providing bursaries to students from rural areas, even if it means that the requirements should be relaxed a little. This is where the most needs are.

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**Challenges faced by people with a rural upbringing in their education and careers – a personal experience**

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**Dihlotlo tšeo bana ba dinagamagae ba kopanago le tšona mo dithutong le mešomong ya bona – mohlala ka mongwadi**

GA GO BONOLO go kgetha thuto yeo o ka e latelago, gagolo ge o se na tblahlo ya maleba. Ge o golela dinagamagae dikgetho ts’a dithuto di laolwa gants’hi ke tikologo yeo o golela go yona le batho bao o batsebago. Ka bomadimabe bontšhi bja batho ge o ba e ba maemong a go ka soma ba leba Gauteng le go mafelo a mangwe go ikhweletša mešomo. Seo se dira gore bana ba bangwe ba ikgethele go tlogela dithuto go leba Gauteng le mafelo ao bapolgo ba bona ba šomago gona ka lehwutšo la go ikhweletša mešomo le bona; ba bangwe ba innetše gore mohlako ke leabela; mola ba bangwe bana ba ikgethela dithuto ts’a go swana le borutiši, booki, bongaka, go ba go ikgethela go ya bophodiseng le bošole ka ge tše e le dilo tšeo di tsebjago goba tšeo ba kopanego le tšona mo bophelong bja bona bjo bo kopana.

Mothe a ka ipošiša gore nna ge go le ka mokgw’o barutiši ba bana ba kae? Bonnete ke gore bontšhi bja barutiši dikolong ts’a dinamagaeng le bona ke bana ba golets’ego mafelong ona ao, ke ka moo le bona ba hlokago tšebo e tlešego.
Richards Bay Coal Terminal being expanded

THE R1.1 BILLION PHASE V expansion at Richards Bay Coal Terminal will increase capacity from its current annual throughput of 72 million tonnes to 91 million tonnes. Special provision has been made to encourage a new generation of coal exporters by earmarking 4 million tonnes per annum for emerging black economic empowerment (BEE) exporters.

Accommodating additional trains necessitated the construction of a fifth tandem tippler for offloading by inverting rail trucks. Dura Soletanche Bachy has been appointed as the specialist sub-contractor to prepare the underground works for the tippler pit. Work at the site is challenging because of space constraints with the new tippler located between two live railway lines, both of them with frequent trains.

Normally the construction solution would be to excavate with shuttering support, and cast the concrete for the floor and walls. But since the coal terminal is at sea level, the water table is only a few metres below the platform level, which rules out conventional construction methods.

‘The solution we proposed was a diaphragm wall throughout both the tippler and the tunnel,’ says Brian McDonald, operations director of Dura Soletanche Bachy. ‘The concrete structure provides lateral support, keeps the water out, allows excavation and eventually becomes a permanent wall.’

The design is the work of David Peralta of SKP Engineers, who was appointed by RBCT. The site manager is Christian Karpy, who has been seconded from Soletanche Bachy, France.

A specialised rectangular mechanical cable-operated grab was deemed most suitable for the dense sand conditions. The grab acts as a vertical bucket, digging down through the sand to create a shaft or vertical trench. ‘Bentonite is used to keep the side walls of the excavation stable while digging. The higher density of the bentonite, coupled with its rheological properties and viscosity, keeps a positive pressure on the soil at the walls of the trench which stops them from collapsing,’ explains McDonald. ‘Strict verticality control is essential and fundamental in ensuring high quality connectivity between panels.’

Dura has the expertise to manage the bentonite, which is also essential. The bentonite is natural clay which swells to 15 times its volume when fully hydrated. The fluid exhibits thixotropic properties, forming a jelly inside the sand as well as a filter cake on the surface of the sand against which the fluid bentonite pressure can act to retain the sand and keep external ground water at bay. ‘When digging reaches the planned depth (as deep

About the terminal

Richards Bay Coal Terminal (RBCT) is the largest single export coal terminal in the world. In September 2006, it set a new world record by loading and exporting 409 809 tonnes of coal in a 24-hour period.

Opened in 1976 with an original capacity of 12 million tonnes per annum, RBCT has grown into an advanced 24-hour operation exporting more than 68 million tonnes of coal a year to buyers around the world.

The deep sea port is able to handle large ships and subsequent large volumes efficiently and reliably. The 260 ha site currently boasts a quay 1.6 km long with five berths and four ship loaders.

The Phase V expansion will increase the terminal’s capacity from its current annual throughput capacity of 72 million tonnes to 91 million tonnes. The expansion is expected to be completed in the first half of 2009.

In August 2007, Richards Bay Coal Terminal handled 753 trains and shipped 5 million tonnes of coal, bringing the year to date total to 42 million tonnes.
as 24 m), we carefully de-sand and replace the bentonite, before inserting cleverly designed and fabricated steel reinforcement cages, and then we tremie concrete into the excavation, upwardly displacing the bentonite.

The diaphragm wall is completed in sections/panels which are separated by a temporary ‘continuous water stop’ steel stop-end designed and patented by Soletanche Bachy. ‘We use our CWS joint which has various technical and competitive advantages. First it enables us to install a rubber water-stop membrane which intercepts the joint and ensures water tightness at the joint between the panels,’ says McDonald. ‘And as it is the only diaphragm wall stop-end jointing system which is extracted laterally, rather than vertically, once we complete casting the concrete in a panel we leave the CWS joint in place. This means we don’t need to ask our site team to work late into the night to wait for the concrete to partially set before pulling the old-fashioned stop-ends vertically with a crane. This gives us a much more modern, highly efficient, high quality and much safer solution.’

When the diaphragm wall is complete the excavation within will be executed using a top-down process within the walls to construct the tippler pit.

South African coal exports generated R21.5 billion in foreign exchange during 2006. Though the country exports coal to 28 countries, almost 90% is destined for the European Union where the United Kingdom, Spain, France, the Netherlands, Italy, Germany, Denmark and Belgium remain the largest consumers.

Demand for South African coal is growing in India and China’s coal imports are growing fast thanks to strong demand and pressures to restrict domestic coal mining investment and production.

Increased demand, matched by greater export capacity, should lead to the creation of a significant number of new jobs in the coal mining and associated sectors.
Major roadworks under way at De Hoop Dam

LIVIERO CIVILS MD Richard Saxby says the company has an excellent mix of ‘old and wise’ and ‘young and energetic’ who all share a passion for what they do.

Bridges, stadiums, roads and dams are all part of the company’s repertoire and they are hungry for contracts anywhere, anytime.

‘We’re growing fast because of our expertise and enthusiasm and it’s great to be a part of it,’ says Saxby.

One Liviero contract that has caught the imagination comprises a major road contract around the De Hoop Dam in Limpopo Province. The contract is being undertaken by Liviero in a joint venture with two other companies, lead partner Hillary Construction and Eigenbau Construction.

The dam – one of the biggest ever in South Africa – is being built by the Department of Water and Forestry (DWAF) 35 km south of Steelpoort and will flood portions of the existing P169-1 road between Roossenekal and Steelpoort, which runs parallel to the Steelpoort River.

John Colman, Liviero contract director, explains: ‘The scope of works on this project is multi-faceted. Firstly, as part of the existing road will be inundated by the dam, it is being relocated to higher ground on the western side of the river where 20 km of new road will be constructed. Also, a number of roads and several bridges that will give access to the dam wall and several retaining walls and culverts are being built.’

Colman adds that one of the biggest challenges of this operation is that it takes place in a pristine, riverine environment, which must be protected at all costs.

‘This corner of the world is part of the heritage of this country, celebrated for its flora, fauna and general beauty, and we must be conscious of this all the time.’

One is left in no doubt of their earnestness in this regard on learning that hundreds of small, bulbous plants on the new road’s route were carefully transplanted and thus saved.

De Hoop Dam will ultimately provide water to the local communities for domestic use and for several new mines that have been established or are being planned in the area. These mines will help provide employment to communities that are among the poorest in South Africa.

One example of this is the community of Sekhukhuneland, an area in close proximity to the dam site. According to Saxby the JV has taken very seriously its responsibility to use local labour and to ensure adequate skills transfer.

‘This is an aspect of our work where there are no compromises, whether on this project or any other,’ says Saxby. ‘We do whatever we can to ensure that local communities benefit from the projects in their areas and that they learn the skills to continue work long after the project has
been completed.’

To this end the JV has set up both a recruitment and training programme, which has been accepted and ratified by the Construction SETA.

The recruitment selection process is being handled through the labour desk, which is situated within DWAF. ‘We give them the basic requirement for a particular job and they select personnel in terms of agreed proportions relative to the different areas of Sekhukhuneland,’ explains Colman.

There will be on-site and off-site training, the latter taking place in a community hall which has been specially rendered fit for purpose.

‘The training – which is truly comprehensive – will not only include specific skills training for what is required on the job, but will also, for example, include mentorship programmes and entrepreneurial training to help people run their own small businesses when the contract is over.’

The Construction SETA will conduct all the training programmes and more than 200 people are expected be trained.

‘It is gratifying to be able to work on a project that will make a real difference. This dam will improve the quality of life of literally thousands of people and I am pleased that Liviero is able to play an important role in that process,’ says Saxby.

Part of the success of Liviero is its emphasis on good governance. Saxby says the company continuously strives to achieve more effective management structures and better integrated management information and control systems, all of which help to make good governance a deeply imbedded aspect of Liviero’s corporate culture.

Good governance and transparency are all about being fair yet, according to Saxby, there is always a balance that must be attained between fairness and toughness.

‘This is crucial in the Civils industry, because ill discipline can be dangerous to human life. One has to exercise firmness at all times to ensure the proper standards. Simply, where safety is concerned, we don’t take chances.’
Hartebeesfontein watercare works

THE EAST RAND Water Care Company (ERWAT) recently completed the upgrading of its 45 Mℓ per day Hartebeesfontein wastewater care works near Tembisa and Kempton Park.

Owing to the dolomitic subsurface conditions and the possibility of sinkhole formation, the design of various structures required the extensive use of Geomembrane products as underlays to prevent any possible seepage through the structures into the underlying strata.

BALANCING TANK
A 1500µ Hyperliner Geomembrane was installed under the entire area of the balancing tank, which was then overlayed with a 200 mm thick reinforced concrete slab. This membrane was also installed over the 45° sloping wall areas and under the wall/floor support beam.

Hyperliner, an ethylene vinyl acetate material, was chosen because of its excellent multiaxial deformation characteristics. This allows it to be easily installed into difficult three-dimensional corners.

The construction of this structure required close cooperation between Aquatan Lining Systems and the Grinaker-LTA concrete teams to ensure that the membrane was not damaged or ruptured during the difficult concreting operations. Close liaison was also maintained with the designers, ARQ Consulting Engineers, to ensure the watertight sealing of the membrane to the penetrating inlet and outlet structures. These structures had to be modelled due to their intricate nature. Construction traffic was carefully controlled to eliminate any possible damage.

On completion of this tank, thorough leakage detection testing was carried out with a resulting complete success of the system.

AERATION TANKS
A similar underliner was laid under all the settling tanks. These tanks differed in that a matrix of ground beams were first cast and the Hyperliner membrane was laid in panels between the beams. In order to ensure a watertight seal to these beams, a Hyperliner rearguard water bar was cast into the top edges of the ground beams and the Hyperliner panels were then welded to the cast in Waterbar.

Similar stringent quality control supervision was applied with the same successful results as per the balancing tank above.

AAR4 TANK
The most challenging structure was the lining of the AAR4 tank. This tank was badly eroded and cracked. With the possibility of further movement, ARQ decided to line the entire surface area with a 1 500µ HDPE lining. This material was chosen due to the following restrictions:

- The aggressive nature of the contained treated effluent
- The need for ultraviolet-protected
material where the liner was exposed above the top surface level
Owing to the relative stiffness of HDPE it was a difficult installation process to ensure that the liner conformed to the conical and circular profiles of the tanks.

Each side of the tank had 12 rectangular columns protruding from the sloping walls to support an overhead pipe and access bridge. To accommodate the lining system it was decided to modify their rectangular shape into circular stub columns approximately 1 m high. Special circular preformed liner boots were fabricated and sealed to the columns with cascade clamps. A cusped sheet (Hidrain) was installed over the floor areas which ensured that any leakage could flow unhindered to an underdrainage pipe. The liner also had to be designed and fixed to the concrete at contain positions in order to prevent any movement of the membrane due to hydraulic forces.

When the tanks were tested, much to the dismay of the project team, a substantial leakage became evident. Every effort was made to establish the source of the leakage, including the following:
- The engagement of divers who meticulously inspected all areas. This method did not produce any definitive results. Minor possible leakage was identified and later repaired
- The reinstallation and resealing of all the underwater steel make-offs. The tank included a central division wall to which the liner was sealed below top water level
- All intricate corner lining areas were removed and reinstalled
- About 80% of the boot make-offs to the stub columns were redone
- All pipe flange make-offs were inspected and reinstalled if considered at all susceptible
- Extensive electrical spark testing of all Geomembrane joints was performed

The tanks were then retested, with similar results! A lining contractor’s nightmare!

The tanks were then progressively emptied and carefully monitored. It was then established that there was a possibility that the Cascade Clamp make-off to the stub columns could be the source of the problem. After extensive discussions with the clamp suppliers, it was decided to eliminate the ‘step’ between the 2 mm HDPE liner and the upper concrete surface by placing a 2 mm thick gasketting bandage directly above the top edge of the liner. The clamp was then reinstalled with the new ‘bandage’ ensuring that the clamps were not distorted by the liner ‘step’.

And hey, presto! No more leaks (and no more costs)!

Aquatan Lining Systems would sincerely like to thank the project team of ARQ Consulting Engineers and Grinaker/LTA for their assistance and cooperation and the client, ERWAT, for their patience and understanding during the lengthy investigation period. This was certainly a case of if you first don’t succeed, try, try and try again!
Civil Engineering • January 2008

Laduma for the Franki pile

Franki Africa is currently involved in many prestigious contracts throughout the country and beyond. These include various works on the two highest profile projects in the country – Gautrain and 2010 FIFA World Cup infrastructure. One of these projects is the Nelson Mandela Bay Stadium (formerly Prince Alfred Park), one of the soccer stadiums to be used in the 2010 World Cup. The stadium is situated close to the Port Elizabeth City Centre on the banks of the North End Lake.

NELSON MANDELA BAY Stadium has been a feather in the cap for the Franki team. At times they had to install piles quicker than possibly on any other job to ensure that the main contractor was not delayed. And it didn’t help that fairly regularly winds reached up to 70 km/h and that rain at one time delayed them for almost a week!

‘This has been a challenging project,’ says project manager Graeme Wray.

‘Owing to some initial unavoidable delays and the weather challenges, at one stage we had to complete up to 135 piles a week, pouring up to seventy cubic metres of concrete per day, which is tough in anybody’s book. But I’m pleased to say that, with the help of outstanding machinery, especially our new Bauer Auger Rig, and a great team, led by foreman Stanley Eaton, we did it and will finish the job on time.’

According to Franki technical director Gavin Byrne the solution proposed in the tender documentation was a predrilled Franki driven cast-in-situ pile – otherwise known as the Franki pile. The original solution proposed approximately 1 550 piles.

The pile design was to be carried out by the contractor. Franki’s tender was the lowest and after post tender discussions and clarifications, Franki was awarded the contract in March 2007.

‘There were very tight schedule requirements and critical milestone dates for handover of the four main sections of the stadium structure to Grinaker-LTA. Programming was always going to be tight and to compound matters, the stadium design evolved during construction resulting in a significant increase to Franki’s scope of works – the final piling quantity is now likely to be up to 2 295 piles installed.'
to Franki’s scope of works. The final piling quantity is now likely to be up to 2 295 piles installed – an increase of 45% from the original tender. These necessary design changes and other tricky occurrences, like the rain, has made this a very challenging project,’ says Byrne.

The stadium site is underlain by Kirkwood formation mudrock and sandstones at relatively shallow depths – approximately 8 m below natural ground level. The bedrock is overlain by transported horizons and residual soils which exhibit heaving properties.

To overcome the problems associated with the heaving profile, as well as to carry the moderate and heavy column loads, the piles were pre-drilled through the expansive profile into the underlying stable, soft rock horizons.

The ubiquitous Franki base was then formed after driving below the pre-drilled level. ‘This guaranteed satisfactory load capacity and settlement performance of the large groups of Franki super-heavies and heavies detailed for the project,’ says Byrne.

Significant earthwork terracing is being incorporated in the stadium design and a large number of piles have been installed from elevated terraces which have resulted in founding depths of up to 12 m below piling platform levels.

Byrne concurs that the Bauer BG 15 hydraulic drilling rig played a major role in the success of the project.

‘We fully utilised the extensive capability of this newly acquired rig to expedite the significant quantities of pre-drilling required for the project.’

The rig has been supplemented by two other older, mechanical drilling rigs to pre-drill for two leader-equipped piling cranes and two Franki crawler rigs.

Technically speaking, the real champion, however, was probably the world-renowned Franki pile, which has been used extensively throughout southern Africa for more than 50 years and is still today one of the most popular pile types. With a wide range of pile sizes and the advantages of the enlarged base, the Franki pile is suited to structures that vary from single storey residential buildings to multi-storey office blocks, stadiums and other such structures.

The main feature of the Franki pile is the enlarged base formed at the toe of the pile. In forming this base the end bearing area is increased considerably. Furthermore, the displacement achieved when expelling the plug and forming the enlarged base compacts and preloads the soil surrounding the base. Thus the end bearing of a Franki pile develops at much lower base deflections that that of a bored pile.

The installation technique for a Franki pile is rather unique. The piling rig for installing the pile has an engine, a winch, a mast, and an open-ended piling tube and a long cylindrical drop hammer which is located within the ball of the piling tube, the latter being held and guided by the mast.

The first operation is to drive the piling tube into the ground. To be able to do this a plug of gravel or sand is formed inside the tube at its toe. This is achieved relatively easily by placing a measured quantity of gravel or sand in the tube while the tube is resting on the ground and then compacting this with short drops of the hammer.

Once the plug is compacted the hammer drop is increased and the tube is driven into the ground by successive blows of the hammer falling on the plug. The plug arches in the tube thus drawing the tube into the ground while at the same time preventing the ingress of water and/or soil.

The positive features of the Franki pile are now legendary: it is often a very economical system; there is an extensive range of pile sizes; the pile has an excellent load/deflection performance; noise levels are relatively low; and the pile has excellent tension load capacity.

‘The main benefit that is gained from these features is that the founding level for the Franki pile is often at a considerably higher elevation than that necessary for other piling systems. This often results in a significantly better cost for the piled foundation based on the use of the Franki pile while pile cap deflections remain within acceptable limits,’ says Byrne.

On Nelson Mandela Bay Stadium, because of the tight schedule to meet the 2010 deadlines, the project has required close cooperation between Franki and Grinaker-LTA to optimise coordination of earthworks and piling operations to facilitate handover of the foundations for the erection of the reinforced concrete frame superstructure.

The project is being resourced and managed by Franki’s Cape Town division using as much local expertise and labour as possible – including the project manager, Graeme Wray, who has intimate knowledge of the local industry and conditions having, managed Franki’s branch in Port Elizabeth in the 1980s.

With the cooperation of the contracting parties and professional team, the critical milestone foundation handover dates have been generally adhered to and Franki is proud of its successful adherence to the time frame on this project and helping getting the stadium ready for the much-anticipated 2010 World Cup.
WORK HAS BEGUN on upgrading the Moreletaspruit outfall sewer system in the City of Tshwane metropolitan area.

This major infrastructural project will take seven years to complete.

Draining a 113 km$^2$ catchment area bounded by Rigel Avenue and Moreleta Park on its southern perimeter, the Pienaars River catchment area (east), Waterkloof Ridge (west) and the Magaliesberg range (north), the project has been commissioned by the City of Tshwane Metropolitan Municipality (CoT).

Johann Wessels, deputy manager in the City of Tshwane’s Water and Sanitation Division, says greater population densities in the catchment area – especially in its southern suburbs of Moreleta Park, Valley Farm and Garsfontein – have placed increasing pressure on the existing system.

The decision to proceed was taken after hydraulic and structural assessments had been undertaken by consulting engineers Africon Engineering International (Pty) Ltd. These were conducted in the context of Tshwane’s sewer master plan, compiled by Cape Town-based consulting engineers GLS Consulting.

The plan includes a hydraulic model of the entire catchment area which Africon used to determine future potential total flows and additional capacity requirements. The areas earmarked for upgrading are highlighted in green (see map).

When the entire upgrade has been completed, the combined system will accommodate the catchment area’s ultimate peak dry-weather flow comfortably at no more than 70% capacity. The remaining 30% is reserved for handling storm water ingress during the wet summer months.

The existing pipeline, installed in the late 1950s and 1960s, splits into two at Derdepoort and these drain into the wastewater treatment works of Zeekoegat and Rooiwal.

A physical examination of the existing system using CCTV cameras was used to diagnose structural failures and root ingress at the joints, although some sections of the line could not be properly examined owing to consistently high flow rates.

When the initial assessment had been completed, Africon conducted a feasibility study and a detailed survey of the whole route to chart the optimal layout of the new pipeline.

Thereafter it was decided that the project would be implemented in three phases. Phases 1 and 2 involve the laying of new pipelines comprising CAC-lined reinforced concrete pipes. When these have been completed in 2014, the existing and new pipelines will operate in tandem as a dual-line system.

Phase 3 will address non-hydraulic capacity issues on the existing line, such as fractured pipes, structural failure, root ingress and water infiltration.

According to Kobus Prinsloo, the Africon engineer in charge of the project, budget constraints on the R74.8 million Phase 1 contract will delay its completion until the second half of 2009.

‘The reason for this was the huge and unanticipated escalation in South Africa’s construction-related costs during recent years. As a result, the estimate on which the original budget allocation was based was too low,’ said Prinsloo.

Much of the new pipeline along the Phase 1 alignment comprises 900 mm diameter concrete pipes, although stretches of the lower sections will include pipe sections in diameters of 1 050 mm and 1 200 mm. Pipe diameters ranging from 900 mm at Val de Grace to 525 mm in the upper reaches of the catchment area in Garsfontein will be used for Phase 2. Joints will be sealed internally on all sections of the project.

Phase 1, which was begun in February 2007, is being constructed from Derdepoort in the north to Val de Grace in the south, a distance of approximately 8.4 km.

Most installation work in Phase 1 is based on open trenching, apart from seven instances where pipe-jacking is required, six under existing roads and one under a rail crossing. The pipe-jacking work is being done under a separate contract by Borwa Construction.

Cerimele Construction was appointed as the main contractor on Phase 1. General manager Kobus Grobler explains that the trenching, which runs to a depth of up to 8 m, is Cerimele’s major challenge.

Work on Phase 2, which covers 7 400 m from Val de Grace to Garsfontein, will probably commence in 2011 and is due for completion in 2014.

Many areas in which the new line is being laid, especially those in the southern sections, are heavily developed. Prinsloo observes that in previous decades the enforcement of floodlines was less strictly applied than today, and many of the properties are located below the 1:50 and 1:100 floodlines.
This has resulted in the encroachment of properties right onto the banks of the spruit, a factor which imposed severe constraints on the route of the new line. This necessitated our opting for pipe-jacking under two townhouse developments in Val de Grace.

As pipe-jacking involves a considerable amount of blasting, we commissioned an environmental impact study and embarked on an extensive public participation drive before this option was chosen. Part of the process included meetings and negotiations with residents over a six-month period before the decision to tunnel under their properties was reached.

The Val de Grace pipe-jacking operation entails drilling and blasting through some very hard rock at a depth of 9 m to 20 m below the surface and over a length of 275 m. Two 500 t jacks with inter-jacking stations are being used on the project by Esor Ltd, the main pipe-jacking contractor. Jacking commenced at the beginning of April 2007 and should be completed by February 2008.

Although a connection to the rest of Phase 1 will only take place in 2009, we decided to go ahead with the Val de Grace pipe-jacking project as soon as there was consensus to go underground. While the blasting and pipe-jacking operation is taking place we are being as proactive as we can in addressing any issues of concern to property owners,’ comments Prinsloo.

On the subject of piping material, Prinsloo says it was almost a foregone conclusion that the choice would be reinforced concrete.

‘We didn’t really consider other options as the size and application of the pipes precluded us from doing so. The existing line is also made up of concrete piping. It has performed well during its 50- to 60-year lifespan, and we believe it will continue to do so well into the foreseeable future.

The real choice lay in selecting the most suitable pipe-lining option. Ultimately, we settled for CAC because of its good abrasion resistance and because much of the catchment area has fairly steep slopes. These result in higher flow velocities and a greater potential for abrasion. The lining itself is 13 mm thick and considerably thicker at the pipe ends, owing to the manufacturing technique adopted by SPC,’ explained Prinsloo.

One of the design principles adopted for the upgrade was the positioning of the new pipeline on the opposite side of the spruit to that of the existing line. However, there are sections where the lines will be run in parallel on the same side of the spruit owing to space limitations.

‘Another feature of the old line is that it crosses through rather than under the spruit in several places. This led to the construction of what were essentially small weirs, which in turn led to scouring and erosion at the bottom of the weir walls. Consequently some pipe sections are in a poor structural condition at several crossings. However, by running the new pipe on the opposite side of the spruit many of the crossings will be made redundant. Those that remain could be upgraded to provide additional flexibility and to facilitate inter-connectivity between the new and existing systems in cases of emergency.

‘A total of five connections will be made between the new and existing pipelines along the alignments of Phases 1 and 2. This will facilitate flow divisions at each of these points via manually operated sluice gates. Under normal operating conditions a pre-determined flow position will balance flows between the two sewer systems,’ says Prinsloo.

Another facet of the new line is the introduction of long radius bends to reduce frictional losses and minimise the hydraulic problems usually encountered at conventional in-situ manholes. Smooth bends reduce potential blockages, and by so doing minimise long-term maintenance requirements.

‘Long radius bends call for a contractor such as Cerimele, which can build this type of line, as well as a pipe supplier who is willing to get involved with the design aspects. We were fortunate that Southern Pipeline Contractors were able to accommodate our design requirements with ease,’ concludes Prinsloo.

Owing to a lack of space or obstructions such as roads and rail tracks certain sections of the new Moreleta spruit outfall sewer were routed underground using pipe-jacking. Most of them were minor operations, apart from a 275 m section at Val de Grace, a suburb in eastern Pretoria. The picture shows workers at the rock face of the Val de Grace section where drilling and blasting took place 8 m to 20 m underground.
REACHING ONE OF the most significant milestones since construction started some 14 months ago, Gautrain’s long-awaited, high-technology tunnel boring machine (TBM) arrived at Rosebank Station, where it was assembled and named.

‘Not only does Gautrain rely on the best international technology used on projects around the world today, but we also celebrate South Africa’s rich heritage along with a global TBM naming tradition. Called Imbokodo, our TBM will proudly make a way for South Africa’s first ever rapid rail tunnel,’ said Jack van der Merwe, CEO of the Gautrain Management Agency.

The naming of a TBM is a time-honoured tradition throughout the world. Boring cannot start until local people have chosen a suitable name and, as is customary, it is given a woman’s name as a sign of good luck for the project ahead.

In the spirit of 9 August 1956 – when 20 000 women of all races marched to the Union Buildings in Pretoria to hand over a petition against the Urban Areas Act – Gautrain joined the women who sang: ‘Wathinta abafazi, wathinta imbokodo’ (‘If you strike a woman, you strike a rock’).

‘Imbokodo therefore symbolises a country’s heritage of willpower in its drive to overcome obstacles. In the same manner, a dedicated project team is working around the clock to build an innovative, world-class public transport system that will bring freedom of movement and new economic opportunities for the people of Gauteng,’ said Van der Merwe.

Designed in Germany to cope specifically with complex underground conditions south of Rosebank along Oxford Road, the TBM will start boring a tunnel towards Park Station in January 2008. Geology in this area is affected by a high water table as well as different degrees of hard rock, sand and soft, water-clogged soil.

German engineers at the Herrenknecht factory in Swanau custom built a mixed face earth pressure balance shield TBM for Gautrain. It will be the first such machine to be used in South Africa.

The benefits of using a TBM for tunnelling are recognised worldwide. These giant machines are usually designed to bore tunnels in specific areas and to cope with site-specific ground conditions. A computerised guidance monitoring system is used to steer the machine accurately underground whilst the machine and tunnel lining resist the soil pressures during and after the tunnel construction. This means that TBM is an environmentally sound method of tunnelling, especially in built-up areas.

Urban tunnelling requires that the ground surface is left undisturbed, es-
especially since tunnelling has to be done under deep infrastructure foundations. Another advantage of TBM technology is its ability to produce a smooth tunnel wall that is cost effective and time efficient.

The designing and building of Gautrain’s R300 million TBM took about 12 months. After its pre-assembly at the Herrenknecht factory in Swanau, Germany, it was transported via sea to Durban Harbour and via road to Rosebank Station. Here it was re-assembled by an international and local team of experts.

Imbokodo, with her 145 m long back-up system comprising 13 trailers or gantries, will bore a 3 km long tunnel with an excavated diameter of 6.8 m and a minimum ground cover of 15 m at some places. She weighs 885 t.

The remainder of the 15 km tunnel between Johannesburg Park Station and Marlboro Portal will be excavated using conventional drilling and blasting.

**AUTOMATED TUNNELING TECHNOLOGY**

At the front end of the TBM is a rotating cutting wheel, known as the cutter head, that excavates the ground. Behind the cutting wheel is a chamber where the excavated material accumulates before being extracted by a pressure-relief discharge system called a ‘screw conveyor’.

Excavated soil is transported via a 0.8 m wide conveyor belt from the back up to the Rosebank south shaft, where it will be picked up by tipper trucks.

The front cutter head of the machine bores the ground with 1.5 m advances at a time whilst the tunnel lining is built ring by ring in the rear.

These pre-cast segment rings form a watertight concrete cylinder. In this way the tunnel structure is completed, section by section, as the TBM slowly moves along like a giant earthworm.

The machine is directed or driven by a pilot (or driver) who sits in a control cabin surrounded by an array of computer screens. His job is facilitated by a sophisticated electronic guidance system that displays a target he has to follow.

Maintenance or replacement of the cutters can be done from behind the cutter head. Access to do this is via an airlock that has to be pressurised when the machine is passing through water bearing ground.

The cutter head is driven by seven motors and comprises 150 drag teeth for soft rock. It also comprises 45 single disk cutters and four twin disk cutters used for hard rock. The total electric power of the cutting wheel is 2 450 kW.

**Guidance system**

A computerised guidance monitoring system provides information to the TBM pilot on a continuous basis. It also allows the pilot to steer the machine and to continuously monitor the actual three-dimensional position of the machine in relation to the theoretical centre line of the tunnel at any given location along its route.

The construction of the segmental lining that takes place directly behind the cutter head is also controlled by the guidance system and is expected to be installed to within a tolerance of 25 mm of the theoretical alignment.

**GEOLoGY CAPABILITIES OF EARTH PRESSURE BALANCE SHIELD TBM**

Generally the geology through which the tunnel has to go varies from soft residual granites to three hard granite rock spurs.

The length through which the rock spurs comprises nearly 300 m to 400 m of the 3 km tunnel. For the most part the tunnel will be driven through decomposed granite below the water table.

The tunnel will also need to traverse the soft zones that will often be below the water table.

**OTHER APPLICATIONS**

A Herrenknecht earth pressure balance shield TBM was successfully used for the construction of a 3 650 m long highway tunnel that crosses the city centre underground in Madrid, Spain. The tunnel can accommodate three traffic lanes as well as integrated sidewalks on both sides.

This TBM had an unprecedented diameter of 15.2 m. Geology includes marl, marl and gypsum and solid gypsum.

Another example of the successful application of earth pressure balance shield TBM technology from Herrenknecht is the construction of the new high-speed rail tunnel between Karlsruhe to Basle in Germany. It is the longest German railway tunnel being constructed.

Two TBMs were successfully used to excavate through the multi-layered geology of the Rhine Valley, where water pressures of up to 9 bar must be kept safely under control. Named Marion and Inken, each has a diameter of 11.12 m. Geology includes limestone, sandstone and marl.

In the highly congested city of Los Angeles, a subway rail network is extended by 10 km by using a similar TBM. Two tunnels need to be bored through soil containing oil, which makes it necessary to protect the machines against flammable gas. The geology includes loam, sand and silt.

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**TBM FACTS**

<table>
<thead>
<tr>
<th>Principal specifications</th>
<th>6.81 m diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutter head</td>
<td></td>
</tr>
<tr>
<td>Tooling</td>
<td>195 drag teeth for soft material and 48 disk cutters for rock</td>
</tr>
<tr>
<td>Cutter head motors</td>
<td>7 x 350 kW electric motors</td>
</tr>
<tr>
<td>Maximum revolution of the cutter head</td>
<td>5.1 rpm</td>
</tr>
<tr>
<td>Nominal torque at 3 rpm</td>
<td>5 685 kNm</td>
</tr>
<tr>
<td>Total length of the machine</td>
<td>Approximately 160 m</td>
</tr>
<tr>
<td>Back-up</td>
<td>13 trailers (approximately)</td>
</tr>
<tr>
<td>Weight of shield</td>
<td>325 t including the cutter head</td>
</tr>
<tr>
<td>Weight of back-up</td>
<td>560 t</td>
</tr>
</tbody>
</table>

Compiled from Gautrain website
Interesting mechanics

At the heart of Fischer Seelenbinder & Associates lie the passion and commitment of two enthusiastic engineers, Wolfgang Fischer and Henning Seelenbinder.

These engineers have undertaken many exciting initiatives, one of which is the adaptation of the foundation design originating from Germany for a 58 m high stereoscopic telescope near Gamsberg, Namibia.

The interesting venture began its construction phase in March 2007 and according to Wolfgang represents the fifth and largest known stereoscopic telescope.

‘This project was done in a joint venture with Refa Construction Management. We were responsible for the geotechnical investigations for the earthing design and construction drawings.

The construction drawings for the foundation were detailed on infrastructure design software package, AllyCAD. We prefer this program because it is quick and easy to use. As engineers, we operate in a multidisciplinary environment and having the AllyCAD Toolkits that range from mechanical through to structural is a huge plus,’ explains Wolfgang.

One of the requirements of the telescope project was that the design would be compatible with local standards while still conforming to the specifications as provided by the client’s German consultants. The client, the Max-Planck Gesellschaft in Munich, is the lead institute of a group of participating European scientific institutes.

According to Wolfgang, the complex nature of the project made it particularly interesting.

‘This venture required a high degree of dimensional accuracy for the geometry of the foundation. This was not an easy task, as the site was founded on decomposed granites, quartzite’s and conglomerates, leaving room for only nominal differential settlement tolerance.’

Despite these challenges, the team at Fischer Seelenbinder & Associates have never missed a deadline and have delivered on client expectations project after project.

‘The concrete foundation was completed on schedule in June 2007 by Murray and Roberts Namibia while a specialist team from the Max-Planck Institute in Heidelberg is currently installing the HD bolts, base plates and rails for the telescopic boogies.’

To Wolfgang and Henning, part of the allure of being a civil and structural engineer is the satisfaction of seeing the detailed designs come together in the finished project. ‘This – coupled with the fact that no two projects are ever the same – keeps them routed to the profession.

‘Henning Seelenbinder went on retirement but decided to come back to work. We are all in agreement that there is no difference between practising a hobby and doing what you love to do. Being a civil engineer and solving difficult engineering problems when producing designs is what we love to do. To us, retirement is not an option,’ says Wolfgang emphatically, adding that the team consists of four employees with future plans to increase the staff complement by an additional two.

‘We would like to keep the team small. Each of us share the same belief in quality and service delivery and we all contribute with the same commitment to projects. As consulting engineers, project managers and specialists in construction dispute resolutions, we intend to take on more projects. In fact, the greater the complexity the better we enjoy it,’ he says.
IN BRIEF

NO ‘MAGIC CURE’ FOR SOUTH AFRICA’S CRITICAL SKILLS SHORTAGE

As has been widely reported, the development potential of the South African economy is being seriously hampered by major skills shortages in engineering and the sciences — and there is no immediate solution to the problem, according to Brian Middleton, managing director of SRK Consulting.

Worst hit in South Africa is the mining industry, as it experiences significant growth. However, the difficulty extends across the board to include civil, water and geotechnical engineering. There are also serious shortages of natural and environmental scientists.

‘The greatest challenge is in the middle ranks; we have sufficient leaders at the top and younger people are now coming in. The qualified and experienced 30 to 45 year olds have left the industry and also the country with their families, in huge numbers. The drivers for their departure seem to be crime, and failing standards in education and hospital services.’

‘In the 1980s and early 1990s we were in recession, and not focused on recruiting. We had taken our eye off the ball and we did not promote science, engineering and technology (SET), as careers of choice. Young people chose careers in IT, law, accounting, administration, and human resources, among others, where mathematics and science were not always necessary to get a degree. When economic growth started around the world, the skilled professionals we had were very saleable and mobile. We have probably lost thousands of professionals since the early 1990s,’ he said.

He added that part of the problem was that insufficient funds had been spent on infrastructure maintenance and development in South Africa during the past 20 years, while government focused mainly on other aspects such as a just and equitable society and housing. Had there been more interesting projects requiring these skills, South Africa may have kept more of our SET people at home.

Growth worldwide in the mining industry in recent years has been incredible. At the same time, South Africa is facing demand for massive infrastructure development involving electricity supply, roads development, the 2010 FIFA World Cup, and water procurement, among other needs.

‘Infrastructure development is essential because the economy has grown, and there are high expectations from people,’ said Middleton.

‘The problem is that we are not getting the work done, which is exacerbated by a shortage of technical people. We hear industry leaders highlight plans for the future, but they add that they are not certain whether or not they can achieve their objectives because of the shortage of human capital.

‘Construction around the country is also being slowed because of the shortages of other requirements, like steel and cement. Here, too, there is a knock-on effect arising from the skills required to design and build factories.

‘The problem goes further than this; we do not have the technical people in procurement teams to get documentation together for an engineering team to start the work. The shortage extends right through the supply chain,’ he said.

The short-term solution is to try and balance the skills demand with imported skills, which is not always the panacea because of different cultures and language difficulties. The longer-term solution is education and training.

‘This starts with government funding mathematics and science at school level, which is now a ray of light in an otherwise dark situation. Minister Trevor Manuel has put more money into universities, and we are now starting to see more engineering and science graduates from our universities, and more diplomats emerging from our technikons,’ he said.

‘This is encouraging, but these people are not really useful until they have sufficient experience. It takes a minimum of three years to become a registered professional.’

Recruitment in the marketplace is extraordinarily difficult at present because of the shortages and the huge demand, Middleton went on to explain. Salaries are escalating rapidly, and those organisations that have some of the skills, do what is necessary to retain skilled people.

‘Millions of rands are now being ploughed into bursaries, but the problem is that there are now probably two or three bursaries available to any one person who may qualify.

‘In line with our strategy to position SRK as the employer of choice in the sector, we are encouraging our people to upskill. The focus has shifted to attracting and retaining the best available SET talent. We have offices in other parts of the world, but because of demands arising from buoyant economies, it is difficult for SRK in South African to draw on those skills. We cannot do much outside because we are experiencing an over-traded market. Our staff complement has grown, and we are training young graduates and doing the best we can,’ he concluded.

AFRICA’S URBAN POPULATION NOW GREATER THAN NORTH AMERICA’S

Africa now has a larger urban population than North America and has 25 of the world’s fastest-growing large cities.

These are among the findings published by the International Institute for Environment and Development (IIED) in the 2007 edition of its analysis of urban change, which has been published periodically since 1986.

The research highlights the gap between rapid urban growth and government capacity to plan and manage it in most of Africa, Asia and Latin America.

Half of the world’s urban population now lives in Asia, which has half of the world’s largest cities and half of the fastest growing ones. And since 1900, Europe’s share of the world’s 100 largest cities has fallen from more than half to under 10 per cent.

The analysis draws on the latest urban data from the UN’s Population Division and IIED’s review of 70 recent censuses. It analyses which cities are growing most rapidly and which are declining and discusses the social, economic and political causes and their implications for sustainable development.

‘The world’s urban map is rapidly being redrawn,’ says David Satterthwaite, a senior fellow in IIED’s human settlements group.

‘Most of Europe’s great centres of industry are no longer among the world’s largest cities and most of the future growth in urban areas will be in low- and middle-income countries.’

The analysis dispels some myths and reveals some surprising findings:

■ Many of the world’s largest cities now have more people moving out

■ The world’s urban population is not concentrated in large and ‘mega-cities’ (far more people live in smaller urban centres of under one million inhabitants)

■ The speed of urban growth has been exaggerated in low- and middle-income countries, particularly African ones

‘Urbanisation is often attributed to an urban
bias in government and aid agency policies, but there is little evidence to support these claims,’ says Satterthwaite.

‘In fact, these policies leave much to be desired as they tend to neglect the urban poor, leading to high levels of urban poverty, overcrowding in slums and serious health problems. Governments should see urbanisation as an important part of a stronger economy and their expanding urban population as an asset, not as a problem.’

Worldwide, a billion people live in low-quality tenements or squatter settlements with inadequate water and sanitation.

Economic growth is the dominant driver of urbanisation in most nations. The largest cities and much of the world’s urban population are concentrated in the world’s largest economies, and there is a strong association between a nation’s wealth and level of urbanisation. Satterthwaite warns however against broad generalisations.

‘Despite the underlying economic foundation to urban growth, the form it takes is shaped by political and social factors at a local or national level.’

‘Most of the ten-fold increase in the world’s urban population over the past century was in low- and middle-income countries,’ he says.

‘Most of these nations lack the institutional, legal and financial systems needed to manage rapid urban change over the next 15 years in a way that addresses urban poverty and the risks associated with climate change.’

‘Many governments still see urban growth as something they should try and stop but urban growth does not have to mean urban problems,’ says Satterthwaite.

‘Many of the world’s fastest growing cities are among the best managed. Cities create opportunities for improving quality of life without increasing resource use and environmental problems. How they are governed and planned will becoming increasingly important in the 21st century.’

a series of global targets to raise energy access, increase the reliability of energy systems and curb energy-related emissions. The targets will benchmark progress by industry and government in building a sustainable energy future.


‘The WEC targets can be achieved, given much greater levels of international cooperation between governments, closer government-private sector collaboration, increases in research and development, and further integration of energy markets,’ said Brian Statham, chair of the WEC Energy Scenarios Study.

WEC targets the following:

- Halve the number of people without access to a minimum level of commercial energy to one billion by 2035, and halve again to 500 million by 2050
- Develop commercial and physical energy systems that are 99% reliable in the US, Europe and parts of Asia by 2035, and in most of Asia, Africa and Latin America by 2050
- Stabilise greenhouse emissions by 2035, and reduce man-made emissions by 2050, decoupling emissions growth from economic growth

Contrary to the traditional approach, which uses economic modelling to construct scenarios, the WEC report takes a bottom-up regional view, focusing on policies needed to ensure a sustainable energy future.

The report was collated after conducting 20 workshops involving 400 principals from industry, academia, NGOs and trade groups in Asia, Europe, Africa, North America, and Latin America and the Caribbean.

WEC Energy Scenarios to 2050 will form the basis for a debate at the World Energy Congress in Rome, a WEC global energy forum that takes place every three years.

FLOOR SPACE SELLING FAST FOR BIGGEST TRADE EXHIBITION IN SOUTHERN AFRICA

ON THE INTERNATIONAL calendar, Electra Mining Africa is ranked as the second largest mining show in the world and the biggest trade exhibition in southern Africa, and is a recognised gateway into Africa for local and global investors looking for new business opportunities in the mining, construction, industrial and power generation industries.

‘The broad scope of the show brings these coinciding industry sectors together at one location for visitor and exhibitor convenience,’ says John Kaplan, MD at Specialised Exhibitions, organisers of the show.

‘It’s a platform to showcase the latest developments, technologies, trends, products and services in all sectors of these industries.’

Held every second year, Electra Mining Africa celebrated its eighteenth successful year in 2006 achieving exceptional growth over 2004 with exhibitor numbers swelling to 690 – an increase of 13% – and contracted floor space increasing to 31 000 m².

Attracting over 35 000 top-level decision-makers, many exhibitors reported excellent sales and sales leads.

Following trends of previous years, the 2006 exhibition attracted a high number of international visitors, including an inward buying mission organised by the South African Capital Equipment Export Council, which brought major buyers of capital equipment from countries where mining and building construction activities play an important part in their economies.

‘The mining industry continues to experience major growth with new ventures, expansions and upgrades – many developing to keep up with China’s apparently insatiable demand for commodities,’ says Kaplan.

‘In addition, with South Africa hosting the 2010 FIFA World Cup, the country has embarked on major infrastructure projects that demand a massive input of supplies and machinery. This is good news for general industry beyond 2010, and for Electra Mining Africa 2008.’

Electra Mining Africa 2008 takes place at the Expo Centre, Nasrec, Johannesburg, from 8 to 12 September 2008.

USHERING IN A CLEANER ENERGY ECONOMY

AS DEBATE INTENSIFIES over how to satisfy the world’s growing thirst for energy while simultaneously meeting environmental goals, the World Energy Council (WEC) has introduced

SEAWATER DESALINATION PLANT CONTRACT AWARDED

KEYPLAN (PTY) LTD NAMIBIAN subsidiary has been awarded the contract to supply a seawater reverse osmosis (SWRO) plant to Uranium Namibia (Pty) Ltd for their uranium project at

MORE INFO
Specialised Exhibitions T 27-11-835-1565 www.specialised.com

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Trekkopje which is located approximately 65 km inland and east of Swakopmund.

The desalination plant will be located on the coast approximately 35 km north of Swakopmund.

Keyplan is the leading contractor in southern Africa providing ultrafiltration (UF) and microfiltration (MF) technology for the pretreatment upstream of reverse osmosis desalination plants in many large capacity industrial and mine water treatment applications. These industrial effluents and mine waters are usually far more difficult to treat than seawater because of the variable quality of the water.

For this project the seawater intake will be located approximately 1 000 m beyond the surf zone. This will ensure that a relatively clean water low in suspended solids is supplied to the process.

However, this coastline is renowned for its rich planktonic growth and sulphur upwellings which require superior treatment compared to conventional multimedia filtration. Course and fine screening has been included upstream of the UF plant.

After examining alternative UF technologies which are currently being used or have been piloted internationally as pretreatment for SWRO plants Keyplan selected Norit X-Flow Seaguard UF membranes for the Uranin Project. The information gained during this design review confirmed Keyplan’s experience in the design and operation of other effluent desalination plants using UF as pretreatment. The Seaguard UF membranes have low transmembrane pressure, high flux rates and low power consumption, the latter being an essential requirement for the project.

Based on techno-economic selection criteria, Toray was awarded the contract to supply their TM 820-400 SWRO membranes. Consistently low SDI water will be produced by the X-Flow Seaguard UF membranes making the selection of high surface area RO membranes possible. The plant will have a potable water production capacity of 20 million m³/annum (55 000 m³/day). Bel Composite Industries of Israel will supply the pressure vessels.

Energy Recover, Inc (ERI) has been selected as the pressure recovery device as they have a vast international experience in supplying energy recovery systems for seawater desalination at a competitive price. Above all, the guaranteed energy recovery will ensure excellent power savings per cubic metre of water produced.

Potable water will be pumped approximately 60 km inland to Uranin’s Trekkopje open cast uranium mine where the heap leach process will be used for the extraction and recovery of uranium.
THE ICCX (International Concrete Conference and Exhibition), which is scheduled to run from 19 to 21 February at Sun City, follows hard on the heels of this year’s very successful event in Cape Town.

ICCX Sun City promises to eclipse Cape Town’s event, which was the largest construction fair on concrete technology ever held in sub-Saharan Africa.

Comprising a technical conference featuring several themes on concrete technology, it will also include a trade fair for concrete-related technology and machinery.

A technical course aimed at architects and engineers, on the design of precast frame buildings, will precede the conference on Monday, 18 February.

Conference organiser Dr Hans-Dieter Beushausen of the University of Cape Town’s Civil Engineering department, says that the increasing demand for modern and efficient concrete technology and manufacturing techniques, requires frequent exchanges of knowledge and expertise between cement producers, precast concrete manufacturers, engineers, architects and researchers, as well as machinery and material suppliers.

‘ICCX Sun City will expose its visitors to the latest developments in concrete technology, and provide excellent opportunities for networking and the interchange of technical data,’ says Beushausen.

Several overseas speakers will deliver papers, including Martin Clarke from the UK, Belgium’s Arnold van Acker and Patrick De Clerc, Germany’s Frank Dehn, Christian Phlhofer, Helmut Ehnes and Steffen Mothes, as well as Brian Shackel and Don Hume from Australia, Michael Khrapko from New Zealand and Spain’s David Fernández-Ordonez.

Local speakers will include Ian Thom, Andrew Rowe, Hugh Fraser, Bryan Perrie, Gideon van Zyl, Mark Alexander and John Cairns. Topics such as Gautrain, the FIFA World Cup 2010, developments in architectural concrete and precast solutions for affordable housing will be covered.

At least 70 exhibitors are expected to participate, among them leading equipment and material suppliers as well as associations and institutes from Europe, North America and South Africa. They will present a range of products in the fields of concrete materials, plant technology, mixing and formwork technology, transport and handling systems, special concrete products, cement extenders, admixtures, pigments, construction chemicals, connection and fastening systems, placing technology and reinforcing steel.

A site visit to Africa’s largest precast yard, specifically established for the Gautrain project, will round off the programme on 21 February.

The conference is being held against the backdrop of a local construction boom which has witnessed concrete production running at full capacity for the past three years and growth rates within the industry exceeding 20%.

Besides the construction of new stadiums for the 2010 FIFA World Cup, several large infrastructural projects are currently being planned or executed. These include the construction and enlargement of major airports, the extension of road and railway networks, new power supply facilities, as well as the construction of hotels, parkades, shopping centres and offices. In addition, the residential housing market and the development of low-income housing projects are booming, resulting in increased demand for modern concrete technology and time-efficient, high-quality building systems.

ICCX Sun City is being sponsored by the Concrete Manufacturers Association (CMA), the Cement and Concrete Institute (C&CI), the Concrete Society (CSSA), the South African Ready Mix Association (SARMA), Sika South Africa, BASF, and PPC Cement.

BATSWELEDI PROGRESSING WELL

PPC CEMENT’S BATSWELEDI expansion project in Limpopo province is progressing according to plan. The project’s major civil works have been completed, including the construction of the facility’s reinforced concrete preheater tower standing 104 m above ground level.

Some 11 000 m³ of concrete was used in constructing the preheater tower. This includes the piles, pile caps, foundations, lift shaft and tower structure.

The preheater tower has a rectangular footprint of 24 m by 25,5 m and is founded on 78 augered piles, each 1 800 mm in diameter and approximately 18 m deep.

Once fully equipped with all the mechanical equipment, the final preheater tower height will be 115 m above ground level.

Work has commenced on the final steelwork erection, mechanical installation and the plant electrical installation with the project on track for hot commissioning from April 2008.

The R1,36 billion expansion project will ultimately increase PPC’s inland cement capacity by just over 1,25 million tonnes per annum by about mid-2009.
STATE-OF-THE-ART EXPANSION PROGRAMME

TO ACCOMMODATE its rapid growth, Intaka Tech has commenced a R300 million high-tech, four-phase expansion programme in Africa, which is scheduled for completion in November 2008.

Intaka Tech, a division of the international Intaka Group, manufactures and markets innovative, portable equipment, in particular water purification plants and on-site oxygen and medical air generation plants. This cost-effective equipment produces water and oxygen of a superior quality that is in accordance with international standards, ensuring it is fit for human consumption. It is used in many applications, ranging from construction and mining to healthcare.

The company already has well over 200 units in operation in a variety of local hospitals and rural communities, in both the private and public sector.

The objective of the ambitious expansion programme is to support and back the ever-increasing number of Intaka Tech state-of-the-art plants in South Africa and neighbouring countries, and to contribute to technical and infrastructural development throughout the continent, no matter how remote the locations requiring water purification or oxygen and medical air generation may be.

The programme is fundamental to the company’s strategy to increase and entrench its business throughout the continent on an ongoing basis.

The R300 million investment has been allocated to the development of at least three, most probably four, additional manufacturing sites, and will go to their construction, the cutting edge equipment required, as well as labour and training.

Central to this investment will be a focus on optimising customer service delivery and equipment back-up, and therefore developing Intaka Tech’s service and maintenance facilities even further.

‘This latest undertaking is another step forward in the implementation of our policy to improve and enhance the lifestyle and well-being of our target market and contribute meaningfully to industrial development in southern Africa,’ says Dr Gastón Savoi, chairman of Intaka Tech.

Some of the other industries in which Intaka Tech equipment operates are environmental and recreational organisations, the food and packaging industry, fishing, waste management, and disaster zones.

CONCRETE SURFACE BED TRAINING

Ever been to a function where the sandwiches had been out for too long and curled up at the edges? Shrinkage in concrete panels in floors causes exactly the same effect, says Bruce Raath, education and training manager at the Cement & Concrete Institute (C&C).

‘Shrinkage in the exposed top 50 mm of a concrete floor panel shrinks far more than the concrete in the bottom 50 mm. The difference in the shrinkage is much greater when there is a sheet of plastic underneath the floor – then the only escape route for moisture is upwards.

‘The surface shrinkage then curls the corners so that they lift away from the base underneath. When a heavy load, such as a fork lift truck, travels over one corner the panel will rock, and anyone standing on the opposite corner is liable to be thrown off his or her feet. After many passes of the fork lift, the corner will break off,’ Raath states.

‘Now consider what will happen if the floor is washed, and water can get through badly sealed joints to wet the underside of the panels which will expand. Again plastic underneath will make the resultant curling much worse.’

Raath says reducing the occurrence of curling, and many other defects in floors caused by not understanding the inherent properties of concrete, will be discussed during the training course on concrete surface beds to be presented by the School of Concrete Technology at the C&CI this year. Details of dates and more information are on the website www.cnci.org.

First the corners curl, and then the panel cracks under weight – how to prevent this ‘curling’ in concrete flooring will be part of a C&CI training course in Midrand this year.

Continued from page 19

The logical approach to dealing with the civil engineering quantities when using SANS 1921 and SANS 2001 is to base measurement and payment on a single stand alone document that deals with the standard system of measurement for civil engineering works in its entirety. Such a document should be sufficiently flexible to be used with any of the standard forms of contract that are included in the CIDB’s Standard for Uniformity in Construction Procurement and the range of standard specifications that are currently in use in South Africa, including SANS 1921 and SANS 2001. Ideally such a document should be compatible with international practice.

It makes no sense to revert back to CEQ73 or to update CEQ73. It is preferable to simply adopt the system currently used in the UK and elsewhere in the world.

CESMM3 is a logical choice as it is a document which is founded on the same thinking and philosophy as the system that has evolved in South Africa. It is widely used in Africa, is sold by SAICE and is well understood by the international community. It is a tried and tested document that is adequately supported by a range of comprehensive handbooks and texts.

JCD’S PROPOSAL FOR A GUIDE TO THE APPLICATION OF CESMM3 IN SOUTH AFRICA

The Joint Civils Division is currently developing a guide to the application of the third edition of the Civil Engineering Standard System of Measurement (CESMM3) in southern Africa. This guide will:

■ Introduce the reader to the philosophy and thinking behind CESMM3
■ Highlight the differences between the current system as embodied in Civil Engineering Quantities 1990 and the SABS 1200 standardised specifications
■ Make recommendations regarding the adaptations that should be made to successfully apply it in the South African contracting environment

This publication will not replace CESMM3 in any way, nor will it purport to be a handbook on the subject. It will merely serve as a guide to the application of CESMM3 in the South African context to facilitate the adoption of CESMM3.
Thursday 21 February 2008
19:00 for 19:15
Bytes Conference Centre, Bytes Business Park, Block C,
241 Third Road, Halfway House, Midrand
Business attire
Drinks on arrival followed by Johan de Koker’s presidential inauguration
and the bestowing of Honorary Fellowship/s in the auditorium. A finger
supper will be served afterwards.
Attendance is free but **bookings are essential** and will be handled on a
first come first served basis. **Please note that we can accommodate
only a certain number of people.**
Zina Girald on or before Friday 08 February 2008.
Fax: +27 (11) 805 5971 e-Mail: zgirald@saice.org.za

Directions & Map

FROM PRETORIA:
Take the N1 South from Pretoria – Take the NEW
ROAD off - ramp, turn right and cross over the
motorway taking the CROWTHORNE LANE. (in the
direction of Vodaworld and Kyalami)

FROM SANDTON:
Take the N1 North from Sandton, turn left into NEW
ROAD. Continue until the traffic light where you
have a SHELL GARAGE on your left hand side.
Turn left into SIXTH ROAD (there is a directional
board displaying “BYTES CONFERENCE
CENTRE”).
At the very first road turn left again into INVICTA
ROAD. Continue until you reach a T-Junction and
turn right into THIRD ROAD. Pass the UNITED
HOTEL and right next door is the entrance to
BYTES BUSINESS PARK.

PROCEED TO:
CONFERENCE CENTRE - BLOCK C
241 THIRD ROAD, HALFWAY HOUSE, MIDRAND

Booking Form

Name: __________________________________________
Tel: ____________________ Fax: __________________
Address: _________________________________________________________________________________________________
Number of guests
(including yourself): __________________ Names of guests: ______________________________________________________
Dietary requirements : _________________________________________________________

Signature: __________________

**COMPLETE AND FAX TO: Z GIRALD +27 11 805 5971 ON OR BEFORE 08/02/2008**

**TO DOWNLOAD MORE DETAILS PLEASE VISIT OUR WEBSITE: www.civils.org.za on the main top menu under > Events and Awards -> SAICE**

**Members’ Function**
Failure is not an option!

The message was not only a motivation for junior students, but it described the Hundred for Hundred (H4H) project that was initiated in 2003 by Allyson Lawless, 2000 SAICE president, and Dudu Mkhize, a mathematics education academic, on a zero budget.

This was the message of one of the final-year students at the Hundred for Hundred award function hosted by SAICE at SAICE House in Midrand on 16 November 2007.

The message was not only a motivation for junior students, but it described the Hundred for Hundred (H4H) project that was initiated in 2003 by Allyson Lawless, 2000 SAICE president, and Dudu Mkhize, a mathematics education academic, on a zero budget.

In line with SAICE centenary in 2003, the project aimed to recruit a hundred students from disadvantaged backgrounds into civil engineering studies.

Despite financial constraints, the project has not only survived – thanks to Jones & Wagener Consulting Engineers – but has managed to identify and keep what seems to be future jewels in civil engineering in South Africa! For example, a final-year civil engineering student at the University of Johannesburg, Thandiwe Ngwenya, did not fail one course during her four-year studies and has accumulated 14 distinctions.

The new partnership with the Thuthuka Project is set to take the H4H project to the next level.

Thuthuka is a project that has as its prime objective the increase of the number of black chartered accountants in South Africa. The project was launched in 2002 in partnership with the South African Institute of Chartered Accountants (SAICA) and the University of Johannesburg. Its sponsors include SAICA and the National Skills Fund.

Currently there are 560 students in this programme, 16 of whom are postgraduate.

One of the Thuthuka sponsors offered a helping hand to H4H by awarding ten civil engineering bursaries. Along with ten bursaries, Thuthuka brought along their ‘whatever it takes to polish the identified jewels’ policy, which is passionately promoted by Thuthuka’s Natalie Zimelmann (director) and Ethel Nhlapo (manager).

Fruits of this were evidenced by three Thuthuka engineering students who scooped achievement awards in their first year of study.

Another partnership in the pipeline is with TCTA, a state-owned entity whose mission is to fund and implement bulk raw water infrastructure – hence their interest in civil engineers.

TCTA is coming in with a ‘ten in, ten out’ policy to be implemented on civil engineering students they will be supporting in the next few years.

With such partnerships H4H does not have an option to fail but to soar higher and higher!

The function was attended by the heads of civil engineering department from the University of Pretoria and the University of Johannesburg, as well as representatives from the Gauteng Department of Education, Goba, Jones & Wagener, TCTA and Thuthuka.

The SAICE president for 2008, Johan de Koker, delivered an address on the importance of professional development for young civil engineers through SAICE membership.

Forty students who took time off their exams to attend the function had their afternoon well spent. They networked with sponsors and university lecturers, and were also inspired by young practising civil engineers Jabulile Sibanyoni and Winston Nxumalo. The cherry on the top was twenty awards for student achievers.

Thanks to Goba, Jones & Wagener, TCTA, Thuthuka and SAICE, who made this function a success!
Gold from straw?

BETTER THAN THAT, gold from dirty dishwater!

Two Grade 7 pupils from Blairgowrie Primary School, Leila Shirley and Amy Grose, received gold medal awards from the SAICE Water Engineering Division for their excellent project entitled ‘Grey Water Disposer’ at the 2007 Expo for Young Scientists.

The judges were impressed by the girls’ approach, which included surveys and interviews with Alexander Township residents, construction of a high-quality practical working prototype from readily available trash, an easily understood manual on its construction and use, experimentation with different soils, and a worksheet to teach children the dangers and potential of grey water. The girls’ clear understanding of the issues was evident from their very competent presentation.

Silver medals went to Matthew Kemp and Devin Kane of St Stithians College for their well-constructed experiment to explore Bernoulli’s Principle.

Don’t despair if your aircraft goes down in an arid desert. Our two bronze medal winners from Prestige College, Obakeng Difero and Phetolo Mabina, have devised a means for you to purify your urine to obtain drinking water …

▶ Amy Grose (left) and Leila Shirley (right) from Blairgowrie Primary School explaining their project.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event and CPD validation number</th>
<th>Presenters/venue</th>
<th>Contact details</th>
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<tr>
<td>14–15 April – Pietermaritzburg</td>
<td>Handling Projects in a Consulting Engineer’s Practice SAICEproj06/00003/08</td>
<td>Wolf Weidemann</td>
<td>Dawn Hermanus <a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
</tr>
<tr>
<td>12–13 May – Cape Town</td>
<td>Business Finances for Built Environmental Professionals SAICEfn06/00004/08</td>
<td>Wolf Weidemann</td>
<td>Dawn Hermanus <a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
</tr>
<tr>
<td>17–18 April – Pietermaritzburg</td>
<td>Stormwater Drainage SAICEtr06/00022/08</td>
<td>Peter Pearce</td>
<td>Dianne <a href="mailto:Sarfusel@acenet.co.za">Sarfusel@acenet.co.za</a></td>
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<tr>
<td>11–16 February – Nelspruit</td>
<td>Project Management and the Law – Practical Guidelines for Management of Engineering and Building Contracts</td>
<td>Tertius du Toit</td>
<td>Carla de Jager <a href="mailto:registration@carlamani.co.za">registration@carlamani.co.za</a></td>
</tr>
<tr>
<td>12–13 May – Cape Town</td>
<td>USEPA SWMM and PCSWMM. NET Stormwater modelling workshops</td>
<td>Bill James</td>
<td><a href="mailto:info@computationalhydraulics.com">info@computationalhydraulics.com</a></td>
</tr>
<tr>
<td>18–19 February – Pretoria</td>
<td>Structural Steel Design to SANS 10162-1:2005 SAICEstr06/00050/09</td>
<td>Greg Parrott</td>
<td>Sharon Mugeri <a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
</tr>
<tr>
<td>20 February – Gauteng</td>
<td>International Conference on Stormwater and Urban Water Systems Modeling</td>
<td>Bill James</td>
<td><a href="mailto:info@computationalhydraulics.com">info@computationalhydraulics.com</a></td>
</tr>
<tr>
<td>19–21 February – Sun City</td>
<td>The Application of the Finite Element Method in Practice SAICEstr06/00018/08</td>
<td>Roland Prukl</td>
<td>Dawn Hermanus <a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
</tr>
<tr>
<td>28–29 February – Gauteng</td>
<td>Technical Report Writing SAICEbus06/00014/08</td>
<td>Les Wiggill</td>
<td>Sharon Mugeri <a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
</tr>
<tr>
<td>4–7 March – Johannesburg</td>
<td>Project Management SAICEbus07/00252/10</td>
<td>Tony Lydall</td>
<td>Sharon Mugeri <a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
</tr>
<tr>
<td>18–22 May – Sun City</td>
<td>WISA 2008: The Confluence of the Water Industry ProvSAICEwat07/00154/08</td>
<td><a href="http://www.wisa.org.za">www.wisa.org.za</a></td>
<td>Melissa Wheel <a href="mailto:wisa@wisa.org.za">wisa@wisa.org.za</a></td>
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<tr>
<td>24–26 November – Cape Town</td>
<td>2nd International Conference on Concrete Repair, Rehabilitation and Retrofitting</td>
<td><a href="http://www.civil.uct.ac.za/iccr">www.civil.uct.ac.za/iccr</a></td>
<td><a href="mailto:iccr@eng.uct.ac.za">iccr@eng.uct.ac.za</a> +27-21-689-7471</td>
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