PROFILE OF SAICE’S 2009 PRESIDENT

Focus on the Joint Civils Division

SAICE-DFC WATER COMPETITION
ON THE COVER

Tony Ritchie Engineering and Ritchie Midgley Consulting Engineers, structural and civil consultants for the new mixed-use Sandton development, Legacy Corner, relied on building information modelling (BIM) technology to meet the development’s aggressive project schedule, taking significant changes in the scope of work in their stride. The BIM solution, Revit Structure from Autodesk, was used in conjunction with a suite of specialised analytical programs from Prokon.

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Civil engineers – custodians of the environment

THE ASCE BODY OF KNOWLEDGE (BOK) is a laudable initiative, currently stimulating new ways of thinking.

During the recent workshop on capacity building of the World Federation of Engineering Organisations, in conjunction with the World Engineering Congress in Brazil, speakers and participants discussed various topics, and one of the speakers used a series of slides to illustrate the world that never was. Together with this he repeated a well-known phrase:

“We are educating engineers today, for projects and a world of tomorrow that has not been invented yet.”

Mind-boggling projects such as the Petronas Towers, the Palm Islands of Dubai and the new tower on the site of the World Trade Centre were shown. To crown it all, he showed a slide depicting the futuristic bubble city of Dubai, a whole city floating in the sky, held aloft by balloons of helium and powered by solar power.

In stark contrast to this, another speaker then said that the greatest challenges of the engineers of the future would be to provide sustainable engineering services to the developing world.

So the question is:

How does one bring together the ethics as manifested in the BOK and the extravagance and almost reckless disregard for the environment and sustainability that these over-the-top prestige projects represent?

What is the role and responsibility of the engineer, if we really subscribe to the BOK principles, when a client comes along with enough money to build (another) prestigious dream, and we know very well it is ‘immoral’ and ‘unethical’ in terms of sustainability?

And what about caring for the under-privileged who will be even further disadvantaged while the ‘developed’ world gobbles up the scarce resources for its excesses?

Matters are even further complicated when one looks at the SAICE Code of Ethics, according to which civil engineering professionals are expected to (amongst others):

- Ensure that systematic reviews are undertaken of all aspects of a project that impact upon the environment, including the justification for the need of the project and economic, social and political factors in order to minimise any adverse effects
- Treat people with dignity and have consideration for the values and cultural sensitivities of all groups within the community who could be affected by their work
- Not allow the serving of a client’s or community’s needs to take precedence over the needs of the wider society
- Seek solutions that are compatible with the principles of sustainable development, particularly those that relate to social development and poverty relief

DIFFICULT CHOICES!
“When I read through the profiles of other people in Civil Engineering magazine I can think of absolutely nothing interesting about myself. I do such mundane things.” This may be 2009 SAICE President Elsabé Kearsley’s self-styled opinion, but once the 45-year old bundle of compacted energy starts recounting some of her choice experiences and observations, her life sounds anything but humdrum.

Swamped by exam papers, Elsabé made time to speak to Lorraine Fourie toward the end of the academic year of the University of Pretoria (UP) where she heads the Department of Civil Engineering.

IT IS ELSABÉ’S 19TH YEAR of tenure at UP where, on top of her duties as head of department, she still does a considerable amount of lecturing. “I am supposed to spend about 20% of my time teaching and a minimum of 20% on research, but I spend much more time in the classroom. I should probably cut down on lecturing, but I love it so much. The students absorb everything you say and you feel as if you can really exert a positive influence and make a difference to their lives.” When it comes to the ‘incredible kick’ she gets out of guiding her students through their projects in the department’s concrete research laboratory, she says, “I really have the perfect job; I get paid to play.”

When Elsabé joined the UP staff in 1990 she was returning to familiar stamping ground. It was where she had graduated, where she had obtained her MEng (Civil) degree, and where her father Prof Archie Rohde was, from 1984 to 1997, head of the Department of Civil Engineering, the position his eldest daughter would later take up.

She vividly remembers her first taste of university life as one of 16 female students among 450 male first-years in the class of 1981: “It was horrific! There were these long benches and the men would occupy both ends and make us walk on the desks while wolf-whistling us to our seats. I used to blush easily, which of course didn’t help my cause. I think that was part of the reason why I went back to the UP: to create an experience for women that is better than what my generation endured and to help change their status in the workplace. You can’t do this by shouting and slamming doors; you’ve got to fight the system by being an example, by being better than anybody else in your job. That is the only way you can be a role model for people.”

DOING WHAT COMES NATURALLY

Her upbringing had not prepared her for the initial ‘shock’ of university life. Together with elder brother Gustav, younger sister Mary-Ann and younger brother Daniel, Elsabé grew up in a
home without professional or gender barriers. “My father always said to us that we could follow any profession of our choice, provided we worked hard and showed that we were good at what we were doing. We were also the only household I knew of at that stage where the children had household chores to do. These rotated weekly so that all of us had to feed the dogs, lay the table, wash dishes, and clean shoes. There were no separate male and female jobs and to us it was completely natural. I didn’t realise that we grew up in a liberal household; I only learnt when I got to university that for a girl to think she can do engineering was not your usual option.”

The passion and enthusiasm Archie Rohde had for his profession rubbed off on the children. “Maroelana, where we lived, was then on the edge of Pretoria, and on Sunday afternoons he would take us along to where they were building new roads and laying water and sewage pipes, explaining how everything worked,” Elsbé recalls. “Holiday trips by car to Durban took two days because we would stop at railway lines, examine the roof trusses at service stations and, using our feet, measure the distance between telephone poles to help calculate our travelling speed.” No wonder Gustav, Elsbé and Daniel all followed in his footsteps, with Mary-Anne and Elsbé also marrying civil engineers.

What also influenced Elsbé in her choice of career was that she did not want to ‘work with people’. “I saw myself as an introvert sitting at a computer in a design office.” Before she enrolled at university, her father, who was then at Van Wyk & Louw (now Africon), arranged holiday work for her at the company. “He told them to give me the worst jobs they could find. They made me draw road cross sections on graph paper for six weeks and I loved it,” she laughs.

In 1985, after graduating, she started working full-time in the structures section at Van Wyk & Louw. Hardly four months into design work she was asked to consider moving on to a construction site. “They gave me a few sites to choose from and since I had never been to the Eastern Cape I thought I might as well go there.” She went down to Grahamstown where, apart from supervising the construction of several prestressed concrete bridges and in-situ culverts on the national route, she teamed up romantically with co-worker Andrew Kearsley. Hailing from the small town of Abergwaun in Wales, Andrew had come to South Africa in 1982. The couple were married in 1988 shortly before their departure for the UK where Andrew was to pursue his masters studies at Leeds University.

In Leeds, Elsbé took up a position with the firm of White Young Consultants, a small structures specialist company. What she enjoyed most was doing structural design for the renovation and modification of historical buildings in and around Leeds. “Several of those old buildings — and by old I mean hundreds of years — were built of sandstone and were weathering and subsiding because of underground mining activity. The skin of the building would be retained, the structure would be undermined and underpinned, and refurbishing done on the inside,” she explains. Remedial design for various historic bridges in Yorkshire and filter beds at the York sewerage works, as well as the design of, inter alia, reservoirs, settlement tanks and pump chambers for the Yorkshire Water Authority further kept her engrossed.

On their return to South Africa a year later, the couple resumed their careers at Van Wyk & Louw in Pretoria, but Elsbé soon started feeling boxed in. The couple found sharing the same home and working environment not the best of arrangements. “You need an impartial partner at home with whom to discuss problems and thorny issues from the office, which is not possible when you work for the same company,” argues Elsbé. That is why she counsels her female graduates who come back to her for advice after having married engineers from within the same workplace to watch out that a positive situation doesn’t turn negative.

Beginning of 1990 Elsbé accepted a lecturing position at the UP. “I lectured applied mathematics, applying my structural knowledge, to the first-years, and thoroughly enjoyed it,” she says. She was also part of a group who, under the direction of the Chair in Railway Engineering, was researching distress and maintenance of heavy-haul railway lines. “As I became absorbed in the topic I realised that I could just as well write up what I was doing for a masters degree. So that happened almost by default,” Elsbé says. Having studied a range of both structural and non-structural subjects, she obtained a civil honours degree in 1990, which was then followed by the MEng (Civil) in 1992.

In time Elsbé gained valuable insight into her own individuality. To explain she takes a mental step back to her youth: “When I chose civil engineering as a career I always said I wanted to do structures, never ever
construction. But when the opportunity arose, I accepted it and loved it. I came to realise that by having pre-set ideas of a situation you close many doors that would have been interesting to open. So I made a deliberate decision that whatever comes across my way, I would take it. That’s why I don’t plan ahead, which is something I probably shouldn’t say. I take what life throws at me and run with it, and that makes the journey very exciting.”

In the seven years that elapsed between her masters and doctorate she taught every conceivable subject in the department. “I do not like repetition, so every time a staff member left the department and nobody wanted to teach that subject I would say to myself, this could only be interesting, I’ll do it. I’ve added up all the courses I’ve lectured and it’s really a long list,” she chuckles.

SPECIALIST IN CEMENTITIOUS MATERIALS
When Grinaker-LTA – now the Duraset branch of Aveng – was looking for someone to do applied research on the use of their lightweight concrete products, especially foamed concrete, in the controlled closing-up of underground breaches caused by mining activity, Elsabé again was first to put up her hand. In due course she turned her findings into a doctoral thesis and in 1999 a PhD was conferred on her by the University of Leeds. “I did my PhD on the use of large volumes of unclassified fly ash in foamed concrete, and Leeds University was internationally known to have very good concrete materials researchers that were experienced in using high volumes of waste materials as cement extenders,” she says. She was subsequently promoted to associate professor at the UP.

Ten years later Elsabé’s interest in foamed concrete is as keen as ever. She compares blending the aerated mixture to whipping up egg-whites for baking cakes, which happens to be one of her favourite pastimes at home. A current focal point of her research into this technology is its application in the design and production of building materials for affordable housing. The thermal isolation properties of the product are also investigated in view of South Africa’s energy problems. “Until fairly recently we thought South Africa...
had sufficient energy resources, but now we have been forced to conserve. The use of foamed concrete in buildings could, for instance, obviate the use of air-conditioning equipment,” she says.

Elsabé saw the effective use of this technology first-hand in Russia where she had been invited in 2005 to deliver the keynote address at the Poreconcrete Conference in Belgorod, some 700 km south of Moscow. “There they are using foamed concrete in buildings that have to withstand an ambient temperature of about -35°C, without being compelled to build exterior walls of a metre thick and having to use excessive energy to heat the interior.”

A further offshoot of that visit was an arrangement with the University of Belgorod to have two of their doctoral students regularly come out and do their practical work under Elsabé’s leadership at the department’s concrete research laboratory. “We are really pushing the boundaries of the use of concrete, making samples that are 200 MPa strong and as thin as 3 mm,” she says. “In conjunction with the cement industry we are also looking at manufacturing concrete with a smaller carbon footprint. To me foamed concrete fits in perfectly here, because instead of exploiting raw materials we are using waste materials such as pulverized coal fuel ash in the process. To promote the more intelligent use of materials we are now teaching our undergraduates to give serious thought to the material properties in the design of structures and not simply to assume property.”

The department’s research outfit has had two patents registered based on the work carried out there. One that has Elsabé all enthusiastic is an easy to operate combined foam generator and concrete mixer that can be plugged into a wall socket at home, and was designed specifically for use by entrepreneurs in the townships. “You fill a 20 ℓ drum with water, you throw in a bag of cement and a bag of mixed materials, you press a button and out comes 180 ℓ of foamed concrete three minutes later,” she sums it up simplistically. Elsabé and her sponsors were ready to put this concept to use in the housing market but political intervention and corruption made her deliberately withdraw from the project, which she hopes is temporary. “I have no intention of greasing some councillor’s palm; I want the person on the ground to get value for money,” she says bluntly.

Elsabé makes no bones about the fact that she can be very stubborn if the cause merits it. “I laugh at my mother when she says I was a difficult child, the most demanding of the four siblings. In some respects I have changed; I’m not
such a perfectionist as I used to be, but when something is really important to me I won’t budge.”

Her drive and determination in focusing on research projects that really make a difference in the marketplace have made for extremely satisfied industrial partners, some of whom have been sponsoring her research for more than 15 years. “Using hi-tech technology to make a high-quality product as cheaply as possible is my challenge and the focus of my research,” she says emphatically. Recognition for her efforts has come by way of the NRF’s THRP (Technology and Human Resources in Industry Programme) Excellence Award for creating growth, employment and equity.

**NOT AFRAID TO SPEAK OUT**

At home her stubbornness is matched by Andrew’s. “We’re alike in that there are certain issues that are non-negotiable. So we have great fights. I think it is important to be able to disagree – what bothers me in today’s environment is that you should be able to stand up and say I disagree with you. That doesn’t make you my enemy; to me an enemy is someone who stabs you in the back. I think disagreement is essential in a diverse society such as ours.”

She also thinks it essential that South African civil engineers contribute some of their time to foster the profession. “At the university I battle to get external examiners for my final-year subjects because everybody is always too busy. Such an attitude is bound to lead to a lowering of standards and then we are heading for disaster. As an industry we have to take responsibility for ourselves, and part of that is to plough back. You can’t be too busy to volunteer your time for SAICE or ECSA or any other professional organisation; it’s not an option.”

Elsabé herself has had a long-standing involvement with SAICE and ECSA. Apart from filling the SAICE Presidency this year, she is also an ECSA council member until the end of 2009. At SAICE, before taking up the chair of the Editorial Panel of Civil Engineering, she handled the magazine’s financial portfolio and was at one stage forced to make some drastic adjustments. “I believe very strongly that you shouldn’t complain about something if you haven’t tried to fix it. You have to be the change agent, otherwise nothing will ever change. So I see myself as a doer. I come in and I fix difficult situations. But what I do not like is standing on a podium and waving and smiling at people; I’m not your proverbial baby-kisser,” she grins.

With a finger on so many buttons concurrently, Elsabé admits that over-commitment may be her Achilles heel. But she is adamant that living fully in the now is more important than having dreams that might remain unfulfilled and leave you disappointed. She would rather continue to grab every opportunity and run with it as hard as she can and not dwell too much on the future.
Legacy Corner –
the new face of Sandton’s CBD

With an 18-storey curved, glazed front façade, the mixed-use development, Legacy Corner, currently under construction, is tipped to become the new landmark of Sandton’s business hub.

TIMELY PROJECT EXECUTION has, however, been no mean feat with engineers receiving significant scope changes, including the addition of four floors to the building, at an advanced stage of the structural design phase. Productivity enhancing building information modelling (BIM) technology accelerated and coordinated drawing production, enabling engineers to stay on top of the project, keeping it on track for its pre-2010 opening.

Located on the last undeveloped site in the Nelson Mandela Square precinct, the exclusive Legacy Corner development, for Legacy Hotels and Resorts International, comprises the luxury 175-room Da Vinci

Legacy Corner is tipped to become the new landmark of the Sandton hub
(Image: Bentel Associates International)
Hotel, an apartment block, three levels of retail space and four levels of parking.

Joint venture partners, Tony Ritchie Engineering and Ritchie Midgley Consulting Engineers (RMCE), operating from Midrand outside Johannesburg, teamed up as the structural and civil consultants for the project. The team already had projects such as Nelson Mandela Square, the adjoining Michelangelo and Raphael Hotels, the Michelangelo Towers and the Pan Africa Junction in Alexandra to its credit. Architectural design of the project was developed by a team from internationally-renowned Bentel Associates International (BAI), with whom RMCE had collaborated on the 38-storey Michelangelo Towers, which is also a Legacy Hotels and Resorts development.

RCME had introduced the building information modelling (BIM) software, Revit Structure, from Autodesk, to its practice several years earlier, recognising that in the right applications the product could significantly increase production capacity – without increasing human resources. Revit Structure integrates physical and analytical modelling for efficient, accurate and flexible analysis, design and documentation, with parametric change management and bidirectional linking to structural analysis software, and providing for the automatic update of documents.

Having undertaken several smaller projects using Revit Structure, the firm was proficient in its use by the time the Legacy Corner project got under way. The software was used in conjunction with PROKON 3D Frame Analysis, a general finite (FE) analysis package, and a suite of specialised programs from Prokon, enabling the RMCE team to focus on engineering and design, and not on the laborious manual coordination of drawings. Moreover, by easily accommodating and coordinating design changes, the

2 Legacy Corner is scheduled for completion ahead of the 2010 Soccer World Cup (Image: Bentel Associates International)
3 Being able to visualise the building enabled engineers to identify design flaws and select appropriate solutions with confidence, saving the project many hours of reworks (Image: Tony Ritchie Engineering & Ritchie Midgley Consulting Engineers)
4 Structural components of the building were analysed using a suite of programs from Prokon
5 Construction of Legacy Corner, Sandton, in progress
software helped the team to quickly and confidently produce large volumes of construction detail.

Challenges in terms of lateral stability of the structure were compounded by the fact that some of the columns and shear resisting elements were not continuous throughout the structure. Several columns changed shape at some point up the building, while others had to be supported on substantial transfer beams. The structural analysis was further complicated by the column-free downstairs reception foyer. However, the biggest challenge facing the professional team and contractor on the project was the aggressive project schedule, with a pre-2010 Soccer World Cup opening date.

The Tony Ritchie and Ritchie Midgley team was on the back foot from day one of the project. “Not only was Bentel Architects still involved in aspects of design development by the time we had completed our analyses and issued construction drawings for foundations and basement columns, but then the client decided to add four floors to the structure,” says Ritchie Midgley director, Don Midgley.

“Despite being inundated with scope changes and revisions to floor and column layouts at every turn, we had substantially developed the Revit model of the building and so were in a position to accommodate the late changes more accurately and much quicker than would otherwise have been possible, enabling us to meet the architectural requirements and demands for construction detail by the contractor. The facility to re-work our calculations and accurately update drawings in a fraction of the time it would have taken without the intelligence of BIM was a great benefit, and we are more than happy with the performance of Revit Structure.”

Further substantial changes that had to be addressed quickly were revisions to various floor levels and consequent changes to stair layouts, alterations to column positions, changes to lift shaft sizes and positions, as well as the late introduction of aesthetic treatment of the façade, which impacted on slab edges. Again, the Revit model enabled the structural team to easily update the relevant drawings and quickly create new sections through the building, clearly illustrating the revisions for purposes of re-design and detailing, facilitating the speedy issue of updated information to the contractor.
The challenge of the column-free downstairs reception foyer was addressed by hanging the façade of two retail floors from the hotel floor above, the façade of which was suspended over several levels and post-tensioned back to substantial load-transfer elements. The ability to model the structure in Revit Structure so as to visualise the complex building and then to export a model into various PROKON structural analysis packages was of enormous benefit.

“A valuable feature of the Revit Structure/Prokon offering is its ability to isolate a portion out of the overall model and then carry out sub-frame analyses,” says RMCE structural engineer, James Norton. “The analysis of Legacy Corner in tricky areas where columns are not continuous and require load-transfer walls could be extracted. The load-transfer walls, plus the columns above and below the affected zones, could be analysed in greater detail as a sub-element of the building. Then, the re-integration of design changes to the sub-frame back into the original model meant accurate production of construction drawings could be undertaken with confidence.”

The detail design and reinforcement detailing of coffered floor slabs throughout the super-structure were predominantly undertaken using PROKON’s ‘Continuous Beam’ concrete design module, while its pre-stressed concrete design module was extensively used by Tony Ritchie for the design of the parking levels. Again, importation of accurate structural dimensions from the Revit model into the PROKON analysis package ensured that the data used for design and reinforcement detailing was to the correct scale and size, saving time and eliminating the potential for error.

Reinforcement drawings for the basement retaining walls were generated at the click of a button, producing elevations and sections for each wall and then exported from Revit to AutoCAD. Structural design of the basement walls was undertaken using the PROKON ‘Retaining Wall’ module and reinforcement was rapidly detailed using AutoCAD’s structural detailing package.

PROKON’s ‘Continuous Beam’ module was used for both design and detailing of coffer slab ribs and beams and required minor formatting of the resulting bending schedules using the PROKON Padds module. RMCE will be converting to the recently released PROKON AutoPadds module to expedite production of bending schedules in an AutoCAD environment.

Ritchie, who worked closely with the architect throughout the project, says: “The visualisation capability of Revit Structure facilitated early identification of design problems and the geometric constraints of the design. With the facility to reference a 3D building model in conjunction with the architects’ 2D drawings, we were able to contribute solutions to several potential errors. We made a meaningful contribution to the design development as we could visualise the building and select the most appropriate solutions with confidence, saving the project innumerable hours of reworks.”

“Another unforeseen result of using the software was being able to provide the contractor with a viewer that enabled him to interrogate a 3D model of the structure, helping him to visualise the structure he was building and making construction much easier.”

Construction of Legacy Corner, which began in 2007, is scheduled for completion towards the end of 2009.

Richard Smedley-Williams
+27 12 346 2231
richard@prokon.com

A valuable feature of the Revit Structure/Prokon offering is its ability to isolate a portion out of the overall model and then carry out sub-frame analyses.
The Joint Civils Division –
Chairman’s Report 2008

THE AGREEMENT OF cooperation between the Institution of Civil Engineers (ICE) and the South African Institution of Civil Engineering (SAICE), signed on 19 January 2007, lead to the establishment of the Joint Civils Division (JCD) in early 2008.

The agreed functions of the division are to:
- Perform learned society activities
- Perform the normal ICE country representative services
- Arrange ICE-SAICE presidential visits
- Arrange Brunel International Lectures
- Promote and communicate ICE and SAICE publications, programmes, best practices and initiatives
- Provide developing country inputs into ICE initiatives and projects

In the last 12 months the division has:
- Successfully established the website – now used as a communication tool with membership
- Resolved outstanding financial issues and developed the treasury and budgeting function
- Attended and presented the first MEA (Middle East Africa) Civil Engineering Convention in Cairo, Egypt
- Clarified and published the Mutual Exemption Agreement
- Updated the membership list and commenced communication with members
- Become the home of the NEC suite of contracts – including the Panel of NEC Adjudicators
- Arranged and presented well-received lectures in Gauteng, Durban and Cape Town in conjunction with the SAICE branches
- Arranged site visits to Gautrain
- Commenced the Guide to the application to CESMM3 in South Africa (Civil Engineering Standard Method of Measurement – 3rd Edition)

Two areas in which we have specific interest as a division are:
- Life Cycle Costing, which will become the future for project assessment. The JCD would be keen to bring this approach on board
- Procurement best practice

The most recent events have been well attended and considerable interest was expressed in the latest presentation on Target Cost Contracting using the New Engineering Contract.

The year ahead promises to be extremely busy for the division, with the organisation of the Brunel Lecture in April, and preparations for the 2010 ICE-SAICE Middle East Africa Convention in Cape Town. The division also intends to expand the lecture series to include some international speakers and increase the number of site visits.

The year 2009 will see the completion and publication of the first major project, being the CESMM3. This document has been used extensively on construction contracts overseas and much valuable experience has been gained in the application of the document. The guidance notes and modifications made to adapt it for use in South Africa are nearing completion. Publication is anticipated in the first half of 2009.
The internationalisation of the Institution of Civil Engineers

The Institution of Civil Engineers (ICE) has some 81 000 members of all grades, of which 17 800, or roughly 22%, live and work outside the United Kingdom. The vast majority of the international members reside in four strategic regions as indicated in Table 1.

Currently membership in the Asia Pacific Region, which includes Hong Kong, China and India, is growing at more than 6 percent per annum. The Middle East Africa (MEA) region is growing at a similar pace, principally as a result of the construction boom currently being experienced in the United Arab Emirates (UAE) and surrounding environs.

This international growth phenomenon was recognised by the ICE and has in recent years become a focused strategy for the Institution. A focused International Policy Committee (IPC) was established in London with the mandate to serve the growing global membership. One of the key recommendations of IPC was to incorporate representation from international strategic regions onto Council.

In January 2008 the Joint Civils Division of the SAICE and ICE was invited to participate in the first MEA Convention, which was held in Cairo, Egypt. The two-day event was a huge success and forged stronger cooperation between the various country representatives of the MEA region as a whole.

It was decided that an MEA regional representative be elected to Council, and following an international ballot, Mike Lomas was elected to serve a 3-year term of office (2008 -2011). The countries currently participating in the MEA forum include the UAE, Oman, Jordan, Bahrain, Lebanon, Egypt, Mauritius, Tanzania, Zimbabwe and South Africa.

Strategically the country representatives decided to hold regional biennial conventions focused on topics of common interest. The grouping also participates in regular conference calls to discuss matters of regional importance. Closer working relationships will be fostered through mini-summits, the first of which is planned for Dubai in 2009.

We are delighted to have been chosen to host the 2010 Regional Convention in Cape Town. The theme will be Construction Procurement, which is clearly a major challenge currently facing the whole region.

On the local front the Joint Civils Division has seen a marked increase in membership enquiries, including those from international infrastructure development companies currently operating in South Africa.

If we are to successfully continue to implement our mandate of providing a service to the members of both SAICE and ICE, then the divisional structure will need to be expanded in the year ahead to cater for the increased demand.

Table 1 International members

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<tr>
<th>REGION</th>
<th>% OF INTERNATIONAL MEMBERS</th>
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<tbody>
<tr>
<td>Asia Pacific</td>
<td>55%</td>
</tr>
<tr>
<td>Middle East Africa</td>
<td>20%</td>
</tr>
<tr>
<td>Europe (Including the United Kingdom)</td>
<td>16%</td>
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<tr>
<td>The Americas</td>
<td>9%</td>
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ICE Council for 2008 – 2009
ICE Presidential Apprentice Scheme

In 2005 the ICE President, Gordon Masterton, established a President’s Apprentice Scheme for young graduate civil engineers. The objective of the scheme was to enable young civil engineers to gain direct experience of the Presidential role and a better understanding of the workings of the Institution.

The Apprentices have over the last few years been engaged in a range of activities, from work-shadowing the President on various ICE events to working on the preparation of Presidential briefing papers on particular engineering topics and themes.

The experience has proved invaluable for the young engineers involved. To date, the Apprentices have been drawn from the United Kingdom. Provided the necessary finances can be raised, the plan for 2010 is to expand the number of Apprentices to include an additional five international graduates.

Apart from bringing the Apprentices together for workshops, occasional meetings and continuing professional development, they will work through electronic communication to meet the project objectives set for group members.

In early January 2009 the detailed scheme will be announced and the recruitment and selection process will commence. The final selection of Apprentices will be announced late in 2009, ready to commence their period of tenure together with the newly elected ICE President in 2010.

As 22% of ICE’s members reside outside of the UK, the 2010 Apprenticeship Scheme is planned to reflect the changing demographics of the Institution.

Details of the scheme, qualification requirements and application information will be posted on the Joint Civils Division website (www.jointcivils.co.za) as soon as these are available.

To all those young engineers wishing to experience international exposure, we would encourage them to review the website. Look for the Apprentice icon and apply as soon as possible.
News from the JCD secretary’s desk

NEC PANEL OF ADJUDICATORS
During 2008 the Joint Civils Division (JCD) established admission criteria, called for applications and admitted eight persons to this Panel. There has been increasing usage of adjudicators to resolve contract disputes during the past year, and the publication of adjudicators’ contact particulars on the JCD website has facilitated the location and use of accredited adjudicators.

The JCD website offers two different methods for appointment of adjudicators – at contract award, and also at the time when a dispute arises. A list of accredited adjudicators is published on the website, along with the required Contract Data and Z-clauses needed to activate the different options and make reference to the JCD’s NEC Panel of Adjudicators.

Criteria and application forms for admission to the JCD’s NEC Panel of Adjudicators are available on the division’s website (www.jointcivils.co.za).

ICE PROFESSIONAL REVIEW APPLICANTS
During the past year the JCD has received many ad hoc queries from young (and older) engineers wishing to become members of ICE and become eligible to register with ECUK as Chartered Engineer, Incorporated Engineer or Engineering Technician. Whilst we are willing to assist anyone to achieve his/her goal of international recognition, we would like to try and establish a more formal procedure in South Africa for candidates wishing to undertake the Professional Review, or become members of ICE.

Many of the individuals who have approached the JCD are candidates who would like to sit their Professional Review interview with ICE. At the moment these individuals are required to travel to the UK in order to do so, but there is no guarantee that they will be successful, and expenses therefore may have to be incurred again.

The JCD would like to assist individuals by conducting Readiness Assessments in South Africa, in conjunction with ICE, in order to make sure that candidates only travel when they are ready for the Professional Review. If there are sufficient numbers, the JCD may be able to persuade ICE to set up a Professional Review in South Africa. However, this can only work if the numbers warrant it.

In order to facilitate this, the JCD requests that all persons intending to register with ICE in the next few years pass their particulars on to the secretary, Alain Jacquet. This information could then be used to motivate (hopefully!) a delegation from ICE to visit South Africa in order to conduct Professional Review interviews here. If you are in this position, please visit www.jointcivils.co.za and submit your particulars on the form which can be found under Membership, or send an e-mail to secretary@jointcivils.co.za for more information.

SEARCH FOR SUPERVISING CHARTERED ENGINEERS
There are several different routes to registration as a Chartered Engineer and membership of ICE. One of these entails a Career Appraisal which requires a Supervising Chartered Engineer to assess a candidate’s experience and determine whether he/she complies with the minimum required criteria for membership. The JCD would like to establish a list of ICE members who are prepared to undertake this task. Any interested person who is registered as a Chartered Engineer (MICE or FIACE) and who would be prepared to assist in this capacity is invited to send his/her particulars to the JCD secretary (secretary@jointcivils.co.za).
The mission of the Engineering Council UK (ECUK) is:

To maintain internationally recognised standards of competence and commitment for the engineering profession, and to license competent institutions to champion the standards.

The engineering profession in the United Kingdom is regulated by ECUK through 36 engineering institutions (Licensed Members) who are licensed to put suitably qualified members on the ECUK’s Register of Engineers. The Register has three sections: Chartered Engineer, Incorporated Engineer and Engineering Technician. These titles are protected by the Engineering Council’s Royal Charter and may only be used by registrants.

The 36 engineering institutions are increasingly becoming international organisations which happen to have their head office in London. For example, the Institution of Civil Engineers (ICE) has members in 150 countries while the Institution of Structural Engineers has members in 105 countries. It is therefore not surprising that almost 20% of those registered with the ECUK are not UK citizens.

ECUK has a strategy to extend the recognition of those registered with the Council and who are working outside of the UK by reaching mutual recognition agreements with professional bodies and by inclining governmental organisations towards liberalisation of professional recognition and of the provision of engineering services.

In carrying out this strategy ECUK sees the world as being currently divided in two blocks. There are the countries whose education and engineer formation systems are built on a UK/USA model - for example all or most of North America, Asia, Pacific, Africa and China - and then there are the European countries with a Napoleonic/Humboldtian system of education and formation. The UK (and Ireland) bridge these two blocks and actively engage with both systems in order to reconcile differences and enhance mobility.

Within Europe the ECUK is involved in two over-arching professional organisations (ENAE and FEANI) and interacts with the European Commission. Outside Europe the ECUK is involved in the International Engineering Alliance which comprises the Washington Accord, Sydney Accord, Dublin Accord, International Register of Professional Engineers, APEC Engineer Register and International Register of Engineering Technologists.

ICE membership – an international passport to civil engineering

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ICE membership – THE ROUTE TO ECUK REGISTRATION

ICE is a licensed member engineering institution of the ECUK. Provided that their educational qualifications are acceptable to ECUK for the required grade, ICE Members are eligible to register as Chartered Engineers (CEng) or Incorporated Engineers (IEng). Similarly, a Technician Member is eligible to register with the ECUK as an Engineering Technician (EngTech). (ICE members have to pay a once off entrance fee and annual subscription fee to ECUK for these titles, in addition to the ICE fees.)

In contrast, SAICE Members (MSAICE) are required at the time of admission to be professionally registered with a South African statutory council or an international body recognized for this purpose by SAICE’s Council. The Engineering Council of South Africa (ECSA) registers those engaged in civil engineering. (Those engaged in the management of civil engineering projects may alternatively be registered by the South African Council for the Project and Construction Management Professions (SACPCMP)).

Accordingly, ICE membership is the route to registration with the ECUK. Registration with ECSA, SACPCPM or ECUK is the route to membership with SAICE.

An article setting out the equivalency of grades of membership between ICE and SAICE, the benefits of such membership, the details of the mutual exemption agreement and particulars of the grades of membership was published in the March 2008 edition of SAICE’s magazine Civil Engineering (pages 55 to 58) (also see http://www.jointcivils.co.za/Files/Doc/ICE%20SAICE%20Membership%20Feb%202008.pdf).

ROUTES TO ICE MEMBERSHIP

The ICE website (http://www.ice.org.uk/joining/index.asp) contains a wealth of information on membership (see areas on membership downloads and non-UK qualified applicants). Everyone who wants to become a professionally qualified member must satisfy the requirements of the three stages to membership, whether they are UK or non-UK based:

- Stage 1: Educational base
- Stage 2: Initial Professional Development (IPD)
- Stage 3: Professional Review

The criteria for each stage are different depending on which grade of membership is sought. There are also different ways (routes) in which a potential member may complete each stage. There is great flexibility in how these can be achieved and a lack of a formal academic qualification does not necessarily prevent an applicant from applying for membership. As well as being able to qualify into a membership grade directly, it is also possible to progress from one grade of membership to another.

ICE is a global institution and therefore welcomes applicants from all over the world. Qualifying for membership requires the successful achievement of the three aforementioned stages. The standard route for those candidates who possess an accredited qualification is:

- Accredited qualifications
- Training agreement or career appraisal
- Professional Review

An accredited course is one that has been assessed as having satisfied all or part of the required educational base. This includes qualifications accredited within the FEANI Index, Washington, Sydney and Dublin Accords, which provide for the mutual recognition of engineering degree courses between signatory countries. A course search facility is available to confirm if a qualification is accredited (see Figure 1). Candidates who do not have accredited courses may be eligible for Associate Membership (AMICE) or Membership (MICE) without ECUK Registration (CEng or IEng). Alternatively, they may apply for

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Academic Assessment should they wish to attain Chartered Membership and registration with the ECUK.

Candidates who have undertaken academic study outside the UK leading to a non-accredited qualification will need to apply for Academic Assessment (ICE 3120 Academic Assessment Application Form) should they wish to attain chartered membership and registration with the ECUK.

A career appraisal is required if the applicant has not completed an ICE/HKIE Training Scheme and has self-managed his or her training. However, the requirements of the ICE Development Objectives must still be met and verified through this process. (The Career Appraisal (CA) is a means of demonstrating satisfactory completion of IPD by those who have not entered into nor completed a Training Agreement with a company operating a training scheme approved by ICE and are self-managing their own IPD. The CA will identify whether your experience has given you the same basic competencies as someone who has successfully completed their IPD via a training agreement. The appraisal is not intended as an obstacle to qualification but is designed to provide an opportunity for assessment and counselling on how far you have progressed towards the Professional Review.)

An application for a Career Appraisal (ICE 3126) must be accompanied by the following supporting documents:
- A copy of academic qualifications
- A detailed CV
- A copy of the Core (ICE 2011B) or Development Objectives (ICE 3005) and, if applicable, any Specific Objectives which ideally show your mentor’s assessment of the progressive levels and dates of achievement (self-certification is acceptable but obviously has less credibility)
- An Experience Report of not more than 2 000 words in length, cross-referenced to the Objectives, which must include a brief indication of your proposed route onwards to the Professional Review
- Documents produced during the normal course of your work as evidence that you have met the Core/Development and any Specific Objectives (these need to be selected with care as they must be relevant and referenced to the Report)
- A photocopy of your Development Action Plan (DAP) and Personal Development Record (PDR) (ICE 3006) The outcome of the Career Appraisal is an indication of satisfactory progression to the next stage, or advice on any further study or training required.

The Professional Review is the final stage in becoming a Professionally Qualified Member. Graduates who have completed an ICE approved training scheme, or candidates who have successfully undertaken a Career Appraisal may apply for the Professional Review at the level appropriate to their grade of membership.

ICE is an international organisation and, as such, strives to accommodate applicants from all over the world. There is an established Professional Review Centre in Hong Kong. Depending on candidate numbers Professional Reviews can also be arranged in China, the UAE, Brunei, New Zealand and India. It is possible to sit your Professional Review in South Africa, depending upon the numbers requiring an interview. Arrangements should be made with the JCD secretary at:
secretary@jointcivils.co.za

**ROUTE TO ICE MEMBERSHIP FOR SAICE MEMBERS**

Corporate SAICE members who are registered as professional engineers with ECSA may become members of ICE through the current Mutual Exemption Agreement (MEA) between ICE, ECSA and SAICE.

Applications for membership via the MEA route are considered by ICE’s Exemption and Recognition Panel which meets four times a year. The review is conducted as a desktop exercise, but some applicants may be invited to attend an interview.

Candidates perusing this route to membership need:
- To hold an academic qualification covered by the Washington Accord or listed on the FEANI register (if the applicant’s qualifications are not accredited, the applicant needs to apply for an Academic Assessment to assess them prior to the application being submitted)
- To be a full corporate member of SAICE and have gained registration as a Professional Engineer via ECSA’s standard review route

The application needs to be accompanied by:
- A Membership Application Form (ICE 3105)
- Three Sponsors’ Questionnaires (ICE 3123). (At least one sponsor must be a Chartered ICE member. The other members may be ICE Chartered Members or SAICE members who are Professional Engineers)
- The administration fee
- A detailed CV – please include descriptions of the projects on which you have worked, including size, cost and positions of responsibility, as well as key achievements
- Copy of your Professional Development Record and Development Action Plan
- Copy of SAICE Membership certificate and ECSA Registration
- Copy of Degree Certificate (if you are not already a Graduate member of ICE)

**APPLICATIONS FOR ICE PROFESSIONAL REVIEW**

Candidates wishing to undertaking the ICE Professional Review in the next year or two should contact the secretary of the JCD (secretary@jointcivils.co.za) and place their names on a list. Should South Africa have sufficient candidates, the JCD will arrange to have the interviews done in South Africa, saving time and money.

**NOTE**

1. ENAEE: European Network for Accreditation of Engineering Education

FEANI: Fédération Européene d’Associations Nationales d’Ingénieurs

Course search facility on website
(Note website address is: https://wam.ice.org.uk/accredited_course_search/step_1.asp)
Update on the CESMM3

The Joint Civils Division (JCD) reviewed the whole question of measurement and payment when using SANS 1921 and SANS 2001 during 2007. The Division came to the conclusion that the logical approach 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 made no sense to revert back to CEQ73 or to update CEQ73. As a result, the Division proposed that the system currently used in the UK and elsewhere in the world be adopted, i.e. the CESMM3.

The Division embarked upon the development of a guide to the application of the third edition of the Civil Engineering Standard System of Measurement (CESMM3) in southern Africa to:

- 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

The intention of this was not to replace CESMM3 or to provide a handbook on the subject. This document will merely serve as a guide to the application of CESMM3 in the South African context to facilitate the adoption of CESMM3.

The Division appointed Peter Becker, who had been responsible for preparing SAICE’s Civil engineering quantities 1990, to develop this guide. A meeting was held in August 2008 with industry experts from SAICE, SAFEC, SAISC and CIDB to review the first draft and the progress made to date.

At the first meeting of the expert panel held on 14 August 2008, it became apparent that a number of amendments will be required to amend references to British Standards and the ICE Conditions of Contract 6th Edition and to tailor CESMM3 for southern African conditions. It was also thought that it might be necessary to introduce additional classes of works to address certain dynamics within the South African industry.

The expert group explored two options for accommodating the amendments and additions – list them in the Division’s proposed guidance document, or bring out a southern African edition of CESMM3. The expert group favoured the latter.

ICE was approached by Ron Watermeyer and Peter Becker in October 2008 with a view to bringing out a southern African edition of CESMM3. It was proposed that the southern African edition would maintain the same look and feel and formatting and style as the UK one, but would replace the text requiring amendment with text that is suitable for use in southern Africa. The new classes of work would also be included. No guidance would be included, as guidance is the subject of another publication. ICE welcomed this proposal.

The issue of whether or not the method of measuring roads needs to be revisited has arisen. It was agreed that a draft SANS 2001 would be prepared and considered early in 2009 to assist in the deliberations as to how earthworks are to be measured.

The southern African version of CESMM3 and the application documents will be completed and published in 2009.
International standards for construction procurement

BACKGROUND
A proposal was submitted by the South African Bureau of Standards (SABS) to the International Organisation for Standardisation’s (ISO) Technical Committee for Building Construction (TC 59) during 2005 to develop a series of international standards to address within the construction sector:

- Procurement procedures and methods
- Formatting and compilation of procurement documents
- Standard conditions of tender
- Targeting of enterprises and labour within contracts

This proposal suggested that the standardisation of construction procurement procedures, processes and methods was fundamental to infrastructure development in developing countries. This view was informed by recent forecasts for the demand for new infrastructure which indicated that about 80% of the world’s new infrastructure in the next 15 to 20 years will be constructed in developing countries. A standardised rule-based system was seen to address many of the constraints to development facing developing countries, improve governance and reduce poverty in support of their Millennium Development Goal commitments.

The development of the proposed series of standards for construction procurement was supported by the Institution of Civil Engineers, the Institution of Structural Engineers, the South African Institution of Civil Engineering, the South African Construction Industry Development Board, and the Africa Engineers Forum comprising some 14 African member institutions.

The TC 59 Chairman’s Advisory Group (AG) reviewed the proposal at a meeting in Oslo in 2006 and communicated the following to the members of TC 59:

“Iso TC 59/AG, having received and studied a proposal from South Africa for developing international standards to cover construction procurement processes, methods and procedures, recognises that there is a need for standardisation in this field, finds such standards to be especially relevant for developing countries that lack experience and instruments in this field, and further recognises the potential for improving international trade that will be useful also for international organisations. Such standards can be helpful to achieve fair competition, reduce possibilities for abuse and improve predictability in procurement outcomes.”

SCOPE OF THE 8-PART SERIES OF CONSTRUCTION PROCUREMENT STANDARDS
The project proposer developed the 8-part series of standards during 2007, covering various aspects of construction procurement as set out in Table 1.

The content of these parts was based on:

- South African National Standards (SANS 294, SANS 1914, SANS 10396 and 10403)
- CIDB Standard for Uniformity in Construction Procurement
- Various CIDB informal practice notes

PROGRESS TO DATE
TC 59 Building Construction is the ISO technical committee for standardisation in the field of building and civil engineering. There are currently 32 countries actively participating in the work of this technical committee and another 32 countries that are observer members who have a right to comment on the work of the TC.

Eight parts were circulated to the member countries for adoption as work items. All eight parts were accepted and the series of standards was designated as ISO 10845, Construction Procurement. Work could, however, only commence on part 1 as, in terms of ISO rules, a minimum of five countries must agree to nominate experts to take the work forward. Experts from Australia, Japan, Norway, South Africa and the USA commenced work on Part 1 in London during November 2007. Work commenced on the other seven parts in Istanbul in May 2008 after experts had been nominated by the UK and Zimbabwe to join experts from Australia, Norway, South Africa and the USA.

All eight parts were circulated to member countries for approval as enquiry drafts (DIS) during 2008. The required majority of votes were obtained in all instances. All eight parts therefore currently enjoy Committee Draft (CD) status.

THE NEXT STEPS TO COMPLETION
All eight parts will be issued separately as enquiry drafts (DIS) during 2009. Member countries will be given five months to vote on the draft (positive, negative, or abstention). If no negative votes are received, the standards proceed to publication. (Abstentions are excluded when the votes are counted, as well as negative votes not accompanied by technical reasons.)

If the majority of those voting are in favour of the document, the
Table 1: Content of the various parts of ISO 10845, Construction Procurement

<table>
<thead>
<tr>
<th>Part</th>
<th>Title</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Processes, methods and procedures</td>
<td>This part describes generic procurement processes around which an organisation may develop its procurement system. It establishes basic requirements for the conduct of an organisation’s employees, agents, board members and office bearers when engaging in procurement. It establishes the framework for the development of an organisation’s procurement policy, including any secondary procurement policy. It establishes generic methods and procedures for procurements, including those pertaining to disposals.</td>
</tr>
<tr>
<td>2</td>
<td>Formatting and compilation of procurement documentation</td>
<td>This part establishes, in respect of supply, services and engineering and construction works contracts, at both main and subcontract level: a uniform format for the compilation of 1) calls for expressions of interest 2) tender and contract documents and the general principles for compiling procurement documents.</td>
</tr>
<tr>
<td>3</td>
<td>Standard conditions of tender</td>
<td>This part sets out standard conditions of tender which bind the employer and tenderer to behave in a particular manner. It establishes what a tenderer is required to do in order to submit a compliant tender. It makes known to tenderers the criteria by which the tenderer will be evaluated. It establishes the manner in which the employer will conduct the process of offer and acceptance and provide the necessary feedback to tenderers on the outcomes of the process.</td>
</tr>
<tr>
<td>4</td>
<td>Standard conditions for the calling for expressions of interest</td>
<td>This part sets out standard conditions for the calling for expressions of interest which bind the employer and respondent to behave in a particular manner. It establishes what is required for a respondent to submit a compliant submission. It makes known to respondents the criteria by which the respondents will be evaluated. It establishes the manner in which the employer will conduct the process of calling for expressions of interest.</td>
</tr>
<tr>
<td>5</td>
<td>Participation of targeted enterprises</td>
<td>This part establishes a key performance indicator, in the form of a contract participation goal, relating to the engagement of targeted enterprises on a contract for the provision of goods, services or engineering and construction works.</td>
</tr>
<tr>
<td>6</td>
<td>Participation of targeted partners in joint ventures in contracts</td>
<td>This part establishes a key performance indicator, in the form of a contract participation goal, relating to the engagement of targeted partners in a joint venture on a contract for the provision of goods, services or engineering and construction works.</td>
</tr>
<tr>
<td>7</td>
<td>Participation of local enterprises and labour in contracts</td>
<td>This part establishes a key performance indicator in the form of a contract participation goal relating to the engagement of local enterprises and labour on a contract for the provision of services or engineering and construction works.</td>
</tr>
<tr>
<td>8</td>
<td>Participation of targeted labour in contracts</td>
<td>This part establishes a key performance indicator, in the form of a contract participation goal, relating to the engagement of targeted labour on a contract for the provision of services or engineering and construction works.</td>
</tr>
</tbody>
</table>
IPSA award for the CIDB

THE INSTITUTE OF PURCHASING South Africa (IPSA), an affiliate of the Chartered Institute of Purchasing Supply (UK), held its first Pan Africa Procurement Awards in May 2008. The CIDB (Construction Industry Development Board) entered the Best Process Improvement category which focuses on how purchasing or supply management processes have been upgraded or changed, and how superior results have flowed as a result of adopting them.

The CIDB’s entry on Standardising Construction Procurement Processes, Procedures and Methods in South Africa profiled the CIDB Standard for Uniformity in Construction Procurement and the CIDB Construction Procurement Toolbox as published on its website. This entry caught the judges’ eye and received the Best Process Improvement Award. Inba Thumbiran accepted the award on behalf of the Procurement and Delivery Management Programme at the awards banquet at Emperor’s Place on 19 May 2008.

The Construction Industry Development Board Act, 2000, makes it mandatory for the public sector to apply the Standard for Uniformity in Construction Procurement in procurement relating to the construction industry. This standard was successively rolled out between October 2004 and March 2006 to all organs of state and has been updated at regular intervals following comments and feedback received from industry stakeholders and users.

A comprehensive toolbox is available on the website to assist users in the application of the standard (see www.cidb.org.za/CIDB_Toolbox_Website/home.htm). This toolbox contains an overview of the legislative framework for procurement and downloadable copies of all the regulations and board notices issued in terms of the CIDB Act, Construction Procurement Best Practice Guidelines, Inform Practice Notes, CIDB standard specifications and forms of contracts, guidance notes, information notes and MS Word templates of component documents used in calls for expressions of interest, tender documents and contract documents.

The toolbox is constantly being expanded to address emerging needs, clarify issues and to improve the performance and outputs of those engaged in various aspects of procurement.

The CIDB has delivered a uniform and standardised procurement system for the construction industry in partnership with the industry within a relatively short space of time. The processes, procedures and methods not only satisfy requirements of public sector supply chain management regulations, but also the needs of the private sector. It is sufficiently flexible to be used by organs of state ranging from district municipalities to major state-owned enterprises such as Transnet, and for procurements ranging from contracts having a value of less than R200 000 to the stadia for the 2010 Soccer World Cup.

The Joint Civils Division congratulates the CIDB on this achievement!
HOWARD SHIPLEE, director of construction of the UK Olympic Delivery Authority (ODA), revealed [in April 2008] how the full NEC3 suite of contracts are being used to deliver facilities for the £9.3 billion London 2012 Olympic and Paralympic Games. Shiplee said the NEC3 suite had been chosen both for its flexibility and for its emphasis on trust and collaboration.

“NEC3 contracts provide opportunities for proactive project management, project discipline, early warning procedures and fair risk allocation. NEC3 is also recommended by the Office of Government Commerce and National Audit Office and is supported by our delivery partner.”

Shiplee confirmed that the Engineering and Construction Contract (ECC) option C (target contract with activity schedule) would be the most widely used NEC3 variant. “It incentivises the contractor via a gainshare / painshare mechanism and the employer and contractor share the risks.”

ECC is being used for the main Olympic stadium at Stratford, the nearby aquatics centre, utilities, structures, bridges and highways. In addition the ECC Subcontract is expected to be used by all tier 1 suppliers for their major subcontractors.

ODA is also using the NEC3 Professional Services Contract (PSC) to retain its delivery partner CLM – a consortium made up from CH2M Hill, Laing O’Rourke and Mace – as well as for supervisor appointments and venue design teams.

The NEC3 Term Service Contract (TSC) is being used for the logistics centres, Olympic Park bussing, the delivery management information technology system and security. Independent technical review appointments are being made under the NEC3 Framework Contract (FC).

ODA has also established a unique independent dispute avoidance panel for the project. Chaired by original NEC author Martin Barnes, the panel consists of eleven construction industry experts and is designed to identify and resolve potential problems before they become contractual disputes. According to Shiplee, “The panel will be called to act by either project executives from ODA or contractors and there is consensual acceptance of the panel’s decision.”

Note
Reproduced with kind permission from the NEC Users’ Group Newsletter, Issue 43 July 2008.
A COMMON QUESTION I am asked by new NEC3 users is, “How much resource is required to effectively manage an NEC3 contract compared to, say, a JCT form?” The answer depends on to what extent the parties intend to follow the contract’s requirements.

This article concerns the NEC3 Engineering and Construction Contract (eCC), which is the main contract form within the NEC3 suite and is designed to be used by an employer to engage a ‘main’ contractor.

Overview of requirements
ECC is intended to be more than a set of terms and conditions reflecting the commercial bargain and legal arrangements between parties – it is also intended to form management procedures.

Most construction contract forms are often signed and left in the bottom drawer, only to be brought out when things go wrong to allocate blame and associated costs. The eCC adopts a fundamentally different approach that encourages the parties to identify proactively and share openly problems and risks as soon as either party encounters one. They are then required to work together in a ‘spirit of mutual trust’ to solve the problem and agree on a way forward.

Management of time
ECC quite rightly recognises the importance of the programme in construction and makes it a cornerstone of the contract. Under ECC, the dates within the programme have contractual significance. The programme needs to be updated regularly, normally monthly, and must reflect the actual status of the project including all time-impacted events. The contract contains extensive and, some say, onerous requirements in respect of programmes that go substantially beyond most traditional contract forms. If you were to comply fully with the contract you would have extensive, ‘best practice’ programming on your project.

Early warnings
ECC contains an early-warning mechanism, which requires either party to inform the other of any issue that is affecting, or may affect, time, cost or quality. The notification is then followed by a meeting at which the parties cooperate to solve the problem and agree on a way forward.

Proactive and timely agreement of change
ECC requires all changes to time and cost, consequent upon compensation events occurring (eCC terminology for variations), to be assessed contemporaneously with the events arising and preferably before change is instructed. The intention is to enable the parties to manage risk successfully and give the employer greater choice and control over change management, together with greater time and cost certainty.

If the contractual mechanism is fully implemented, the effect of all changes should have been agreed prior to, or within weeks of, the completion date, allowing the final account value to be determined contemporaneously with completion. Therefore, the all-too-common situation of a final account settlement being negotiated months or even years after the completion date is avoided, together with the attendant costs. The savings can then be used to offset the increased management costs during construction.

It is expected that if the administrative requirements of the ECC are complied with, then the level of disputes and claims under ECC contracts should be lower than other contract forms.

To date, there is only anecdotal evidence that the ECC has been successful in reducing the number of claims and disputes, at least in relation to formal litigation. However, it is difficult to get comprehensive statistics on the number of disputes being settled through negotiation or adjudication.

Resource requirements
Contract compliance requires the commitment of all parties, particularly regarding the level of resources required, and this is particularly true of the employer’s team. Therefore, the costs to manage an ECC project will be more than those required for a JCT contract of similar size and complexity, for instance. So why would you use it?

The overriding logic is that by increasing resources during construction, problems and issues can be dealt with as and when they occur at a time when the outcome can still be influenced. This should assist in getting the project built to time and budget and should reduce uncertainty for all parties.

Compliance with the contractual procedures should also create an excellent set of records of what actually happened on the project, instructions given, regularly updated programmes, and so on. Therefore, if claims or disputes are raised later, both parties will have access to these records and this should enable simple agreement of any dispute.

Administration versus management
It would seem that if you simply compare the actions of the project manager under ECC to the contract administrator under JCT, it would be relatively easy to determine the additional activities required under ECC. However, a major factor to consider when trying to determine the additional level of resource required is the contract administration requirements compared to those for contract management.

For example, activities such as the submission, review and agreement of programme will almost certainly take place on every well-managed construction project.
Therefore, the costs of this process should be allowed for under any contract form whether explicitly stated or not.

**Cost versus benefits**

ECC might at times be described as aspirational in what it sets out to achieve. It promotes best practice in contract administration through its extensive and involved contractual procedures. Unfortunately, in my experience, it is rarely if ever administered fully in accordance with the contractual provisions and so best practice is not automatically delivered.

That is not to say that people do not follow or try to operate the contract, but the reality is that full compliance is extremely difficult and, therefore, some element of pragmatism tends to be allowed. This pragmatic approach tends to occur by default with the parties informally agreeing to set aside parts of the contract post-contract. This of course creates a risk that, if at some later stage the parties fall out, one of them may try to revert to strict compliance and use the other’s failings to their advantage. If the parties do wish to simplify some of the contractual procedures, this should be done by formal amendment at the pre-contract stage.

It is difficult to argue against the philosophy behind ECC’s administrative requirements or of its aspirations of best-practice project management. However, compliance with the contract comes at a price. If the parties want to get full benefit from the contractual procedures, they will need to invest the resources and therefore the cost to achieve this.

The result is that, where the parties fail to invest the resources and cost in administering ECC contracts correctly, the benefits of the contract offers are reduced proportionally to the effort expended.

It seems clear to me then that full compliance with ECC contract administration requirements will require a higher level of resource than most other standard forms of contract. However, these additional contract administration requirements are there to promote effective contract management and best practice. Therefore, the majority of these activities and their associated costs should be expended, regardless of the contract form being used, if you wish to instigate effective contract management on your projects.

Thus there is an argument that the issue is not about contract form but about how the parties wish to manage their project. Do they want to ‘do the minimum’ and undertake the most basic of contract administration and management functions, or do they want to implement management processes to manage the project proactively and achieve best practice?

The issue ultimately comes down to a simple cost versus benefit analysis. Full compliance with the ECC will come with a cost as would adopting best-practice management procedures under any contract. The parties, and particularly the employer who will ultimately carry the costs, need to decide whether the benefits that can be delivered outweigh the costs involved. The choice is yours.

**Note**

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Getting to grips with the NEC3 ECC target contract with activity schedule

INTRODUCTION
ISO 6707-2, Building and civil engineering – Vocabulary – Part 2: Contract terms, defines a target cost contract as a cost reimbursement contract in which a preliminary target cost is estimated and on completion of the work the difference between the target cost and the actual cost is apportioned between the client and the contractor on an agreed basis.

A target contract is accordingly a contract in which the financial risks are shared by the employer and the contractor in agreed proportions.

In a target contract, the employer and the contractor need to agree on:
- The target
- How to pay the contractor for work done
- How to adjust the target to compensate the contractor for changes in the scope and timing of the works, the failure by the employer to act timeously in accordance with the provisions of the contract, encountering physical conditions which are considered unlikely to have been foreseen, price inflation, etc
- How to incentivise the contractor to propose changes to the scope which result in financial savings
- How to share any savings or overruns

Figure 1 illustrates the NEC3 Engineering and Construction Contract (ECC) target cost concept. A target price is agreed between the employer and the contractor to control productivity. The initial target price is adjusted for compensation events, except those associated with scope changes proposed by the contractor, throughout the contract to arrive at a final “cost” to keep the target equitable. The contractor is paid his costs, profit and overheads on a monthly basis as the work proceeds.

The difference between the “final cost” and the amount paid to the contractor when the work is completed is shared between the employer and contractor in agreed proportions.

The NEC3 ECC is the only standard form of contract endorsed for use in South Africa by the Construction Industry Development Board that has standard provisions for a target contract.

THE NEC APPROACH TO CONSTRUCTION WORKS

The NEC3 family of standard contracts is an integrated and multidiscipline set of contracts for engineering and construction projects. The family includes contracts for engineering and construction works, professional services, term services contracts and supplies. The family also includes back to back sub-contracts for engineering and construction works.

The NEC3 contracts are designed to encourage collaboration and teamwork. They provide effective control of change, speedy agreement of time, quality and cost impacts of change, improved early forecasting of end costs, greater accuracy of end date forecasts, early warning of risks and potential change and quick dispute resolution mechanisms.

The key processes and procedures associated with the NEC typically relate to:
- Risk management (risk register)

Figure 1: Target contract concept
Contractor and Project Manager give an early warning to each other as soon as either becomes aware of a matter that could:

- increase the total of Prices
- delay Completion
- delay meeting a Key Date
- impair the performance of the works in use

Those attending a risk reduction meeting co-operate in:

- making and considering proposals on how to avoid or reduce registered risks
- deciding on the actions to be taken in terms of the contract
- deciding which risks can be removed from the register

Project Manager enters early warning matters in the risk register

Contractor notifies Project Manager of an event that has happened or is about to happen within eight weeks, failing which he is not entitled to a change in the total of Prices, the Completion Date or a Key Date

Project Manager decides the notified event:

- arises from a fault of the Contractor
- has not happened and is not expected to happen
- has no effect of Defined Cost, Completion or meeting a Key Date
- is not a compensation event provided for in the contract

Contractor submits, within 3 weeks of being instructed, his proposed quotations to the Project Manager which proposes changes to the total of Prices, the Completion Dates and Key Dates as assessed by the Contractor as well as any proposed changes to the Accepted Programme

The NEC ECC3 contract makes an event notified to the Project Manager a compensation event if the Project Manager fails to make a decision. Likewise, a quotation is accepted should the Project Manager fail to make a decision on a quotation within the time period stated in the contract.

Any dispute arising from the abovementioned process is submitted to and settled by an adjudicator. Disputes may be submitted to an adjudicator not more than eight weeks after the party becomes aware of the action that triggers a dispute. The adjudicator provides his decision within eight weeks of receiving the first submission.
compensation event that caused the delay or expense.

NEC3 TARGET CONTRACT OPTION
Establishing the target price

The NEC3 ECC has two options for establishing the target price (total of prices) using either an activity schedule (Option C) or a bill of quantities (Option D). Both these methods allow the contractor to build up a price for the works, based on estimates for performing the work which may also include risk pricing. Activity schedules and bills of quantities are vehicles for creating the target and are also the breakdown of the contractor’s tender to provide the basis for tender comparisons and tender assessments.

In the activity schedule option (Option C), the target price is the sum of lump sum prices for each of the activities on the activity schedule unless changed in accordance with the contract. The contractor is required to provide information which shows how each activity on the activity schedule relates to operations on the programme. This allows the project team (employer, contractor and project manager) to monitor the works in relation to the forecasted costs in the activity schedule with payments made in terms of the contract.

In the bill of quantities option (Option D), the target price is the sum of the lump sums and amounts obtained by multiplying the rates by the quantities for the items in the bill of quantities. In terms of this option, a difference between the final total quantity of work done and the quantities stated for an item in the bill of quantities is a compensation event if the differences do not arise from scope changes, the difference causes defined cost per unit of quantity to change, and the rate in the bill of quantities for the item multiplied by the final total quantity for work done is more than 0.5% of the total of prices at the contract date. Accordingly, the exact target prices are not known until the final total quantity of work done has been established and the compensation events associated with changes in quantities, if any, are resolved. Furthermore, the quantities are not directly related to activities on the programme, which makes it very difficult for the project team to monitor forecasted costs with payment made in terms of the contract.

The main difference between options C and D lies in the risk of errors in the pricing documents. Option D is seldom used and will not be discussed any further in this article.

Assessing cost in terms of the contract

Defined cost is:

- The amount of payments due to subcontractors for work which is subcontracted without taking account of amounts deducted for items such as retention and delay damages
- The cost of components in the Schedule of Cost Components for other work, less disallowed cost

Disallowed cost are costs which are not justified by the contractor’s records and accounts, should not have been paid to subcontractors or suppliers, or occurred because the contractor failed to follow a procedure provided for in the contract or failed to give an early warning, and the cost of correction of defects after completion or those resulting from the contractor’s failure to comply with a constraint on how to provide the works, resources not used to provide the works, and the preparation for an adjudication or tribunal. The correcting of defects, other than those relating to the failure to adhere to a prescribed method of working, prior to the completion of the works, is not a disallowed cost.

Defined cost is calculated using rates and percentages stated in the contract data and other amounts at open market or competitively tendered prices with deductions for discounts, rebates and taxes which can be recovered.

Defined cost is used to:

- Assess the value of compensation events (variations)
- Calculate the cost of the entire works for the purpose of assessing the payment due to the contractor
- Calculate the gain or pain share

Schedule of cost components

The Schedule of Cost Components (SCC) is the tool for calculating defined cost. It identifies the cost elements for:

- Non-subcontracted work within the working area (i.e. the areas or land comprising the site which are made available for use by the employer together with additional areas proposed by the contractor such as borrow pits and dedicated batch plant sites) for which the contractor will be reimbursed
- Assessing any changes in target price

Defined cost is calculated using rates and percentages stated in the contract data and other amounts at open market or competitively tendered prices with deductions for discounts, rebates and taxes which can be recovered.
It facilitates the forecasting of cost as it allows the “build up” of costs to be developed in a transparent manner. It interacts with parameters relating to percentages, amounts and rates provided in the contract data.

Despite its name, the SCC is not a schedule of costs – it is merely a detailed list of items of cost broken down into the following sections:

1. People (people who are directly or indirectly employed by or are paid by the contractor and who work in the working areas)
2. Equipment (items provided by the contractor and used by him to provide the works and which the work information does not require him to include in the works, including consumables such as fuels, lubricants, shuttering materials, welding rods, etc)
3. Plant and materials (items intended to be included in the works less credits for disposals unless costs are disallowed)
4. Charges (payments for water, gas, electricity and public authorities in relation to the works, payment for cancellation charges relating to a compensation event, charges for consumables and equipment provided for the project manager’s and supervisor’s offices, as well as an overhead charge incurred within the working area to allow for cost recovery on items such as telephones, copying, sanitation facilities, catering, medical facilities, equipment, supplies and services for the contractor’s offices and workshops, survey equipment, testing equipment, computers, hand tools other than those powered by compressed air, etc. applied to the cost of the people component)
5. Manufacturing and fabrication (items which are manufactured and fabricated outside of the working areas based on hourly rates and overhead costs to cover the costs of supervisors if not included in the hourly rates, rent, etc.) outside of the working areas
6. Design costs (hourly rates and overheads to cover the cost of the use of computers and software packages, office rental, phones, etc.) outside of the working areas

Table 1 Differences between the Schedule of Cost Components and the Shorter Schedule of Cost Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Schedule of Cost Components (SCC)</th>
<th>Shorter Schedule of Cost Components (SSCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 People</td>
<td>Amounts paid cover all the specific items listed in the full SCC. The contractor only justifies the amounts paid for people to simplify matters</td>
<td></td>
</tr>
<tr>
<td>2 Equipment</td>
<td>Equipment rates based on open market rates, rental rates or rates in contract data</td>
<td>Equipment rates based on percentage adjustment of listed prices or rates in contract data. Open market rates applied to items not covered by lists or contract data</td>
</tr>
<tr>
<td>3 Plant and Materials</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>4 Charges</td>
<td>Separate payment for charges other than overhead costs incurred within working areas relating to the provision and use of equipment, supplies and services</td>
<td>Separate payment only for cancellation charges relating to a compensation event, payment to public authorities, and charges for consumables and equipment provided for the project manager’s and supervisor’s offices. All other charges are included in the people percentage overheads</td>
</tr>
<tr>
<td>5 Manufacture and fabrication</td>
<td>Hourly rates multiplied by hours worked plus a percentage for overheads</td>
<td>Amount paid by contractor (cost)</td>
</tr>
<tr>
<td>6 Design</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>7 Insurance</td>
<td>No difference</td>
<td>No difference</td>
</tr>
</tbody>
</table>

Table 2 Prices for work done to date

<table>
<thead>
<tr>
<th>Component</th>
<th>Total for component</th>
<th>Amount (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 People</td>
<td>total A</td>
<td>R</td>
</tr>
<tr>
<td>2 Equipment</td>
<td>total B</td>
<td>R</td>
</tr>
<tr>
<td>3 Plant and Materials</td>
<td>total C</td>
<td>R</td>
</tr>
<tr>
<td>4 Charges (including charge calculated by multiplying the total people costs by the percentage for working area overheads)</td>
<td>total D</td>
<td>R</td>
</tr>
<tr>
<td>5 Manufacture and fabrication</td>
<td>total E</td>
<td>R</td>
</tr>
<tr>
<td>6 Design</td>
<td>total F</td>
<td>R</td>
</tr>
<tr>
<td>Total for schedule of cost components</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>Less cost of events for which the contractor is required to insure and costs paid to the contractor by the insurers</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Less Disallowed cost</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Defined cost of other work</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Defined cost of subcontract work</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Total defined cost (Defined cost of other work + defined cost of subcontracted work)</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>
the working areas

7 Insurance (deduction of costs of insured events and costs paid to the contractor by the insurers)
Whatever is not in the Schedule of Cost Components is treated as being included in the fee. Accordingly, profit, head office charges and overheads, finance charges, the cost of performance bonds, insurance premiums, head office staff, superintendence on subcontractors, etc, as relevant, are included in the fee. The fee must:

- Exclude the overheads which are recovered under the manufacture and fabrication and design components outside of the working area.
- Conversely, the overheads for these items must not include the contractor’s overheads and profit.
- Include the cost of people who are directly employed by the contractor in providing the works, whose normal place of work is outside of the working areas and are not included in the manufacture and fabrication and design components of the SCC, e.g. contracts director and staff who would not form part of the working areas daily labour records.

The ECC provides for two different fees – a direct fee percentage which is applied to own work and a subcontract fee percentage which is applied to subcontracted work.

The principle underpinning the schedule is that an amount may be included only in one cost component and only if it is incurred in order to provide the works.

It may be appropriate in some contracts to amend the items in the SCC to accommodate specific requirements.

Shorter Schedule of Cost Components
The Shorter Schedule of Cost Components may be used to assess compensation events should the project manager and contractor agree, or where the project manager makes his own assessments. It is simpler to apply than the full Schedule of Cost Components and is suitable for assessing certain types of compensation events.

The differences between the Schedule of Cost Components and the Shorter Schedule of Cost Components are set out in Table 1.

Prices for work done to date
The price for work done to date is the total defined cost which the project manager forecasts will have been paid by the contractor before the next assessment date plus the fee.

The defined cost may be calculated or assessed by allocating the costs on the site to the appropriate heading in the Schedule of Cost Components and to summarise them as in Table 2.

The fee is calculated as in Table 3. The prices for work done to date are then the sum of the total defined cost plus the fee.

Pain or gain share
The difference between the target price (total of prices) and the price for work done to date is divided into increments. Unique target (pain or gain) share percentages can be assigned to each of these increments. The target share between the employer and the contractor varies the risk between one principally carried by the employer to one principally carried by the contractor, and to any stage in-between these extremes.

A number of target share approaches are illustrated in Table 4. The contractor’s gain share percentages where the share range is less than 80% are typically low as contractors should not be incentivised to cut costs. In any event, the likelihood of reducing final “costs” to below 80% of the target prices is low.

The contractor’s gain share percentages in the share range of between 90% and 100% are typically between 30% and 50%. This provides the contractor with a reasonable incentive to keep costs down and to apply value management principles in looking for

<table>
<thead>
<tr>
<th>Table 3 Fee Calculation</th>
<th>Component</th>
<th>Amount (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee for defined cost of other work:</td>
<td>= direct percentage fee stated in contract data / 100 x defined cost of other work</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>= ……………… / 100 x ……………….</td>
<td>R</td>
</tr>
<tr>
<td>Fee for subcontracted work:</td>
<td>= subcontracted fee percentage stated in contract data / 100 x defined cost of subcontracted work</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>= ……………… / 100 x ……………….</td>
<td>R</td>
</tr>
<tr>
<td>Fee (Fee for defined cost of other work + fee for defined cost of subcontracted work)</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4 Target share percentages</th>
<th>Share range (Difference between target price and final “cost” (see Figure 1))</th>
<th>Contractor’s share percentages</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
<th>Example 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Example 1</td>
<td>Example 2</td>
<td>Example 3</td>
<td>Example 4</td>
<td></td>
</tr>
<tr>
<td>&gt;120%</td>
<td></td>
<td>20%</td>
<td>15%</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>111 – 120</td>
<td></td>
<td>70%</td>
<td>75%</td>
<td>75%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>106 – 110</td>
<td></td>
<td>60%</td>
<td>70%</td>
<td>75%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>101 – 105</td>
<td></td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>96 – 100</td>
<td></td>
<td>50%</td>
<td>45%</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>91 – 95</td>
<td></td>
<td>40%</td>
<td>30%</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>80 – 90</td>
<td></td>
<td>30%</td>
<td>15%</td>
<td>40%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>&lt; 80%</td>
<td></td>
<td>20%</td>
<td>15%</td>
<td>30%</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>
ways to change the works information in order to obtain better outcomes. A 100% contractor pain share percentage, where the share percentage exceeds 100%, creates a guaranteed maximum price (see Example 4 in Table 4). Such a percentage will cause the contractor to risk price when establishing his target price. Raising the guaranteed maximum price to a share range in excess of 120% (see Example 3) may soften the risk pricing around the target price.

On the other hand, the share percentages can be set to cause the contractor to lose his profit and some of his overheads on the works should the share range reach 120%, e.g. Example 1 will result in a “loss” of 5.5% and 12.5% should the share range reach 110% and 120%, respectively, while Example 2 will result in a “loss” of 6% and 12.5% for the same share ranges. The contractor share percentages in Examples 1 and 2 provide the contractor with an incentive to complete the work with the target price, but does not cause a contractor to carry major losses should the share range exceed 120% for any unforeseen reason.

ASSESSING THE FINANCIAL OFFER IN THE EVALUATION OF TENDERS

Tenderers are required in a target contract (option C) to tender:

- The total of prices derived from an activity schedule
- Parameters (percentages relating to fees, listed equipment prices, and fabrication and professional service overheads, and hourly rates for off-site fabrication and professional design services) which are applied in the schedule of cost components to assess compensation events and to make payments to the contractor

The manner in which tenders are to be reduced to a common basis for comparative purposes should be stated in the tender data and a tender assessment schedule included in the returnable schedules.

Where the target price is negotiated after the formation of the contract, when the scope of work is available, the tender assessment schedule should set out estimates of the costs and time usage that are likely to occur in the various cost components of both the SCC and the SSCC so that the tendered parameters can be applied in order to arrive at a total of prices for comparative purposes. Alternatively, a quantum of costs and time should be stated in the tender assessment schedule in the proportions that are likely to occur.

Where tenderers tender the total of prices derived from an activity schedule, the tender assessment schedule needs to combine the tendered total of prices with the impact of the tendered parameters on the contract. This can be done by applying the tendered percentages to representative portions of the total of prices and the tendered rates to time estimates, as relevant. This will result in the application of a percentage increase to the total of prices for comparative purposes to represent the impact of the tendered parameters.

Care must, however, be taken in ensuring that the fee percentages that are applied in the tender assessment schedule are comparable, as different tenderers may take different views regarding what is included in a percentage fee or overhead (see Figure 3). It is therefore advisable to request tenderers to provide a breakdown of their preliminary and general items and their percentage fees. Alternatively, the SCC should be modified to include or exclude specific items so that equitable comparisons can be made.

MONITORING A TARGET CONTRACT

Target contracts by their very nature require open book accounting. The ECC target contract requires the contractor to allow the project manager to inspect the

Table 5 Basic means of verifying costs

<table>
<thead>
<tr>
<th>Component</th>
<th>Means of verification items in the SCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 People</td>
<td>Payroll sheets for the period concerned</td>
</tr>
<tr>
<td></td>
<td>Proof of payment of amounts made</td>
</tr>
<tr>
<td>2 Equipment</td>
<td>Invoices and proof of payment</td>
</tr>
<tr>
<td></td>
<td>Equipment is required to perform the work</td>
</tr>
<tr>
<td></td>
<td>Demonstration of the change in value over time</td>
</tr>
<tr>
<td></td>
<td>Rates in the contract data (hourly or daily)</td>
</tr>
<tr>
<td>3 Plant and Materials</td>
<td>Time worked</td>
</tr>
<tr>
<td>4 Charges</td>
<td>Invoices and documentary proof of payment</td>
</tr>
<tr>
<td>5 Manufacture and fabrication</td>
<td>Documentary proof</td>
</tr>
<tr>
<td>6 Design</td>
<td>Documentary proof</td>
</tr>
<tr>
<td>7 Insurance</td>
<td>Documentary proof of payment and amounts received from insurers</td>
</tr>
</tbody>
</table>

Figure 3: The prices for activities and preliminary and general items with the Schedule of Cost Components
accounts and records of the contractor at any time during working hours. Contractors commonly use software packages such as CCS (Construction Computer Software) to prepare monthly evaluations to monitor any possible over-runs on tendered amounts as well as variations on cash flow. Other types of software such as Build Smart are also used to monitor measured work with actual expenditure and to allocate wages. Some use daily time cards to record the time spent by their staff on site. They also have systems in place to requisition equipment, plant and materials and monitor deliveries to site, and employ buyers to issue purchase orders. Accordingly, the starting point in the monitoring of the contractor’s cost is to establish if the contractor’s internal systems are capable of proving the information on costs required in terms of the contract and what reliance may be placed on their internal systems for accurate record keeping.

Audits (see Table 5) can pick up things that the project manager may miss during his assessment. At the very least, an audit can confirm that amounts claimed under the contract have been paid for and so provide the client with a reasonable level of comfort that the project costs are as stated.

If contractors are required to allocate costs to specific elements, elemental cost models can be developed. These models can in time be used to enable estimates of cost to be monitored during design development of future projects, the reasonableness of target prices and to forecast budget requirements.

THE ATTRACTIVENESS OF TARGET CONTRACTS

The sharing of the cost over-run is likely to:

- Have less of an impact on the contractor’s profits than a price-based contract, and as a result, the contractor is less motivated to concentrate on minimising cost
- Reduce risk pricing in high risk premium contracts

Accordingly, target contracts are an attractive option where:

- Time or quality is more of a priority than minimum cost
- There is a relatively high measure of unquantifiable risk
- There is a relatively high risk, where the contractor may be best-placed to manage the risk, but not to carry it

The open book accounting procedures associated with target contracts gives rise to transparency of costs and leads to openness and improved collaboration in other areas. This in turn promotes a higher degree of cooperation than is apparent in most price-based contracts and provides a solid foundation for partnering approaches.

The target price can be established at tender stage or negotiated when the scope of the work is better known. The negotiation of the target price after the award of the contract facilitates the early engagement of contractors in projects and allows clients to successfully implement design, and develop and construct contracting strategies as the target price can be negotiated when the design is sufficiently advanced to allow price certainty.

Target contracts also enable framework agreements to be entered into with one or more contractors in the absence of a detailed scope of work over a term and to invite competition if necessary between framework contractors to undertake specific projects.

REFERENCES


Design applications scrutinised

INFRASTRUCTURE DESIGN software has progressed at a significant pace in the last twenty years. Multi-disciplinary projects which need finalisation within short time frames have placed a greater emphasis on forward thinking software that allows time-consuming routines to be automated.

Broadly speaking, a measurement of the effectiveness of practical software and IT systems in engineering projects includes a rationale relating to the nature of the task at hand and the efficiency with which data can be captured, analysed and integrated into the final design.

South African design standards are adopted with the end user in mind and embrace ISO 9003-3-1991 guidelines in its entirety. The ISO 9001 application for the development, supply and maintenance of software are ‘user-centric’. Measurement criteria are defined in terms of “the totality of features and characteristics of a product or service that bear on its ability to satisfy specified or implied needs.”

Local civil engineering software expert Vincent Bester has analysed the needs of civil engineers and produced a series of software tools that operate using an integrated infrastructure design approach. According to Vincent, integrated software allows developers to complete projects faster, leading to an increase in productivity while maintaining high standards. His locally developed Civil Designer software comprises nine integrated modules which provide interactive functionality and are powerful as individual design entities in their own right.

Integrated software evolved in response to increasing demands from civil engineers faced with multi-disciplinary project deadlines and a shortage of manpower. This has resulted in a shift from the stand-alone design model to a multi-disciplinary software suite, allowing engineers to access a variety of compatible applications that operate on a single design platform.

SPECIALISED DESIGN SOFTWARE
Specialised design packages have excellent design capabilities, but operate on different interfaces and methodologies. The switch from one design application to the next has, however, been criticised as it leads to long and difficult learning curves for the designer.

Vincent Bester summarises the shortcomings of this approach as follows: “Civil Engineers often find themselves under extreme pressure to complete projects in the shortest possible time, resulting in the need for a program with a short learning curve. Designers who work on various design platforms to complete tasks therefore need to transfer large amounts of data between stand-alone programs. This is a cumbersome process resulting in the loss of valuable time and a dramatic reduction in productivity.”

A further shortcoming of this approach is that specialised design programs have no interaction between the various design elements. This forces the designer to spend hours checking for clashes between services.

CAD-BASED DESIGN AND DRAUGHTING
An alternative approach is the use of CAD-based design and draughting systems. The power of this application lies in its seamless graphical capabilities. However, it offers a design platform that needs an expensive CAD workstation to operate and has often been criticised for producing a design that is not as
in-depth or as robust as it should be. As Vincent explains, “The design program operates as a specialised draughting tool, but there is limited or no interaction between the various design elements.”

INTEGRATED INFRASTRUCTURE DESIGN
Integrated infrastructure design offers a complete integration of both specialised design software and CAD-based draughting with seamless integration between the various design modules. According to Vincent, a robust integrated infrastructure design system has comprehensive design capabilities for every aspect of infrastructure design. Hence engineers are able to interact with the program and may configure the design standard to suit their individual needs. In addition, users have the convenience of one support centre that addresses all their product enquiries and there is only one upgrade schedule. This results in the various program modules never being out of sync with one another.

Integrated infrastructure design, which is embodied in the software application Civil Designer, follows a unique software process model. This model is an adapted version of the Spiral Development Model and places the user at its centre core with regular feedback loops before and after each process in a continuous spiral. The software process model follows the agile development methodology. This is an iterative development process where iterations result in a complete program fragment after a set ‘sprint’ of development activity. Each iteration also entails design, development and testing of the program fragment.

Integrated software has often been considered with caution as many engineers fear that this will result in the loss of specialised design capability. According to Vincent, Civil Designer is the product of nearly twenty years of research into seamless integration with the added benefit of superior design performance. The software handles up to 10 million DTM points and up to 2 GB bitmaps, and produces complete drawings ready for plotting.

The design modules also communicate through a common interface which allows the software to interactively indicate other services and service clashes when designing. This means that when a designer is defining, for example, the road long section (or vertical alignment), he/she will be shown exactly where existing or new pipes cross the road so that the route can be adjusted, avoiding costly delays on site during the construction phase.

CONCLUSION
With numerous software applications surfacing in response to changing civil engineering infrastructure design needs, it is often difficult to assess the viability of a seemingly winning methodology. Vincent Bester’s response to this dilemma is to pursue ongoing software development in tandem with the changing needs of the civil engineer. This has provided a software approach that is not only robust and forward-thinking, but that has outlasted many other applications through its notable track record.

INFO
Charles Scott
021 701-1850
info@knowbase.co.za.
Slide rule to computer –
memories of greybeard engineers

“Is that what my dad calls a slide rule?” – student comment circa 1984

“Oupa, who was Vega?” – student query 2009?

“ONE FINE DAY in the middle of the night” a SAICE past president invited me to meet him on the double-decker section of the Johannesburg M1 Motorway. Repairs and upgrading were in progress. A chance remark that a nearby bridge was the last design which I had done manually, raised the query of how other engineers recalled their involvement with the biggest project ever undertaken by the City Engineer’s Department (CED).

The CED’s early designs were by slide rule, manual (and later electric) calculators, and logarithmic tables. Perhaps the first electronic work was the capture, on Hollerith punched cards, of the 1954 traffic survey. Six years later they hired an ICT 1301, using in-house programmes in machine language, but with a Macro Auto Coding compiler for number crunching. In 1963 City Hall installed its own ICT 1301 (ex-UK). “It is the use of computers for the solution of engineering problems which often provides the greatest potential scope for financial savings.” (ICT opinion noted in Official Opening Ceremony pamphlet, 25 January 1963)

By 1968 the University of the Witwatersrand had an IBM 1420 Model II for engineers’ use; training in Fortran (Formula Translation) was offered for budding programmers. STRESS (Structural Engineering System Solver) and COGO (Coordinate Geometry) were two popular IBM programmes for which listings were freely available. A few years later Wits purchased two IBM 360s, back to back, and consultants had terminals in their offices. But the first sign of lightning in the Free State and everything was switched off without warning. Lesson one: back-up frequently.

Individual computer bureaux opened in Braamfontein, culminating in the arrival of Computer Sciences (CSSL) with its large capacity, time sharing, terminal facilities which quickly spread to all major cities. A large variety of engineering and commercial programmes were available via terminals. BASIC (Beginner’s All-purpose Symbolic Instruction Code) made programming simple for all.
Throughout this changing computational scene the Motorway design and construction progressed. A 1955 report recommended a Motorway system which allowed traffic to bypass the CBD, and to enter it at convenient places. The most convenient east-west route was along the gold reef outcrops where building had been restricted. Escalating costs in the late 1960s restricted the westward construction short of Church Street instead of going on to the Roodepoort boundary.

The initial alignment was based on contour maps prepared from aerial surveys. The road geometrics were all hand-drawn from manual calculations until the CED’s early computers became available. While the preliminary design and negotiations with the National Transport Commission (NTC) and the Transvaal Provincial Administration (TPA) were in progress, the CED decided that a new bridge over the railway yards was essential - structural design work should start as soon as possible. The fact that its south end would be approximately 70 feet (21 m) up in the air was not mentioned!

Generally the tracks were at 13 feet (4 m) centres with a gap of 18 feet (5.5 m) every fourth track - which was the only place available for the piers. The design was welded girders, cantilevered from the north side, pushed out over the tracks. The lowest tender, an alternative for simply-supported, prestressed concrete beams erected from a steel truss cantilevered over the tracks, was accepted. The spans were 30 m – 35 m. The pier foundations, on solid rock some 16 m – 20 m down, were excavated by a ‘hammer-grab’ piling system. The design was all by hand, generally using ‘wind up’ calculators. Lateral moments for stiffener beams were calculated by an approximate method.

Two additional requirements: for the CED, a pedestrian bridge with a staircase at each end, and for the Railways, a reinforced concrete wall to protect the pedestrians from the over-head power lines (or vice versa?).

The CED’s only in-house design work, of the major motorway structures, was the double-decker bridge length and the...
three-way intersection at its south end. In addition it designed several isolated, but integral, structures, plus the elevated structures of the Doornfontein links.

The numerous loading combinations, HA and restricted HB, needed manual Fourier Series to apportion the effects on the slug spans’ transverse diaphragms. The double portals, with cantilevers both sides at both levels, required torsion analyses which necessitated over twenty simultaneous equations. After some juggling of input data and an hour or so running time, the Wits computer churned out the answers – the CED’s first use of a computer for structural analysis. (HA and HB were the British normal and heavy highway bridge loadings. The City Engineer’s attempt, to reduce the HA loading to approximate the AASHO loading, was vetoed by the TPA.)

In order to allay fears, a Perspex model was tested in the university laboratory. A skew, three-span bridge over Xavier Street was also analysed using Perspex.

Neither BSCP 114 nor ACI 317 (the then popular concrete design codes) catered for torsion – reference could be made to the Australian and Russian codes, which had two totally different philosophies!

The double-decker, being bedded on solid rock, had no settlement hassles. The east-west route paralleled the early mining tunnels which created the potential for vertical, horizontal and rotational subsidence.

Around the M1-M2 intersection the shallow mine workings were the main concern. The obvious cure was to compact the dump – but to what depth? There being no consulting speleologist available, the CED put a mine tunnelling engineer in reverse to creep through the old stopes to assess the settlement potential.

As a result bridge design in that vicinity had to incorporate movements of 10 inches (254 mm) in any direction – except upwards! Further east they had to contend with 24-inch (610 mm) and 5° rotation. Calculate the envisaged sway at the top of 10 m high piers and you will soon realise why all bearings were put at the bases. The advent of Teflon reduced many of the bearing problems.

The bases were in two parts – a normal footing sitting within a much larger box. The footing had rebates into which jacks could be fitted – the intention was for the jacks to move the footing as required to restore the deck to its original position. For military emergencies, one HB loaded lane had to be operational during such jacking. Fortunately (maybe) the jacking concept has never been utilised.

The footings resembled concrete stabilised reinforcement – small models with sized wire were made to prove that the bending schedules were feasible. A large reinforced concrete model was made for testing; it was inverted in a heavy rig and an initial load applied to check the measuring system. Tea break – but nobody was delegated to switch off the loading device …..

The Eloff Street to Mooi Street section had three, long, continuous decks. For normal loads they were analysed manually using Hardy Cross moment distribution. The potential large vertical movements could not be accommodated elastically, so the deck was designed to form a ‘hinge’ at a weak point in every other span. At each hinge special shear reinforcement was provided, although considerable bending cracking could occur, a shear collapse was prevented.

The End Street Interchange, a real spaghetti job, had severe constraints on space and elevation. These largely dictated the decision for an orthotropic steel deck – a new venture for both the CED and the consultants. A then recent failure at Milford Haven, Wales, added some spice to the exercise. The combinations of vertical and horizontal curves, with transitions, made setting the bending schedules were feasible. A perhaps because of the date and place of its origin, there is no comparable publication in English.

ACKNOWLEDGEMENT

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Eric Hall, Tony Goldstein, Theo Ahier, Norman Barker, Keeve Steyn, Ken Soderlund, Bernie Carlsson, Bob Davies, Peter Nutt, Andy Hofmeyr, and Gerald Stoch, plus background from others of that era.

PS
“...A computer is the sum of the thinking, the engineering, the experience that goes into its making, plus the accumulated skills that go into its applications…”

(ILsor Computer Seminar, ICT 1961)

Note
1. Computer Sciences Sigma Limited (CSSL) was a California firm, which changed to Computer Sciences South Africa (CSSA) when it was bought by Anglo American. However, it was always referred to as Computer Sciences.
FIGHTING POVERTY AND PROMOTING SUSTAINABLE DEVELOPMENT
Douglas Oakervee
The United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, marked a turning point in public expectations of the private sector. Companies had always contributed to development through promoting growth, creating jobs, supporting enterprise development, transferring technology and paying taxes, but participants at the Rio ‘Earth Summit’ recognised that ‘business as usual’ was a wholly inadequate response to the enormous global challenges that we face. Business, it was agreed, could and should do more.

It was against this background that independent NGO, Engineers Against Poverty (EAP), was established a few years later. Its name captures the desire amongst many in the profession to place science, engineering and technology at the forefront of efforts to fight poverty and promote sustainable development. Supported by the Department for International Development and some of the UK’s leading engineering services companies, we began to build a programme of work aimed at delivering practical solutions that would help transform the lives of poor people.

Building a new NGO from scratch is time-consuming and difficult. Forging relationships, establishing credibility and developing a coherent programme takes time and this has to be balanced against the understandable impatience of supporters to see tangible results. Ten years on and we have created a highly innovative programme of work – across the extractive industries, public sector infrastructure and engineering education – that is delivering a development impact beyond what would usually be expected of a small organisation with modest operating costs. We have also learned four key lessons that we believe serve as a template for mobilising the engineering industry in the fight against global poverty.

Firstly, solutions are needed that can rapidly go to scale. Poverty is a tragedy in progress for the estimated 40,000 people who die each day of poverty-related illness. Aid and debt reduction are important in averting this tragedy, but extreme poverty can only be eliminated through sustainable economic growth and the creation of millions of decent jobs. The impact of corporate philanthropy is negligible. It is with the enterprise skills and core business activities of engineering services companies and their clients where there is most potential. Consider for example that oil and gas majors spend approximately $500 through their supply chains for every $1 spent on community investment. Innovative business models are needed that harness this economic power and the core competencies of industry to rapidly scale-up business solutions to poverty.

Secondly, whilst it is inevitable that tensions will sometimes exist between
business and society, strategies for development must focus on their interdependence. In practice this means developing mechanisms that align the commercial drivers of companies with the development priorities of the countries where they work to create ‘shared value’. EAP’s work in the extractive industries, for example, has shown that contractors who invest in developing suppliers from low-income communities secure cost efficiencies for themselves, whilst creating jobs and drawing local companies into the formal economy. The principle of creating shared value could form the basis for a new contract between business and society.

Thirdly, for most companies the successful alignment of commercial and social priorities and the creation of shared value on a large scale will require a fundamental reappraisal of their business systems and procedures. This includes, importantly, the incorporation of a social dimension into business development, risk management and supply chain development. The management of social issues cannot be delegated to the public affairs or corporate responsibility teams. They are issues that go to the heart of the business model and challenge the conventional wisdom of corporate strategy. Partnerships with NGOs can be very effective in helping companies to think through these opportunities and identify the most appropriate development challenges for them to take on, and from which they can derive most commercial benefit.

Finally, companies should position themselves to shape the environment needed for good governance and private sector development. There are a growing number of examples of companies working together to tackle development challenges that no single company can resolve alone. The UK Anti-Corruption Forum (UKACF), for example, brings together many of the UK’s leading engineering services companies and professional bodies to develop industry-led actions to fight corruption in the infrastructure, construction and engineering sectors. It represents over 1,000 companies and 300,000 professionals, and demonstrates how the engineering industry can organise itself to articulate an informed and responsible voice in governance debates. An international network of similar initiatives could provide a significant boost to efforts to fighting corruption in the construction industry.

These lessons and our practical experience provide us with an opportunity to offer high-level strategic advice to our partners. We are, for example, a key policy adviser to PricewaterhouseCoopers who runs the Secretariat of the Construction Sector Transparency (CoST) Initiative for the Department of International Development. We are also working with the Institution of Civil Engineers (UK) to modify procurement procedures in public sector infrastructure. And we are collaborating with ARUP to develop ASPIRE, a sophisticated software-based tool for maximising the sustainability and poverty-reducing impact of investments in infrastructure. This is how we achieve our developmental impact. We reduce our overheads to a bare minimum and focus on strategic interventions with key partners in government and industry that deliver practical solutions.

It was recognised in the Rio ‘Earth Summit’ that the principal responsibility for eliminating poverty rests with government, but that business had an increasingly critical role to play. Our partners demonstrate how it can fulfil this role and simultaneously strengthen its competitive position. Our efforts form part of a broader effort to mobilise engineering and technology to help build a more stable, civilised and prosperous global environment for all people.

MANAGING RISK AND INNOVATION TO INCREASE INVESTMENT IN INFRASTRUCTURE

Petter Matthews

Sub-Saharan Africa requires more than $20 billion additional annual investment in infrastructure if it is to accelerate growth and progress towards the Millennium Development Goals (MDGs). But conventional financing and delivery systems are failing to mobilise investment on the scale needed. Innovative solutions are needed to increase the rate of investment and maximise its developmental impact. But from a corporate perspective, Africa is often seen as a high risk environment and aversion to risk tends to inhibit the development of innovative business solutions.

Risk management tends to focus on the mitigation of financial risk through various debt guarantee and insurance products. But infrastructure provision relies on a wide range of technologies and institutional arrangements that create additional non-financial risks. The use of public private partnerships, for example, means that investors are increasingly involved in building, operating and maintaining infrastructure. They work in close proximity to affected communities and face challenging social risks. The management of social risk is critical, not only because it helps ensure project success, but because the measures used to mitigate it can also deliver pro-poor outcomes. Work by EAP on procurement and supply chain development helps demonstrate this.

Many companies still see procurement as an administrative function and consider financial cost to be the most important performance criteria. But when procurement is used to maximise local job creation and enterprise development, it also performs important social risk functions. When local people secure a stake in the company and its operations, they are more likely to value its presence and less likely to threaten its assets. Any cost premium has to be measured against the returns, but it often delivers additional cost efficiencies.

If companies are to adopt these kinds of strategies, they need practical ways to mitigate the risk inherent in innovation. Useful starting points include the following:

Selecting the right opportunities: Focus on opportunities that leverage existing capabilities and strengthen corporate competitiveness. The more closely aligned the opportunity is with a company’s core business, the easier it is to mobilise resources and combine commercial and societal benefits.

Experimenting: Avoid the ‘big bang’ approach to innovation by experimenting on a small scale. New approaches can be tested on individual projects and rolled out across the business if they prove successful.

Working through cross-sectoral partnerships: Working with partners, particularly non-traditional partners such as NGOs, helps to spread the risk and increases the chances of developing innovative solutions.

Measuring the impact: It can be difficult to isolate and measure the impact of a
particular innovation, but this should not be used as an excuse to avoid the need to start the process of developing metrics and quantifying the outcomes. Many companies are waiting for the African business environment to improve before they invest. But the presence of world-class companies is a necessary part of the process of securing those improvements. Managing the tension between risk and innovation more effectively can help companies secure a foothold in growing African markets and increase the likelihood of African countries meeting the MDGs.

RECENT EAP PUBLICATIONS
Ron Watermeyer
EAP has during the past 18 months contributed to or published the following documents which may be downloaded from their website (www.engineersagainstpoverty.org):

MDGs at the midpoint - Accelerating Business-led Growth and Collective Action This report examines the critical role of business in accelerating progress towards the Millenium Development Goals in Africa.

**Briefing Note on Social Risk & Opportunity Management for Projects** The importance of managing social risk is increasingly recognised by the proponents and financiers of large projects. Social risks typically arise from the dissatisfaction and grievances of community and non-governmental stakeholders. Experience shows that failure to manage these issues can have enormous economic costs, damage the reputations of organisations involved and put entire investments in jeopardy. This briefing note, that provides guidance to project managers on systematic approaches to managing social risk and opportunity, summarises the lessons from EAP’s extractive industries and public infrastructure programmes, including collaborative research with other organisations.

The global engineer: Incorporating global skills within UK higher education of engineers The publication is primarily aimed at the engineering sector within higher education and outlines why and how universities can embed the global dimension and development education principles within the courses they run for engineering students. Copies are available upon request.

**Briefing Note on Maximising the Contributions of Local Enterprises to the Supply Chain of Oil, Gas & Mining Projects in Low-income Countries** This is an eight-page briefing note to guide oil, gas and mining (OGM) companies on how they can maximise the contribution of local enterprises to the supply chain of their projects in low-income countries.

**Briefing Note on Increasing Local Content in the Procurement of Infrastructure Projects in Low-income Countries** Part I of this briefing note focuses on promoting local content as a policy objective, while Part II provides detailed options for actions to address the challenges and promote local content at various stages of the procurement cycle. The note is intended for the use of developing country governments, local governments, procurement officials, public sector clients and clients’ advisers.
IN MID-JANUARY engineers at Durban’s Moses Mabhida Stadium fitted the final piece to the 350 m arch that spans eThekwini’s iconic new sports facility.

The fitment concluded one of the most spectacular aspects of the multi-billion rand stadium construction. In March last year the first sections of the free-span arch arrived by ship from Hamburg, Germany. The arch, which consists of 56 separate 10 m pieces, stands 106 m high, weighs 3 500 tons and is symbolic of the South African flag – the two legs on the southern side of the stadium come together to form a single footing on the northern side, symbolising the unity of a once-divided nation through sport. A high-tech cable car has been designed to take visitors to the highest point of the arch where they can take in panoramic views of the city. Standing 30 storeys tall, the arch is the same height as one of Durban’s tallest buildings – John Ross House overlooking the harbour.

The last piece fitted in January weighed 60 tons. The arch pieces had to be opened by 5 cm on either side to accommodate the final section.

Functionally, the arch will provide critical support for the stadium roof, which will consist of Teflon-coated glass fibre membranes. In total the roof will have a surface area of 46 000 m² and will be suspended from the arch by 95 mm diameter steel cables and secured around the perimeter of the stadium by an 880 m steel compression ring.

At the fitting of the last segment, Julie-May Ellingson, who heads up Durban’s Strategic Projects Unit, said: “This is an event which we’ve eagerly looked forward to for many months! The completion of the arch is a major milestone in the City’s preparations for 2010, and exciting proof that we’re well on track.”

An engineering feat of epic proportions, the Moses Mabhida stadium with the completed arch, will give Durban a landmark similar to Sydney’s Opera House, New York’s Statue of Liberty and the Christ-the-Redeemer statue in Rio de Janeiro.

The stadium is at the heart of the Kings Park sports precinct that is bordered by the Umgeni River, a major rail line, the beachfront and KE Masinga Road (formerly Old Ford Road). As the backbone for the Kings Park sporting precinct, the stadium is designed to be a multi-functional, hard-working and easy-to-maintain asset for Durban, from which every resident and rate payer will be able to benefit. The creation of the precinct means that Durban will be one of the few African cities able to host most of the Olympic disciplines within a single sporting precinct.
The quality is guaranteed in the manufacturing

Although Elematic South Africa has just entered its third year of business, this Benoni-based manufacturer of prestressed hollow-core concrete slabs has already established an enviable reputation for quality, both of product and service delivery.

Product quality is guaranteed in the manufacture of the slabs, and it is easy to see why when one visits their 3 200 m² state-of-the-art factory, which has the capability of producing 40 000 m² of high quality slabs per month using the latest machinery and technology obtained from internationally-acclaimed Elematic in Finland.

Precast hollow-core slabs are amongst the most technically advanced products in the precast concrete industry. At Elematic a highly automated process uses eight casting beds with longitudinal prestressing strands for the casting of batch-mixed concrete. After being left in a controlled environment for ten hours to attain strength, the slabs are cut, ready for delivery.

Computer-controlled, the concrete mix is identical each time, although samples are regularly tested in Elematic’s own laboratory, ensuring that consistent product quality is guaranteed before the slabs get to site.

Elematic’s prestressed hollow-core slabs are 1 200 mm wide. Depending on the application, slabs of up to 12 m span are available in three standard thicknesses of 150 mm, 200 mm and 250 mm for use as floors, roofs and walls.

The longitudinal voids in the hollow-core construction of the slabs can be used for technical installations such as ventilation conduits, plumbing and electrical pipe work, but their greatest benefit is that they provide a 40-50% saving in concrete when compared with solid slabs, and the prestressing steel required is around 30% less. Also, they need no transverse reinforcement. The hollow-core slabs are much lighter and easier to handle and considerably reduce the weight of the floor, which makes them ideally suitable for large span buildings such as offices, industrial premises, shopping centres, and so forth. Compared to solid slabs, the reduced weight of hollow-core slabs provides savings in foundation and structural requirements. Requiring less support, the longer spans also allow greater freedom in floor plan design.

These hollow core slabs can be used with all types of supporting structures, such as bearing walls, skeletal concrete structures or steel frames, and allow dry construction on site (only the joints need to be concreted).

The slabs are provided with a smooth, even-bottomed surface ready for decoration, thus removing the need for false ceilings. The upper surface is etched to provide a key for floor screeds and similar requirements.
Elematic slabs meet the requirements of the relevant sections of SANS Standard 1879-2004 Precast Concrete Suspended Slabs and SABS 0100/1 Structural Use of Concrete, whilst also conforming to the relevant EN Standards which in some cases are more stringent than the local standards.

The company’s experienced teams erect slabs speedily at 500 – 1000 m² per day on site. One project where full use was made of the speed of installation, due to a very tight time schedule, was the 12 000 m³ hollow-core slab construction at the new Registration Building for UNISA in Pretoria. This project involved the provision of ground and first floor slabs for two administration blocks, a machinery room and a foyer.

Designed by structural engineering consultant HGK Consulting cc of Pretoria, the R130-million project was based around a structural steel frame. Shear connectors were used to tie the slabs to the steel beams for structural stability. The two steelwork suppliers/contractors involved were JR Kopano Engineering cc and ProSpan Structures.

Considering that the final design work was only started at the end of April 2008, with partial occupation planned for 8 December, and completion early in 2009, this project illustrates the speed with which buildings can be constructed using a combination of structural steelwork and Elematic hollow-core slabs.

Pierre Louw, Contracts Manager for main contractor G Liviero & Son Building (Pty) Ltd, recommends the Elematic product and their site performance. “Their service delivery was excellent. They did around 800 m² each day on average, and this is much faster than conventional methods, particularly as you have no curing or prolonged soffit support to wait for and you can start work on the erected slabs the same day. For instance, in the foyer Elematic took two days to install the entire section of slabs, the next day we did the preparation, and that same night we poured the structural screed. So, in a period of just three days we had 1 100 m² of slab completed.”

Louw feels that companies such as Elematic should be included in the design team at the conceptual stage, along with the structural designer and the company providing the services.

Elematic’s precast hollow-core slabs are also suitable for all types of residential installation, and because of their speed of erection, could play an important role in the fast delivery of low-cost housing.
GLOBAL WATER PARTNERSHIP APPOINTS SOUTH AFRICAN AS NEW EXECUTIVE SECRETARY

THE GLOBAL WATER PARTNERSHIP (GWP), an international network that supports sustainable development and management of water resources at all levels to ensure a water secure world, announced the appointment of a South African, Dr Ania Grobicki, as the GWP Executive Secretary, effective 1 March 2009.

“I look forward to serving and supporting this unique network of stakeholders that is GWP, and reaching out to new and potential partners worldwide,” said Dr Grobicki. Noting that her new responsibilities coincide with the start of a new strategy period for GWP (2009 – 2013), she remarked, “Through the global strategy we will support approaches that are innovative and sustainable, in order to meet the water needs of all sectors of the economy and ecosystems.”

Affirming the priorities of the new strategy, Dr Grobicki added, “With communities, societies and nations under pressure from the economic downturn and from the effects of the increasing climate variability, I believe passionately that the GWP’s key task is to keep the focus on water security for all, especially for the most vulnerable people.”

In the words of Letitia Obeng, GWP Chair, “The GWP Steering Committee looked for and found in Dr Grobicki a unique and energising person to lead the GWP network into the next strategy period.”

DHV DEVELOPS FOURTEEN NEW FISHING HARBOURS IN GHANA

DUTCH CONSULTANCY AND engineering firm DHV is developing fourteen new fishing harbours and landing sites in Ghana. The Ghanaian president formally gave the starting signal for construction to start at three locations. Construction will take place up to and including 2014 at a cost of approximately USD150 million.

For more than a 100 years Ghana has been struggling with the question of how to create safe fishing harbours and landing sites along its exposed coastline. Eighteen months ago the Ghanaian Ministry of Fisheries commissioned DHV to tackle this challenge. Ben Reeskamp, DHV’s Director of Ports and Waterways, says, “Nowadays loading and unloading occurs on the beaches. In the future this will be done on quay walls in a hygienic environment, making international export of fresh fish possible. For the coastal sites, breakwaters will create sheltered harbour areas with easy access. This will thus also vastly increase the safety of vessels and fishermen along this exposed coastline.”

According to Reeskamp the new harbours will result in more fish exports, and more employment and other opportunities for the coastal population. The harbours will be designed to include all possible facilities and will allow the clean processing of fish in accordance with EU standards.

The different fishing harbours have all been tailor-made and fine-tuned to local needs. Reeskamp is impressed by the fact that the Government of Ghana and the Ministry of Fisheries had the vision not to tackle just one site but the entire coastline of the country in one go.

The plans for the larger harbours include partial land reclamation, breakwaters and quay walls. The designs also comprise various types of buildings plus all the required infrastructure and network needs. The buildings will include facilities like a workshop, a net-mending shed, a fish market, an administration building and a day care center for children.

For all the new sites involved, DHV went through the various steps of choosing the best locations, developing alternatives, making master plans, doing environmental impact assessments, and completing designs and tender documents.

Twelve of the new harbours and landing sites are scattered along the coastline, while the remaining two are located inland on Lake Volta. Coastal harbours will be built at Axim, Dixcove, Winneba, Senya Beraku, Elmina, James Town, Gomoa Fetteh, Mouree, Mumford, Teshie, Ada and Keta, and inland harbours at Abotoase and Dzemeni on the shores of Lake Volta.

THE BIG DRY

“SOUTH AFRICA AND AUSTRALIA have much to learn from each other in the development of ideas and technology to conserve vital water resources,” says Basil Bold, MD of water metering specialist Sensus Metering Systems. Bold was invited to address delegates at water metering and management seminars in Brisbane and Sydney. The seminars were attended by key personnel in the Australian water industry,
offering Bold the opportunity to study how the Australians are facing up to the problem.

“The Big Dry” – as severe drought is commonly called in Australia – is a menacing presence at some time in every state of that country. In some regions it is permanent. In major cities rigorous control over wastage and restrictions on consumer consumption is part of everyday life as rivers dry up, farms turn to dust and the levels of storage dams drop to dangerously low levels.

“It’s a menace that just never seems to go away,” says Bold. From his observations he gets the impression that Australian consumers are much more concerned about water conservation and avoidable waste than South Africans are. “They seem to be more disciplined, more aware of the longer-term dangers and the urgent need to conserve water.”

As an illustration of how Australia’s largest urban centers are managing the problem, the Sensus MD cites these impressive statistics from Sydney Water, the utility which supplies water to the country’s largest city (population 4.2 million):

■ Sydney Water spends 100 million Australian dollars (about R650 million) a year to stop water leaks
■ It scans 18 000 km of water mains for hidden leaks
■ It replaces more than 100 km of water mains a year in high-priority areas

Through these initiatives, and the use of modern water management technology, Sydney Water saves more than 56 million litres of water every day. According to Bold, the utility boasts one of the best leak-management programmes in the world.

Other water conservation measures the utility is adopting include increasing large scale water-recycling and re-use, improving flow-metering to better identify where leaks may be occurring and renewing water mains.

In Brisbane, the Queensland state capital, 27 million litres of water are lost every day through leaks, most of it from very small, undetectable hairline cracks in pipes, broken seals and burst water mains. “That is a lot of water to lose, especially when it is such a precious commodity,” says Bold. “However, it’s a major improvement on the 65 million litres a day which were being lost in 2004 – 2005 before the local water utility undertook a 240 million Australian dollars (R1 560 million) programme to upgrade the city’s water and sewage systems.”

In a further effort to curb wastage, Brisbane is reducing pressure in many water delivery systems, thus reducing impact on pipes and the potential for leaks.

“South African water metering standards are on a par, or in some cases more comprehensive, than the Australian equivalent, but the Australians are significantly better at implementation and observance of standards. They also appear to be ahead of us on management and conservation. While we are more flexible in adopting state-of-the-art measurement devices and automatic meter reading technologies, we suffer from an inability to sustain, or to take full advantage of the benefits these technologies offer.”

Bold feels that this is primarily due to a serious shortage of qualified technical personnel within the water supply authorities. “Unless this shortage is addressed, we are in danger of a rapid collapse of our water reticulation systems.”

Bold adds that studies suggest that southern hemisphere countries are becoming subject to more frequent and prolonged droughts. “In this respect we are in the same situation as the Australians, and we can learn a lot from each other in combating this very worrying common problem.”

ARLONA LIFTING EQUIPMENT
USED IN DURBAN HARBOUR EXPANSION PROJECT

ONE OF THE MOST IMPORTANT civil engineering projects currently being undertaken in South Africa, apart from a number of mega projects in the run up to the 2010 Soccer World Cup, is the widening of the Durban Harbour mouth.

Arlona Engineering, specialists in the design, manufacture and certification of lifting equipment, was awarded the contract by Group 5 to manufacture a host of specialised lifting equipment that will ensure that the 2010 deadline for this major harbour expansion project is safely and economically met.

Whilst the manufacture of the 45 t concrete Antifer blocks – a vital part of the foundataion – is in itself no mean feat, a huge challenge was to manufacture equipment to safely lift and stack these blocks and then to place them accurately on the sea bed,” says Steve Christy, managing director of Arlona Engineering.

“The company’s involvement in this venture began with the manufacture of four 45 t high-tensile steel SWL Antifer clamps. Two of these clamps were later fitted with Arlona’s specially designed automatic locking devices, which allowed the blocks to be stacked three high beneath the gantry crane. This feature significantly improves the capacity of the stockyard and solves a looming storage problem. The automated clamp also vastly improves the safety of the operation, as workers no longer have to go to the top of the block to lock and unlock the clamps.”

In addition to these Antifer clamps, Arlona has also manufactured special clamps to handle the 25 t dolos blocks which will be used as armouring for the new piers at the harbour.

Before being delivered to site, these new clamps were load-tested and certified by Arlona to ensure that they comply with the requirements of the Occupational Health and Safety Act. Arlona Engineering is a registered LME (Lifting Machinery Entity) and has its own test rig designed to test and certify any lifting equipment up to 100 t.

A number of specially reinforced 40 t SWL skips have also been manufactured by Arlona for dumping smaller rocks required to form the foundation for this project.

Arlona Engineering, which is based at the Durban Harbour, is one of the leading

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A Dolos clamp, manufactured by Arlona Engineering, being positioned to lift the 25 t dolos blocks, which will be used as armouring for the new piers at the Durban Harbour

An Antifer clamp, manufactured by Arlona Engineering, carefully and precisely places the large concrete Antifer blocks on the sea bed during the Durban Harbour upgrade
designers and manufacturers of bulk handling and lifting equipment for the shipping sector in southern Africa. The company continues to provide engineering services to this prestigious project on a daily basis.

CMA INTRODUCES PERMEABLE PAVING DESIGN SOFTWARE

THE CONCRETE MANUFACTURERS Association (CMA) has sold over 200 copies of PermPave, custom-made software to be used in the design of South African permeable paving installations.

The software is authored by two Australians, world-renowned concrete block paving (CBP) expert, Dr Brian Shackel, visiting professor of civil and environmental engineering at the University of New South Wales, and Professor Simon Beecham, head of sustainable water resources at the University of South Australia.

The South African version of PermPave was introduced to this country by Dr Shackel and Professor Beecham in a series of seminars held in Midrand, Cape Town, Port Elizabeth and Durban during the first half of November 2008.

attended by over 270 civil engineers, landscape architects, paving block manufacturers and specifiers, the seminars have gone some considerable distance in convincing local professionals that permeable paving is a viable and cost-effective water management system, and an inexpensive alternative to conventional storm water drainage.

CMA director, John Cairns, says the Australians were very impressed with the level of audience participation during the seminars and were also impressed with South Africa's largest permeable paving project to date, a parking ground on the West Campus of the University of the Witwatersrand (reported in Civil Engineering, October 2008, p 62. Ed.).

"Since the staging of the seminars we have had several enquiries from people considering the installation of permeable paving as part of their projects, and thanks to the involvement of experts such as Dr Shackel and Professor Beecham, I have no doubt that this green technology is taking local hold in a responsible and sustainable manner," observes Cairns.

PermPave offers considerable design scope and can be used with various paving products. The local version has been programmed with South African rainfall data and it allows the further downloading of local climate and rainfall information. It also guides the user in selecting paving blocks best suited to the application and facilitates designing for specified volumes of water, either for storage and re-use, or for replenishing underground water tables.

The filtering out of pollutants is another important benefit. However, Cairns says that the prime driving force behind the technology is the prevention of flooding.

C&CI EXPANDS TRAINING FOR LABORATORY TESTING PERSONNEL

THE NEED FOR MORE durable structures in South Africa has prompted the Cement & Concrete Institute’s School of Concrete Technology to expand the training it offers to laboratory testing personnel.

Petrus Jooste, senior lecturer at the School of Concrete Technology in Midrand, says: "For the construction industry to be sustainable, there is a growing need to construct buildings that will last. The new trend, therefore, is to specify durability testing on newly-constructed buildings to ensure that these requirements are met. To prepare South Africa’s concrete testing laboratories for this task, the duration of the School’s training course for laboratory testers will be increased from one to five days in 2009."

The tuition on existing, commonly performed tests will be expanded with more detail added to the test methods. Laboratory demonstrations and hands-on opportunities for learners will also be provided. "This type of course has never been offered on such an intensive scale in South Africa before and its importance cannot be over-emphasised. It will greatly improve the skills base of testing laboratories," Jooste adds.

Bruce Raath, C&CI Education and Training Manager, feels that training in concrete technology is now massively important with many learners unaware of the extent of the gaps in their knowledge. "The School of Concrete Technology has, for example, trained men who had, for years, operated poker vibrators without understanding what their job is trying to achieve - or how important it is to the overall well-being of a structure. Specification problems caused by poor understanding of materials by engineers, particularly in the acceptance criteria for concrete and the design of industrial floors, still persist, but can easily be improved by appropriate training."

Raath added that the School’s familiar and popular courses would again be available in 2009.

The Education Programme for 2009 is available in hard copy or on the website (www.cncl.org.za).
DURING THE LAST SAICE Council meeting for the year 2008, a plaque was unveiled at the entrance to SAICE House to commemorate the merger on 1 January 1994 of the then South African Institution of Civil Engineers and the South African Institute of Civil Engineering Technicians and Technologists. Through this merger the South African Institution of Civil Engineering, as we know it today, was formed.

To celebrate the merger in 1994, and to symbolise long-term growth, the then Board of Technicians and Technologists (BTT) planted an indigenous tree at SAICE’s offices in Observatory, Johannesburg. However, SAICE has since moved to Midrand where the Institution now occupies its own building. BTT was also disbanded a few years ago as it had served its purpose of bridging the gap from SAICET to SAICE.

Affixing this plaque in a prominent place next to SAICE’s front door seals the marriage between SAICE and SAICET, a marriage which started out with some misgivings on both sides, but which has grown into the voice of the civil engineering profession in South Africa.

The full Council was present at the happy occasion. Pictured here from the left are the following old hands:

Owen Wentzel (past president of SAICET), Johan de Koker (member of SAICET for many years and 2008 president of SAICE), Dawie Botha (executive director of SAICE), Ben Pauw (past president of SAICET), Lemias Mashile (ex-BTT member and Member of Parliament), and Neil Macleod (2007 president of SAICE).
CALL FOR PAPERS
International Association for Bridge and Structural Engineering
Joint IABSE-fib Conference, Dubrovnik, Croatia, 3 – 5 May 2010

THEME
Codes in Structural Engineering - Developments and Needs for International Practice

THE MAIN OBJECTIVE of this IABSE-fib Conference 2010 is to obtain an overview of the present state of codes worldwide, including the underlying legal and economic aspects. Based on feedback from practical applications and using the results of theoretical and experimental research, conclusions should be drawn for the development of future codes, striving for international harmonisation in the ever more globalised market. In addition to traditional topics related to safety and serviceability, new and special topics have emerged concerning, for example, robustness, assessment of existing structures, sustainability, aesthetics or the extensive use of information technology in the design process.

THEMES
1. Objectives and Comparison of Codes
2. Format of Codes
3. Lessons from Application in Practice
4. Additions to Future Codes
5. Speciality Topics
6. Codes and Teaching

Authors are invited to submit an abstract in English (300 words) online in accordance with the themes and topics (see IABSE website for topic details) by 28 February 2009. The Preliminary Invitation is also available on the website (www.iabse.org/Dubrovnik2010).

CONFERENCE SECRETARIAT
Croatian Society of Structural Engineers
T: 385 1 46 39 424
F: 385 1 46 30 632
E: Dubrovnik-2010@grad.hr
Long-awaited standard on concrete retaining blocks now official

STANDARDS SOUTH AFRICA (STANSA) has published the South African National Standard, SANS 508:2008 on concrete retaining blocks (CRB). Covering the manufacture of CRB, the Standard was compiled by STANSA in close collaboration with the Concrete Manufacturers Association (CMA) and its member companies.

Concrete retaining blocks are widely used in the construction of earth-retaining walls and are manufactured either by dry or wet casting, the former being the most prevalent and more modern method. SANS 508 is applicable to both.

CMA president-elect and vice-president of its CRB Division, Silvio Ferraris, says compressive strength is a critical feature of the Standard, as a deficiency in this standard could result in the failure of a wall.

Ferraris notes that the quality of materials used in the production of a block, such as cement, aggregates, water and pigments, is also integral to the Standard, as are other quality-related factors such as dimensional accuracy, shape, appearance and colour.

SANS 508 gives clear directions as to the quality of cement used in the manufacture of a block and each delivery batch must be accompanied by a certificate from the manufacturer in compliance with SANS 50197-1. In addition, if extenders are used, they should comply with the requirements of SANS 1491-1, SANS 1491-2 and SANS 1401-3.

Aggregates are also subject to a standard, in this instance SANS 1083. Every sand delivery must be checked for moisture content so that the quantity of water used in the concrete mix can be accurately determined. Furthermore, the size of the sand granules must also comply with a specified grading envelope.

SANS 508 further stipulates that the water used in the mixing of the concrete should be free of any impurities which might impair the strength or durability of the concrete. Moreover, any pigmentation must comply with the requirements of BS 1014.

Specific details on dimensional accuracy and compressive strength are covered in Tables 1 and 2 respectively in the Standard document, and testing frequencies are covered in Table 3. Besides dimensional accuracy and compressive strength, SANS 508 also includes the testing of shape, appearance, colour and mass.

The Standard requires that a minimum of five units per machine per day be tested for dimensional accuracy. This test applies to dry-cast units only, as it is very difficult to control the slump and instant demoulding which occurs after wet-casting. Allowable tolerances on length, width and height for dry-cast products are plus or minus three millimetres.

The testing frequencies on compressive strength and mass for dry-cast blocks are as follows: Where production is less than 2 000 units, three blocks per production batch must be tested. In instances where production is greater than 2 000 units, six units must be tested. The compressive strength testing frequencies for wet-cast cubes are exactly double that of dry-cast units.

The Standard stipulates that the average compressive strength rating of a dry-cast unit should be 13 MPa whereas that of wet-cast blocks should be 20 MPa. The minimum permissible strength rating is 11 MPa for dry-cast units and 16 MPa for wet-cast units.

Compressive strength must be tested by a purpose-built crushing machine, which applies hydraulic pressure at a rate of 15 MPa per minute until a block or cube is crushed. In the case of dry casting, the actual blocks are tested by a “full platen test”. With wet casting, standard moulded cubes are tested. In dry-cast testing the actual bearing sur-
faces of the blocks are tested, whereas with wet-cast blocks the bearing surfaces are not sufficiently even for accurate testing. Tolerances can vary by as much as 30 mm, and this is why compressive strength testing on wet-cast blocks can only be tested with specially prepared cubes.

Although they do not form part of the Standard, the basic principles of the design for a particular type of retaining block are also covered in Annex C as these offer the designer additional performance guidelines, such as the coefficient for block-on-block friction, nib-shear strength and the crushing strengths of blocks as they apply to specific retaining block products. Details on block-on-block friction, nib-shear stress, back-line load and front-line load testing are included in the Annex. Line-load testing is generally undertaken when blocks are installed with open spacing.

Ferraris says, although not stipulated by the Standard as a requirement, it would be well-nigh impossible to achieve the SANS 508 mark without operating to a quality management system such as ISO-based SANS 9001 and the Standard touches on this aspect in Annex B.

“A quality management system does not have to be ISO-based, but setting up a system normally requires the services of a consultant. Traceability is all important. If a problem occurs, test records must be available to determine possible causes.”

As yet there is no official standard on the actual installation of blocks, although the CMA has published an installation manual which can be used as a standard guideline. An installation CD is also obtainable from the CMA as a training aid.

Ferraris advises that the standard for the design and construction of reinforced soils and fills, SANS 207-2006, is available from Standards South Africa. It defines reinforced slopes as any structure with a face angle less than 70°, whereas walls are defined as those structures steeper than 70°. In addition, two publications, the Code of Practice for Gravity Walls and Design of Reinforced CRB Walls, are available from the CMA to assist engineers with structural designing.
THE EXCITING FINALS of the SAICE-DFC Water ‘Centenary Schools Water Competition’ 2008 were held at the Sci-Bono Discovery Centre in Newtown, Johannesburg.

Wonderful news is that DFC Water (Pty) Ltd has already agreed to sponsor the competition again this year. The finals of the 2009 competition will therefore be held at the fascinating Sci-Bono Discovery Centre again, and will take place on Friday 24 July.

The 2008 champions were the team from the Brackenfell High School, Cape Town, who came first with 30 penalty points, the best result since the start of the competition in 2003. Second was the team from Lofentse Girls High School in Soweto with 260 points, and in the third spot the Cape Academy of Maths, Science and Technology with 280 penalty points. The prize-money for the winning teams, their schools and teachers amounted to R23 000.

Winners of the regional competitions arrived in Johannesburg from as far as Cape Town, Bloemfontein, Richards Bay and Upington to battle the local winners for top honours. Learners were flown to Johannesburg and accommodated in a good hotel – an experience that these young people and some of the educators will never forget! For most this was their first experience of the ‘big city’. The teams were also treated to dinner at

Prof Zweistein (aka Kim Mather, civil engineering technician from Pietermaritzburg) presenting his ‘Fun Physics’ lecture to competitors

Prof Kobus van Zyl of the University of Johannesburg explaining how the competition works
Montecasino, with its distinctive architecture. Without the generous sponsorship of DFC Water (Pty) Ltd this event would, of course, not have been possible.

After the competition the following SMS was received from a member of the Lolentse Girls High School team: “I just really want to thank you. The experience I had is priceless and I feel very honoured to have been part of the competition.”

This girl intends following a career in electrical engineering. Another previously disadvantaged student is currently studying civil engineering at the University of Cape Town as a direct result of having taken part in this competition in 2007.

**BACKGROUND**

Both SAICE and Rand Water celebrated a hundred years of existence in 2003, and as part of their centenary celebrations they launched this joint competition for high school learners, devised by Professor Kobus van Zyl and his students at the University of Johannesburg. Since then the competition has been streamlined and has gained momentum.

**WATER DISTRIBUTION NETWORKS**

The competition exposes learners to the practical application of one of the most important processes influencing their daily lives, namely how water gets to their homes. The teams are tasked to design a model water distribution network to distribute three litres of water equally between three points on the grid using two different diameter pipes and connection...
WINNING SCHOOL: Brackenfell High School
Posing with Brian Holford, Managing Director of DFC Water (Pty) Ltd (sponsor), are from left to right: Danielle de Villiers, Christopher van Wyk and Jaco le Grange

SECOND: Lofentse Girls High School
From left to right: Mamooka Makume, Ericcah Maja, Siphesihle Ngwendu

THIRD: Cape Academy of Maths, Science and Technology
From left to right: Monique Marinus, Chrisnick Fluks, Jacquine Andrews, Sanda Mahlakahlaka, AJ van Breda (teacher)

pieces. They are judged on how well they execute the task, using a penalty points system. They are allowed three attempts in a period of about an hour.

As part of the competition the water cycle is explained to the learners. Related issues are also discussed, such as why we have to pay for water, the building of dams, the distribution of water through water boards to municipalities and then to users, and the concept of water resource conservation.

A NEW LOOK
More good news is that Professor Kobus van Zyl and the graphics department at the University of Johannesburg are currently finalising a ‘new look’ for the grid used in the competition. This grid, depicting the entire water cycle, could then be used on any table, which will make the competition accessible to many more schools.

The competition creates awareness regarding water issues in South Africa – that water is a precious commodity to be conserved, recycled and re-used, that infrastructure should be maintained, and that new infrastructure should be created to provide potable water to those without water.

In addition the competition encourages learners to take mathematics and science at school and to follow careers as science or civil engineering professionals. The future quality of life of all South Africans will depend on these professionals.
The Cape Academy team hoisting their reservoir. From left: Khuliso Ratshivhumo, Irene Maheso, Howard Mabusa.

The spirited team from Eqinisweni Secondary School fitting the pieces. From left: Nkosinathi Laki, Lorraine Mahlangu, Mpumelelo Zondi.

Hoërskool Upington team keeping a close watch. From left: Competition official Francis Gibbons, Peet van Staden, Barend Hayes, Laurie Pieterse.

Tembisa West Secondary School. From left: Sabelo Phadu, Timothy Tarr, Kabelo Monese.

The team from John Ross College. From left: Refilwe Mthethwa, Pooven Pillay, Simon Crampton, Joseph Jacob.
Siviele Wiele –
Tukkies Tour da Durban!

WEDNESDAY 8 OCTOBER 2008 was D-day for the third year group of Pretoria University’s civil engineering students. At 06:00 it was time to depart on the Civil Tour, an annual initiative organised by the students themselves.

Months of planning came together when the 72-strong group boarded buses and started what would be a long trip to Durban. The stopover at the Sterkfontein Dam near Harrismith, despite taking quite a few hours out of the day, proved interesting and impressive. Upon arrival at the Road Lodge in Durban, the students were joined by their lecturer, and the official academic side of the trip could commence.

The first formal site visit took place on Thursday 9 October. The Durban Harbour entrance channel widening and deepening project was the focus of the visit. The group received an insightful presentation at the harbour from HMG Joint Venture’s Roy D’Oliveira. Afterwards, while enjoying refreshments, the work was viewed from the vantage point at the site office.
The next day two Stefanutti Stocks construction sites were visited. The first was a bridge launching site. Several complexities with constructing a bridge over a road with live traffic were explained and demonstrated. The group then left for a guided tour of the new Kwazulu-Natal regional offices for Liberty Life Properties in Umhlanga.

Here the students could see how important it is to be aware of possible safety hazards as sites get busier. Several activities were observed, including excavations using various kinds of machinery, formwork placing and reinforcement fixing, and the casting of slabs. The students were particularly interested in the process of post-tensioning the concrete in the slabs, since this had not been dealt with in their studies yet. Some of the students were also a bit wary of walking around underground in the future parking areas while construction was going on above!

The third and last full day had a sporty feel to it. The 2010 Soccer World Cup stadium in Durban, the Moses Mabhida stadium, was up for a visit. There was great excitement among members of the group as most students would probably only witness the construction of a structure of this magnitude once in their lifetime. After a thorough induction session, the students listened to an in-depth presentation by Ulrich Huber from BKS, a structural engineer on the project. Also present was Luis Mendes, senior project manager from Group 5 KwaZulu-Natal.

Once the students had a general idea of the design of the stadium, they were taken on site in smaller groups. The students who had to wait their turn to go on site, entertained themselves on the mini soccer field, which is part of a complete miniature sample of what the stadium’s seating and other facilities would look like.

The experience on the actual site was overwhelming. The scale to which everything is being constructed is awe-inspiring and the volumes of material being used during construction are

1. Hoisting the banner halfway to Durban: “Siviele Wiele 2008 – We thank our sponsors”
2. Stefanutti Stocks incremental launch bridge near the Durban harbour
3. Michael van den Berg, being the good guy he is, helped out where he could! (Captured in the future parking area of a new office block in Umhlanga being constructed by Stefanutti Stocks)
impressive when actually seen on site. Further highlights included visits to the future ‘presidential box’ and the players' dressing rooms.

After this final site visit, many of the students went to watch the semi-final of the Currie Cup rugby at the ‘old’ ABSA stadium across the road, while the rest used the ‘free time’ to visit some of Durban’s other attractions.

The students would like to acknowledge and sincerely thank the companies (see box) who had sponsored the tour and organised site visits. Without their support this very enlightening tour would not have been possible. Insights gained during this tour will undoubtedly have a lasting effect on each student’s career.

SPONSORS: UP STUDENTS CIVIL TOUR

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MEMO TO READERS

THE PRODUCTION SCHEDULES of the SAICE magazine and journal have been changed as follows by the Editorial and Journal Panels:

Civil Engineering
SAICE publishes eleven editions of its magazine every year. Traditionally the eleventh magazine was a combined November-December edition. From 2009, however, November and December will be separate magazines, while January-February will be the combined edition. This arrangement should fit in better with the customary South African end-of-year holiday pattern. Parties affected by this change were alerted in good time.

Journal of the South African Institution of Civil Engineering
To render production of the journal more cost-effective, the journal will in future appear twice a year, in April and October, instead of quarterly, as had been the case for many years. However, the intention is to still publish the same number of papers every year. This arrangement is effective from 2008. Thomson Scientific, who deals with our ISI-listing, was informed accordingly some time ago.
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<td>14 – 15 May Cape Town</td>
<td>Business Finances for Built Environment Professionals SAICEfin08/00405/11</td>
<td>Wolf Weidemann</td>
<td>Dawn Hermanus <a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
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<td>28 – 29 May Port Elizabeth</td>
<td>Handling Projects in a Consulting Engineer’s Practice SAICEproj08/00404/11</td>
<td>Wolf Weidemann</td>
<td>Dawn Hermanus <a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
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<td>11 – 12 June Nelspruit</td>
<td>Technical Report Writing SAICEbus09/00427/12</td>
<td>Les Wiggill</td>
<td><a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
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<td>30 – 31 July Bloemfontein</td>
<td>The Application of Finite Element Methods 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>
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<td>7 – 8 May George</td>
<td>GCC 2009 CPD number to be announced</td>
<td>Willie Claassen</td>
<td><a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
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<td>11 – 12 May East London</td>
<td>Structural Steel Design Code 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>
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<td>Reinforced Concrete Design to SANS 10100-1 CPD number to be announced</td>
<td>Greg Parrott</td>
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<td>26 March Gauteng</td>
<td>Ridding Stormwater of Litter SAICEwat08/00361/11</td>
<td>Prof Neil Armitage</td>
<td>Sharon Mugeri <a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
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<td>3 March Bloemfontein</td>
<td>Water Law of South Africa SAICEwat06/00073/09</td>
<td>Hubert Thompson</td>
<td><a href="mailto:cpd.sharon@saice.org.za">cpd.sharon@saice.org.za</a></td>
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<tr>
<td>11 May</td>
<td>An Overview of Bridge Maintenance CPD number to be announced</td>
<td>Ed Elton</td>
<td><a href="mailto:dhermanus@saice.org.za">dhermanus@saice.org.za</a></td>
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For more information on courses, venues and course outlines please visit [http://www.civils.org.za/courses.html](http://www.civils.org.za/courses.html) or contact cpd.sharon@saice.org.za.